BUSINESS SIMULATION

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Business Simulation (NWTC)

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Detailed Licensing

Licensing

*A detailed breakdown of this resource's licensing can be found in **Back Matter/Detailed Licensing**.*

CHAPTER OVERVIEW

1: Business Simulation Introduction

https://noobs.guide/wp-conte

Learning Objectives

- Demonstrate Business Management Learning Outcomes
- Use strategic thinking
- Develop practical skills in business management
- Test your business acumen
- Understand overall interaction and impact of various parts of a business on one another
- Grow the awareness of competition

This textbook was organized to help you navigate CAPSIM and our simulation for class. You have learned many of these topics in your classes throughout the program. My hope is that this book will jog your memory and help serve as a resource to make you more comfortable with the simulation as we go.

Why have a simulation?

- Risk Free
- Try alternative strategies
- Enjoyable and competitive
- Compressed time
- Risk free (you aren't actually managing a company with real shareholder dollars.

The simulation is divided into four main decision areas: R&D (research and design), Marketing, Production, and Finance. There are two additional elements you will need to manage in Round 4, HR and TQM. These decision areas correlate to courses in our program like Marketing, Customer Service, Operations Management, Business Finance and Accounting, Lean Management and Human Resource Management. Leadership and Supervision and Team Building and Problem Solving lessons learned will help with this class as well.

I have currated materials that will help you understand and navigate the decision areas in this class and you will find this helpful through the class and the final exam. Enjoy the summary and feel free to bring out your notes from these classes you have taken.

Let's jump into the review by discussing strategy and operations.

1.1: What is Operations Management?
1.2: Transformation Process
1.3: The Operations Function

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1.1: What is Operations Management?

Operations management is the management of the processes that transform inputs into the goods and services that add value for the customer. Consider the ingredients of your breakfast this morning. Unless you live on a farm and produced them yourself, they passed through a number of different processing steps between the farmer and your table and were handled by several different organizations.

Every day, you use a multitude of physical objects and a variety of services. Most of the physical objects have been manufactured and most of the services have been provided by people in organizations. Just as fish are said to be unaware of the water that surrounds them, most of us give little thought to the organizational processes that produce these goods and services for our use. The study of operations deals with how the goods and services that you buy and consume every day are produced.

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1.2: Transformation Process

A **transformation process** is any activity or group of activities that takes one or more inputs, transforms and adds value to them, and provides outputs for customers or clients. Where the inputs are raw materials, it is relatively easy to identify the transformation involved, such as when milk is transformed into cheese or butter. Where the inputs are information or people, the nature of the transformation may be less obvious. For example, a hospital transforms ill patients (the input) into healthy patients (the output).

Examples of Transformation Processes

- Changes in the physical characteristics of materials or customers
- Changes in the location of materials, information or customers
- Changes in the ownership of materials or information
- Storage or accommodation of materials, information or customers
- Changes in the purpose or form of information
- Changes in the physiological or psychological state of customers

Often all three types of **input** – materials, information and customers – must be transformed by a single organization. For example, withdrawing money from a bank account involves information about the customer's account, materials (such as checks and currency), and the customer. Treating a patient in hospital involves not only the "customer's" state of health, but also any materials used in treatment and information about the patient.

As Figure 1.2.1 demonstrates, transformation processes can be categorized into four groups: manufacture (the physical creation of products, e.g. automobiles), service (the treatment of customers or storage of products, e.g. hospitals or warehouses), supply (a change in ownership of goods, e.g. retail), and transport (the movement of materials or customers, e.g. taxi service).

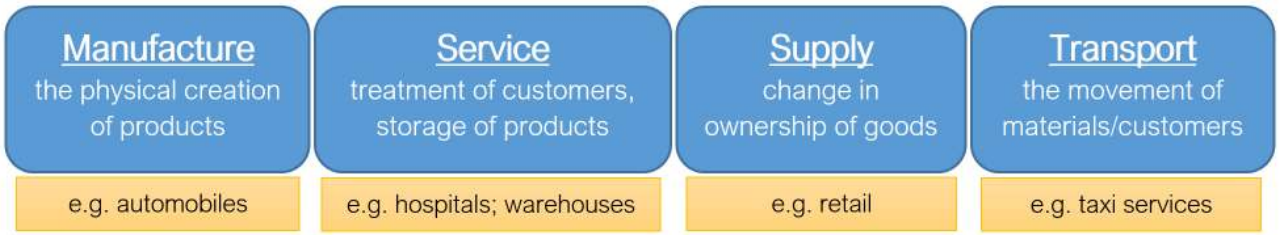

Figure 1.2.1: Categories of transformation processes.

Several different transformations are usually required to produce a good or service. The overall transformation can be described as the **macro operation**, and the more detailed transformations within this macro operation as **micro operations**. For example, the macro operation in a brewery is making beer (Figure 1.2.2). The micro operations include:

- milling the malted barley into grist
- mixing the grist with hot water to form wort
- cooling the wort and transferring it to the fermentation vessel
- adding yeast to the wort and fermenting the liquid into beer
- filtering the beer to remove the spent yeast
- decanting the beer into casks or bottles.

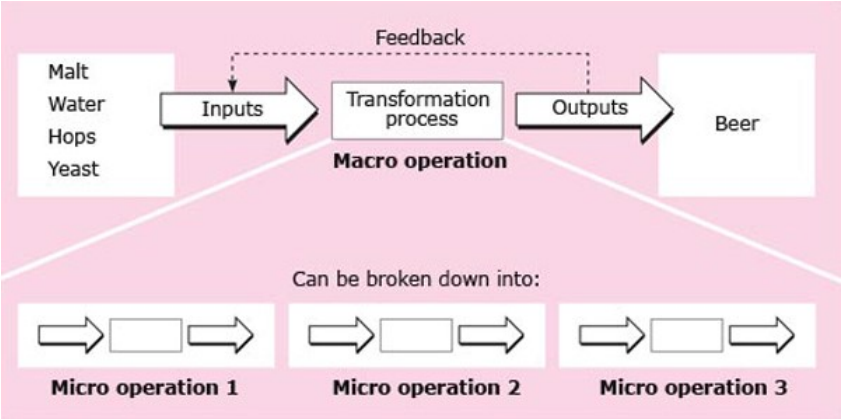

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Figure 1.2.2: Macro and micro operations (transformation processes); Credit: The Open University / open.ed

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1.3: The Operations Function

Every organization has an operations function, whether or not it is called ‘operations’. The goal or purpose of most organizations involves the production of goods and/or services. To do this, they have to procure resources, convert them into outputs and distribute them to their intended users. The term **operations** embraces all the activities required to create and deliver an organization’s goods or services to its customers or clients.

Within large and complex organizations, operations is usually a major functional area, with people specifically designated to take responsibility for managing all or part of the organization’s operations processes. It is an important functional area because it plays a crucial role in determining how well an organization satisfies its customers. In the case of private-sector companies, the mission of the operations function is usually expressed in terms of profits, growth and competitiveness; in public and voluntary organizations, it is often expressed in terms of providing value for money.

Operations management is concerned with the design, management, and improvement of the systems that create the organization’s goods or services. The majority of most organizations’ financial and human resources are invested in the activities involved in making products or delivering services. Operations management is therefore critical to organizational success.

Other functions of the Business:

A typical organization has four distinct basic functional areas; operations, marketing and sales, finance, and human resources. These areas are highlighted in your simulation.

Operations is the area that is responsible for directly creating the product or service for which the customer will pay. The other three departments ensure that the operations area of the business has everything needed in order to do the work.

Marketing – ensures that operations is producing the right product or service in a way that provides customers with all the features or characteristics that they value.

Finance – ensures that the funds for materials, supplies, payroll and equipment are available when needed.

Human Resources – ensures that the correct employees, with the adequate skills and experience are recruited, hired and trained. They are responsible for compensation, collection of income taxes, administration of benefits, succession planning and more. Without HR, there would be no employees in the operations department.

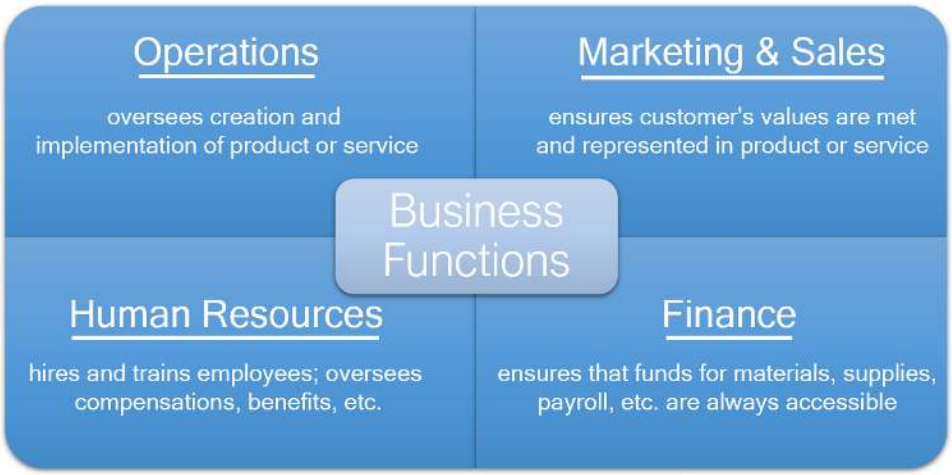

Figure 1.3.1: Business functions of departments.

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CHAPTER OVERVIEW

2: Research and Design

Figure 2.1: Operations Management. (Credit: Chikwenguro / Wikimedia Commons / commons.wikimedia.org/wiki/File:Operations_Management.gif)

Learning Objectives

- Explain each of the key purchasing criteria.
- Differentiate between order qualifiers and order winners.
- Understand the four competitive priorities and common strategies firms use to achieve these priorities.
- Describe the term ‘core competency.’
- Describe the three levels of strategy.
- Know the six categories of operations strategy categories.
- Calculate productivity measures including partial, multi-factor and total productivity.

The first section in your simulation is Research and Design/Development.

There are several things you will be doing in this section:

1. Ensure the perceived age of the product meets customer demands.
2. Build the quality and reliability (MTBF...Mean Time Before Failure) of the products.
3. Invent new products to address the changing market place and take advantage of new opportunities.
4. Determine the specifications of the products to meet customer expectations.

2.1: Competitiveness
2.2: Strategy
2.3: In the Spotlight
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2.7: Product Positioning

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2.1: Competitiveness

We have all competed in various types of activities, perhaps in sports, or school. There may have been prizes or rewards for ranking high in these competitions. Business is no different. We define **competitiveness** as the ability and performance of a firm to sell and supply goods and services in a given market, in relation to the ability and performance of other firms.[1] In other words, how will one firm win over customers in order to become the product or service of choice.

Competitive Advantage and Key Purchasing Criteria

Competitive advantage is the leverage a business has over its competitors. This can be gained by offering clients better and greater value. Advertising products or services with lower prices or higher quality piques the interest of consumers. This is the reason behind brand loyalty, or why customers prefer one particular product or service over another.[2]

Each organization needs to have a deep understanding of their customers and what drives their customers to make purchases. We refer to these as **key purchasing criteria**. They are the factors which customers evaluate and consider when making a product choice.

It is important to keep in mind that the customer is not always a consumer purchasing a good at a store. The customer in many instances may be another business. The city of Toronto may be purchasing heavy duty trucks to use in the landscaping of city parks or Toyota may be searching for a new supplier for automobile glass.

Key Purchasing Criteria Include:

Price – Firms need to understand how much the customer will pay for an item. If products are seen to be very similar to one another, the customer will choose based on price.

Quality – Many customers are willing to spend more in order to obtain a product with specific characteristics or brand reputation. Not only are we considering a product with a great design, but also, one that is long lasting and defect free.

Variety – There is a part of the market that value the opportunity to choose from a wide variety of products. They look for options to change the style, colour, dimensions or technical characteristics.

Timeliness – Some customers care greatly about how long it will take to obtain the product or service. For companies' in the transportation business, this will be a key necessity in order to gain new customers. This can also be related to the capability of the company to deliver at the time that they had promised.

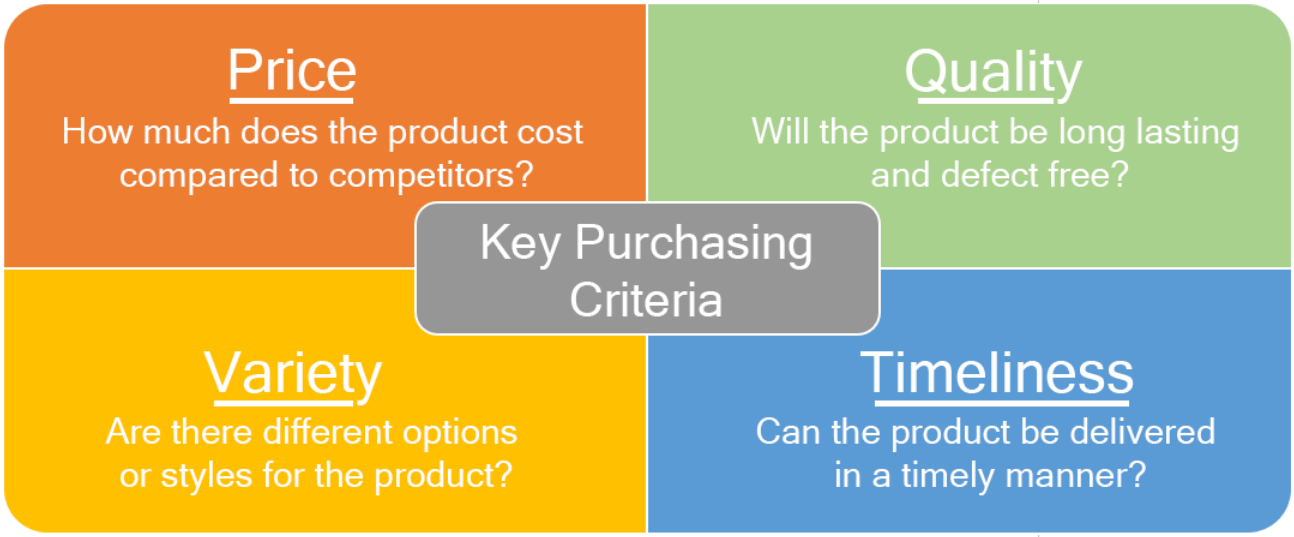


Figure 2.1.1: Categories of key purchasing criteria.

Order Qualifiers Versus Order Winners

Two concepts related to key purchasing criteria are order qualifiers and order winners, first introduced by Terry Hill.[3] For important purchases, the customers will consider which characteristics are absolutely necessary (nonnegotiable) and which characteristics can actually lead them to make their decision.

Order qualifiers are those characteristics that are "the nonnegotiable requirements" of the customer. Unless these characteristics are part of the product or service package, the customer will look elsewhere. Order qualifiers for a car may include and minimum safety features, and air conditioning.

An **order winner** is the characteristic that wins the order. Often it may be a new technical feature that is desirable. It could be a great warranty package or service agreement, or a better price.

Order qualifiers and order winners change over time. What was an order winner some years ago, may now become an order qualifier and vice versa. In 1989, air conditioning in a car might have been considered an order winner. It was new and desirable. In 2020 however, few customers purchasing a new car would consider buying a car without air conditioning. It has therefore changed from an order winner to an order qualifier.

Marketing must understand what the order qualifiers and order winners are for their customers. Operations must respond promptly to ensure that they are making these options and features available to customers.

Competitive Priorities

The competitive priorities are the ways in which the Operations Management function focuses on the characteristics of cost, quality, flexibility and speed. The firm's customers will determine which of the competitive priorities are emphasized.

Cost – Firms whose customers prioritize price will be very interested in having processes that enable them to keep their costs low. These companies are typically paying close attention to identifying and eliminating waste within their operations. By reducing defects, they will reduce costs. These firms will closely monitor and seek to improve their productivity. Factors such as resource utilization and efficiency will be important.

Quality – Firms whose customers prioritize quality focus on creating both excellent product and process design. Marketing and Engineering collaborate to design products that meet customers' requirements. Manufacturing must ensure that the process is able to produce the products defect-free. It is only by having excellent design quality and excellent process quality that the organization can ensure that customers will have their expectations satisfied.

Flexibility – Firms whose customers prioritize variety must prioritize the ability to change rapidly. Firms who value flexibility usually do so by carefully choosing equipment that is general-purpose and able to perform multiple functions. They will often strive to keep a small amount of spare capacity in case it is needed. Multi-skilled employees who are able to work in various areas of the firm or operate multiple types of technology are valued. These firms want to ensure that they can get new products to market quickly and transition from making one product to another quickly. Keeping machine set-ups fast is a critical way to do this. They also strive to be able to abruptly modify the volume of their output in case the need or opportunity arises.

Delivery (reliability and speed) – Firms whose customers prioritize speed of product/service delivery must be very efficient and quick at providing their products and services. McDonald's and Amazon are examples of this.

Below is a table summarizing the relationship between a customer's priority and a firm's strategy.[4]

Customer's priority	Firm's strategy
Cost	Minimizing product costs and waste, maximizing productivity
Quality	Designing superior, durable products, minimizing defects
Flexibility	Adaptability in product design and output, utilizing general-purpose machinery and multi-skilled workers
Delivery	Maintaining reliable and speedy delivery services

It is a long-held understanding that each major decision that needs to be made within the operations of an organization will include a trade-off because it is impossible for any one organization to excel on all the competitive priorities at once! An example is a manufacturer who competes on the basis of cost. In order to reduce defects, they may choose to change one of their input components for one with a better quality. This however will increase their costs. Cost and quality are common trade-offs. Flexibility and speed are also considered trade-offs. When organizations increase their number of options and varieties, it adds operational complexity. This will slow down their operations.

Core Competency (Core Capabilities)

Core competency is a management theory that originated in a 1990 Harvard Business Review article, "The Core Competence of the Corporation."

Core competencies are the resources and capabilities that comprise the strategic advantages of a business. A modern management theory argues that a business must define, cultivate, and exploit its core competencies in order to succeed against the competition.

- Core competencies are the defining characteristics that make a business or an individual stand out from the competition.
- Identifying and exploiting core competencies are as important for a new business making its mark as for an established company trying to stay competitive.
- A company's people, physical assets, patents, brand equity, and capital all can make a contribution to a company's core competencies.

A successful business has identified what it can do better than anyone else, and why. Its core competencies are the "why."

Defining Core Competencies

In the article, C.K. Prahalad, and Gary Hamel review three conditions a business activity must meet in order to be a core competency:

- The activity must provide superior value or benefits to the consumer.
- It should be difficult for a competitor to replicate or imitate it.
- It should be rare.

Some examples of core competencies:

- McDonald's has standardization. It serves nine million pounds of French fries every day, and every one of them has precisely the same taste and texture.
- Apple has style. The beauty of its devices and their interfaces gives them an edge over its many competitors.
- Walmart has buying power. The sheer size of its buying operation gives it the ability to buy cheap and undersell retail competitors.[5]

Foundation Meeting Customer Expectations

An important part of maintaining sales is offering products that customers want to purchase. When R&D decisions are being made, the customer buying criteria should be at the forefront of that decision. Finding the balance between meeting these expectations while remaining profitable is a key component of operating a successful company.

<u>One area of the customer buying criteria change each year:</u>

- **The ideal spot** – customers will always demand faster (*increase in pfmn*) and smaller (*decrease in size*) products

Example Customer Buying Criteria for Low Tech Segment

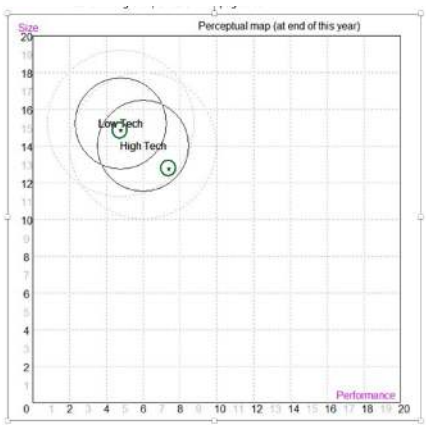
Buying Criteria	Expectations	Importance
1. Price	$15.00-$35.00	41%
2. Age	Ideal Age: 3.0	29%
3. Reliability	MTBF: 14,000-20,000	21%
4. Ideal Position	Pfmn: 5.3 Size: 14.7	9%

When updating products in R&D consider the following:

- Where is the ideal spot for this segment?
- How important is age?
  - Any change to the pfmn or size will reduce the perceived age.
    - When will these changes take place?
    - The most drastic of a change that is being made to the product, the longer they will take. We recommend keeping your revision date within the current year in most cases.
- How important is the MTBF (*mean time before failure*) to this segment?
  - The higher the MTBF, the happier the customers will be (*while staying within range*) but the higher the material cost.

Below is a snapshot of the perceptual map from the Industry Conditions Report. In each segment, the ideal spot is represented by the small asterisk (*circled in green*).

Compare where customers would like you to be positioned (the ideal spot) relative to where you are currently. On page 8 of the Foundation FastTrack, you will find the perceptual map with each products name displaying your current positioning. You can also find this in the R&D decision area. If your products are not near these points, we would recommend thinking about adjusting them in R&D while considering the points on the page above.



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2.2: Strategy

The Strategy Hierarchy

In most corporations, there are several levels of management. Strategic management is the highest of these levels in the sense that it is the broadest and applies to all parts of the firm while also incorporating the longest time horizon. It gives direction to corporate values, corporate culture, corporate goals, and corporate missions. Under this broad corporate strategy there are typically business-level competitive strategies and functional unit strategies.[1]

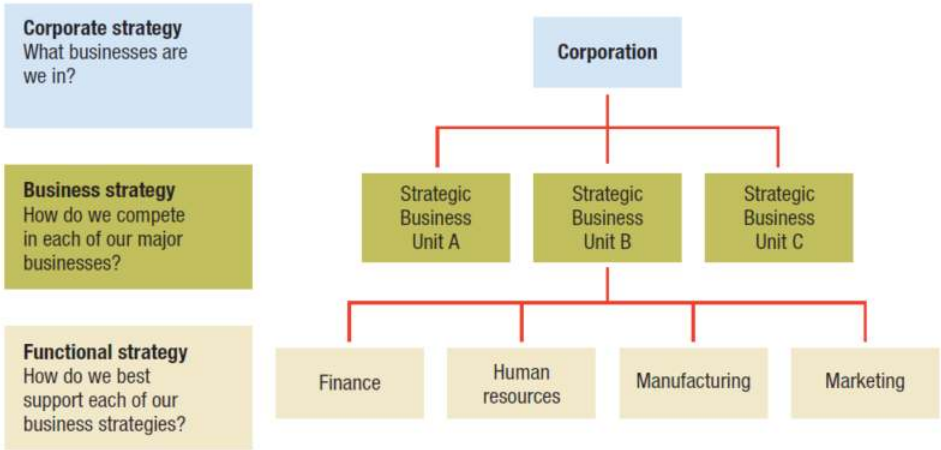


Figure 2.2.1:A hierarchical diagram detailing different strategies within a corporation; Credit: Abey Francis; https://www.mbaknol.com/strategic-ma...egy-hierarchy/

Corporate strategy refers to the overarching strategy of the diversified firm. Such a corporate strategy answers the questions of "in which businesses should we compete?" and "how does being in these businesses create synergy and/or add to the competitive advantage of the corporation as a whole?"

Business strategy refers to the aggregated strategies of a single business firm or a strategic business unit (SBU) in a diversified corporation. According to Michael Porter, a firm must formulate a business strategy that incorporates either cost leadership, differentiation or focus in order to achieve a sustainable competitive advantage and long-term success in its chosen arenas or industries.

Functional strategies include marketing strategies, new product development strategies, human resource strategies, financial strategies, legal strategies, supply-chain strategies, and information technology management strategies. The emphasis is on short- and medium-term plans and is limited to the domain of each department's functional responsibility. Each functional department attempts to do its part in meeting overall corporate objectives, and hence to some extent their strategies are derived from broader corporate strategies.

Many companies feel that a functional organizational structure is not an efficient way to organize activities, so they are reengineered according to processes or SBUs. A **strategic business unit** is a semi-autonomous unit that is usually responsible for its own budgeting, new product decisions, hiring decisions, and price setting. An SBU is treated as an internal profit centre by corporate headquarters.

An additional level of strategy called **operational strategy** was encouraged by Peter Drucker in his theory of Management By Objectives (MBO). It is very narrow in focus and deals with day-to-day operational activities such as scheduling criteria. Operational level strategies are informed by business level strategies which, in turn, are informed by corporate level strategies.[2]

Operations strategy categories can be broken down into many types of areas that must be addressed. The decisions made in these areas will determine whether the business strategy is executed. Below is a list of 10 critical decisions in operations management[8]:

1. **Design of Goods and Services** – The actual design of the product or service will have the largest impact on the cost to produce and the quality to achieve.

2. **Quality** – The way in which the organization will ensure that the product specifications are met. This may include the use of statistical process control, total quality management or Six Sigma.
3. **Process and Capacity Design** – The type of product along with its volume and variety will have the major impact on which type of process to be chosen.
4. **Location** – Important decisions such as how many locations and where to locate them are critical to organization success. This will be a major factor in terms of how quickly the transformation process can take place, and how quickly goods can be shipped to customers.
5. **Layout Design and Strategy** – Consider the placement of work centres, movement of goods, people and information How materials are delivered and used.
6. **Human Resources and Job Design** – Decisions regarding training for employees, how to motivate employees to achieve operational success.
7. **Supply Chain Decisions** – Decisions in terms of where suppliers are located and the level of supplier collaboration are major considerations that impact cost and delivery speed.
8. **Inventory** – How will inventories be used and controlled in the business and the supply chain
9. **Scheduling** – includes both how to schedule production, resources and employees in order to be effective, efficient and meet commitments to customers.
10. **Maintenance**– This involves maintaining equipment and machinery as well as keeping quality high and processes stable.

Common Operations Strategies

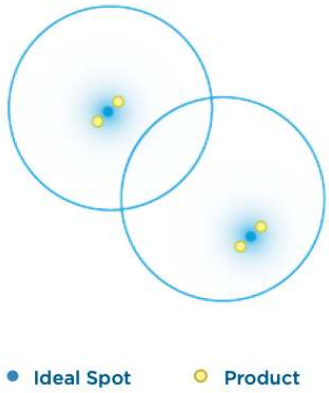
There are many types of Operations strategies; two of the most common are quality-based strategies and time-based strategies.

Quality-based strategies are commonly used when companies wish to elevate their reputation in the marketplace. Improving on their product design and the reduction of errors are the backbone of these initiatives. Firms will often use programs such as ISO9001, Six Sigma, and Total Quality Management in their efforts.

Time-based strategies are used to reduce lead time, which is the amount of time elapsed from the receipt of the customer's order until the products are shipped. Firms that can produce faster will often have lower costs. These companies may use lean production methods to improve the velocity of their processes.

Let's talk Simulation:

There are several strategies to consider when determining where to position your products. Keep in mind that adjusting the initial product from Low Tech to High Tech will cost the same as developing a new product. In addition, you will sell less and it will likely cause you to get an emergency loan. So, just create a new one if you don't want the initial product.



A Broad Differentiation Strategy maintains a presence in both segments of the market. Competitive advantage is gained by distinguishing products with an excellent design, high awareness, and easy accessibility. R&D competency is developed that keeps designs fresh and exciting. Products keep pace with the market, offering improved size and performance. Prices are above average. Capacity is expanded as higher demand is generated.

SAMPLE VISION STATEMENT

Premium products for the industry: our brands withstand the tests of time. Our primary stakeholders are customers, stockholders, management, and employees.

SAMPLE FUNCTIONAL AREA PLANS

Research And Development

We will keep our existing product line, and introduce at least one more line, maintaining a presence in both segments. Our goal is to offer customers products that match their ideal criteria for positioning, age, and reliability.

Marketing

Our company's team will spend aggressively in promotion and sales in both segments. We want every customer to know about our superb designs, and we want to make our products easy for customers to find. We will price at a premium.

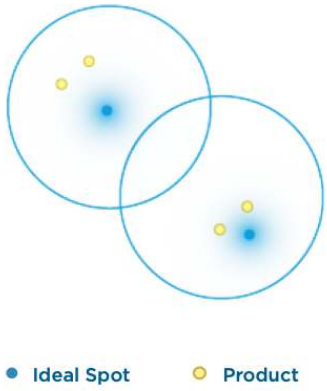
Production

We will grow capacity to meet the demand that we generate, avoiding second shift/overtime when possible. After our products are well positioned, we will investigate modest increases in automation levels to improve margins, but never at the expense of our ability to reposition products and keep up with segments as they move across the perceptual map.

Finance

We will finance our investments primarily through stock issues and cash from operations, supplementing with bond offerings on an as needed basis. When our cash position allows, we will establish a dividend policy and begin to retire stock. We are somewhat averse to debt and prefer to avoid interest payments. We expect to keep assets/equity (leverage) between 1.5 and 2.0. We measure performance in terms of market share, market cap, ROA, and profits.

Broad Cost Leader



A Broad Cost Leader Strategy maintains a presence in both segments of the market. Competitive advantage is gained by keeping R&D costs, production costs, and raw materials costs to a minimum, enabling the company to compete on the basis of price. Prices are below average. Automation levels are increased to improve margins and to offset second shift/overtime costs.

SAMPLE VISION STATEMENT

Low priced products for the industry: our brands offer solid value. Our primary stakeholders are bondholders, customers, stockholders and management.

SAMPLE FUNCTIONAL AREA PLANS

Research And Development

We will keep our existing product line and introduce at least one new line, maintaining a presence in every segment. We'll work to keep our products up to date in each segment despite high automation levels, without sacrificing our cost/price advantage.

Marketing

Our Company's team will spend modestly on promoting and selling products in our industry. Our prices will be lower than average. After we establish our cost leadership position, we will revisit our situation to explore options to improve awareness and

accessibility.

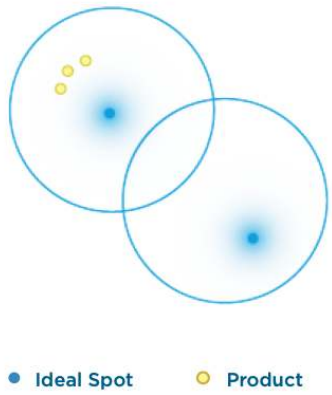
Production

We will significantly increase automation levels on all products. However, because automation sets limits upon our ability to reposition products with R&D, we automate more in the slower moving Low End segments than in the fast moving High End. We will prefer second shift/ overtime to capacity expansions.

Finance

We will finance our investments primarily through long-term bond issues, supplementing with stock offerings on an as needed basis. When our cash position allows, we will establish a dividend policy and begin to retire stock. We are not adverse to leverage and expect to keep debt/equity between 2.0 and 3.0. We measure performance in terms of market share, market cap, ROE, and profits.

Niche Cost Leader



A Niche Cost Leader Strategy concentrates primarily on the Low End segment of the market. Competitive advantage is gained by keeping R&D costs, production costs, and raw materials costs to a minimum, enabling the company to compete on the basis of price. Prices are below average. Automation levels are increased to improve margins and to offset second shift/overtime costs.

SAMPLE VISION STATEMENT

Reliable products for low technology customers: our brands offer value. Our primary stakeholders are bondholders, stockholders, customers, and management.

SAMPLE FUNCTIONAL AREA PLANS

Research And Development

We will concentrate our existing product line in the Low Tech segment, initiating projects as necessary to prevent total obsolescence. We will also introduce at least one new product to our Low Tech customers.

Marketing

We will spend modestly on promoting and selling products in the Low End segment. Our prices will be lower than average in that segment. After we establish our cost leadership position, we will revisit our situation to explore options to improve awareness and accessibility.

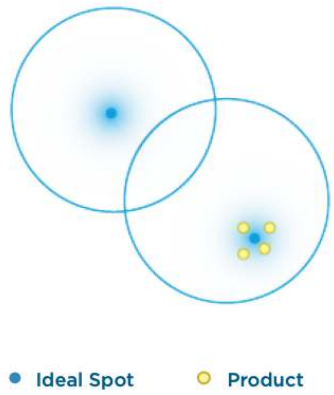
Production

We will significantly increase automation levels on our products. We will prefer second shift/ overtime to capacity expansions.

Finance

We will finance our investments primarily through long-term bond issues, supplementing with stock offerings on an as needed basis. When our cash position allows, we will establish a dividend policy and begin to retire stock. We are not averse to leverage and expect to keep debt/equity between 2.0 and 3.0. We measure performance in terms of ROS, stock price, and ROE.

Niche Differentiator



A Niche Differentiation Strategy focuses upon on the High-Tech Segment. Competitive advantage is gained by distinguishing products with an excellent design, high awareness, easy accessibility, and product extenders. R&D competency is developed to keep designs fresh and exciting. Products will keep pace with the market, offering improved size and performance. Prices are above average. Capacity is expanded as higher demand is generated.

SAMPLE VISION STATEMENT

Premium products for technology oriented customers: our brands define the cutting edge. Our primary stakeholders are customers, stockholders, management, and employees.

SAMPLE FUNCTIONAL AREA PLANS

Research And Development

We will have multiple product lines in the High Tech Segment. Our goal is to offer technology oriented customers products that match their ideal criteria for positioning, age, and reliability.

Marketing

Our Company's team will spend aggressively in promotion and sales in the High Tech segment. We want every customer to know about our superb designs, and we want to make our products easy for customers to find. We will price at a premium.

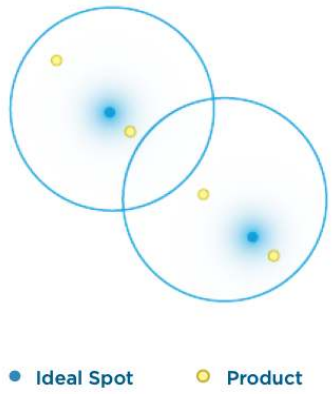
Production

We will grow capacity to meet the demand that we generate, avoiding second shift/overtime when possible. After our products are well positioned, we will investigate modest increases in automation levels to improve margins, but never at the expense of our ability to reposition products and keep up with the High Tech segment as it moves across the perceptual map.

Finance

We will finance our investments primarily through stock issues and cash from operations, supplementing with bond offerings on an as needed basis. When our cash position allows, we will establish a dividend policy and begin to retire stock. We are somewhat averse to debt and prefer to avoid interest payments. We expect to keep assets/equity (leverage) between 1.5 and 2.0. We measure performance in terms of ROE, Asset Turnover, and ROA.

Life Cycle Cost Leader



A Cost Leader with a Product Life Cycle Focus Strategy seeks to minimize costs through efficiency and expertise. Products are allowed to age and change in appeal from High Tech to Low Tech buyers.

SAMPLE VISION STATEMENT

Reliable products for mainstream customers: our brands offer value. Our primary stakeholders are bondholders, stockholders, customers, and management.

SAMPLE FUNCTIONAL AREA PLANS

Research And Development

We will have low R&D spending with very little repositioning on existing products. We will introduce a new product to the High Tech segment every 2-3 years.

Marketing

We will spend modestly on promotion and sales budgets. After we establish our cost leadership position, we will revisit our situation to explore options to improve awareness and accessibility.

Production

We will significantly increase automation levels early in the product's life-cycle.

Finance

We will finance our investments primarily through long-term bond issues, supplementing with stock offerings on an as needed basis. When our cash position allows, we will establish a dividend policy and begin to retire stock. We are not averse to leverage and expect to keep debt/equity between 2.0 and 3.0. We measure performance in terms of stock price, ROE, and ROS.

SAMPLE VISION STATEMENT

Premium products for mainstream customers: quality you can count on. Our primary stakeholders are stockholders, customers, employees, and management.

SAMPLE FUNCTIONAL AREA PLANS

Research And Development

We will have multiple product lines in both segments. Our goal is to offer customers products that match their ideal criteria for positioning, age, and reliability.

Marketing

We will spend aggressively in promotion and sales. We want every customer to know about us, and we want to make our products easy for customers to find. We will price at a premium.

Production

We will grow capacity to meet the demand that we generate, avoiding second shift/overtime when possible. After our products are well positioned, we will investigate modest increases in automation levels to improve margins.

Finance

We will finance our investments primarily through stock issues and cash from operations, supplementing with bond offerings on an as needed basis. When our cash position allows, we will establish a dividend policy and begin to retire stock. We are somewhat adverse to debt, and prefer to avoid interest payments. We expect to keep assets/equity (leverage) between 1.5 and 2.0. We measure performance in terms of stock price, ROS, Asset Turnover, and ROA.

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2.3: In the Spotlight

Since its launch in 1967, Gatorade has been a power player in the sports drink beverage category. Gatorade dominates the US sports drink market, garnering 67.7% of the market, followed distantly by the Coca-Cola Company's Powerade and BODYARMOR brands at 13.7% and 9.3%, respectively (Arthur, 2021). That Gatorade has maintained such a large market share demonstrates parent company PepsiCo's understanding of the marketing mix (i.e., product, price, place, and promotion), how to integrate these elements for its target market, and how to adapt its marketing mix continually to meet changing consumer demands.

Figure 2.3.1: Gatorade remains a market-leading product due to parent company Pepsi's success with the marketing mix—product, price, place, and promotion. (credit: modification of work "Gatorade" by JeepersMedia/flickr, CC BY 2.0)

First, let's consider its approach to the product itself. Gatorade managers saw the exercise boom coming as baby boomers began to age and wanted to be the performance and thirst quencher for everyone from kids to pros. The product, which was intended to replace electrolytes lost in sweat, was scientifically formulated first at the University of Florida and later at the Gatorade Sports Science Institute. But Gatorade didn't rest on its laurels when it came to product innovation. For example, to lure back "lapsed" consumers with concerns over sugar, it launched Gatorade Zero, a thirst quencher without sugar. It also launched its G Series Performance, a new line of food and beverage products designed to provide fuel, fluid, and nutrients before, during, and after activity (Arthur, 2021).

In terms of pricing, Gatorade originally priced its product using a premium strategy because the product was unique. However, to retain its lead, the company subsequently adopted competitive pricing policies when competitors entered the market (Rovell, 2006).

Gatorade has continued to pump marketing dollars into advertising campaigns. For example, in 2020, it launched an iconic advertising campaign featuring some of the world's "greatest of all time (GOAT) athletes"—the NBA's Michael Jordan, tennis star Serena Williams, soccer legend Lionel Messi, and track star Usain Bolt. In the commercial, the sports stars appear at a mythical setting called "GOAT Camp," where student–athletes (considered "future GOATS") can train with these stars (Heath, 2020). Check out the GOAT camp commercial below:

In 2020, Gatorade launched an impactful digital strategy. When NBA games were canceled because of the pandemic, ESPN aired a 10-part documentary, “The Last Dance,” about Michael Jordan’s last year with the Chicago Bulls. Because Gatorade wasn’t an official sponsor, it partnered with the NBA to stream 1998’s Game 6 featuring the Jazz versus the Bulls in what would be superstar Jordan’s last game with the Bulls. Gatorade sponsored a “watch party” keyed to the hashtag #Game6Live (X, 2022). Review Gatorade’s strategy on Twitter’s Marketing website, which outlines campaign results, opportunity, and steps taken.

Gatorade is an example of how one company built market dominance by creating the optimal integration of its marketing mix—product, price, place, and promotion—throughout a product’s life cycle.

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2.4: Marketing and the Marketing Process

Learning Objectives

By the end of this section, you will be able to:

- Define and describe marketing.
- Describe the benefits of marketing to the organization, its interested parties, and society.
- Explain the marketing process.

Marketing Defined

When you ask a group of people, “What’s marketing?” most people will answer “advertising” or “selling.” Both functions are indeed part of marketing, but marketing is much more than that. The American Marketing Association (AMA) defines marketing as “the activity, set of institutions, and processes for creating, communicating, delivering, and exchanging offerings that have value for customers, clients, partners, and society at large" (American Marketing Association, n.d.). That’s kind of a mouthful, so let’s see if we can simplify it a bit.

At its most basic level, marketing comprises every process involved in moving a product or service from the organization to the consumer. It includes discerning the needs of customers, developing products or services to meet those needs, identifying who is likely to purchase the products or services, promoting them, and moving them through the appropriate distribution channels to reach those customers. Marketing, quite simply, is about understanding what your customers want and using that understanding to drive the business.

Marketing can also be defined as the set of activities involved in identifying and anticipating customer needs and then attempting to satisfy those needs profitably (Chartered Institute of Marketing, 2009). But what does that really mean? Let’s break down that definition:

- **Identifying customer needs.** This is typically where marketing research comes in. Marketing research methods will be covered in a later chapter, but market research helps a company develop a detailed picture of its customers, including a clear understanding of their wants and needs.
- **Anticipating customer needs.** After analyzing the data collected, marketers can predict how products might be changed, adapted, or updated.
- **Satisfying customer needs.** If marketers have done their homework correctly and understand their customers’ needs clearly, consumers will be pleased with their product purchase and more likely to make additional purchases.
- **Profitably.** Profitability is a relatively simple term: it’s when a company’s revenue is greater than its expenses. In terms of marketing, the road to profitability means adding value to a product so that the price customers pay is greater than the cost of making the product (Tutor2u, 2021).

How Marketing Benefits the Organization, Its Interested Parties, and Society

Before we go on, let’s consider all the people and groups an organization must consider and serve. Interested parties are those persons or entities that have an interest in a company's success or failure. These parties can be categorized into two types: internal and external (Figure 2.4.1). You may see these people and groups referred to as “stakeholders” in business writing and other media.

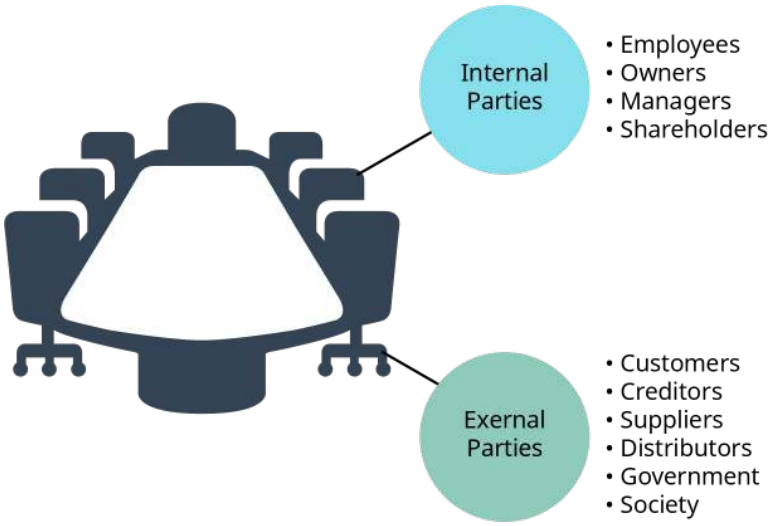

Figure 2.4.1: Types of Interested Parties (CC BY 4.0; Rice University & OpenStax)

Internal interested parties are entities that reside within the organization and that affect—or are affected by—the company's actions. These entities include employees, owners, managers, and investors (shareholders). When we think about marketing, marketers often tend to look outward. They build strategies to engage customers and show them what the company has to offer.

You might think that marketing would be primarily directed toward those outside the company, like customers, but marketing is also directed toward internal groups. Internal marketing involves promoting the objectives, products, and services of a company to its internal constituents—particularly employees (Martyn Bassett Associates, Inc., 2021).

Think about a recent interaction you have had with a business employee. It could be the server who took your order at lunch or the sales associate at a big box store who showed you the features of the new laptop you were looking to purchase. Which interactions left you with a positive experience? Chances are that your evaluation of the experience is based on your interaction with the server or sales associate. That’s a function and benefit of good internal marketing: employees who are motivated and empowered to deliver a satisfying customer experience.

External interested parties include those outside the company, such as customers, creditors, suppliers, distributors, and society. External groups don’t have a direct say in the company’s decision-making process. However, they are vital to the company's success because companies can only succeed with the support of others.

How does marketing benefit external parties? First, consider what marketing does for consumers. It draws out their needs, creates new demand, locates untapped opportunities, and determines the possibilities of selling new products. Second, marketing creates form, time, place, and possession utilities for the company’s goods and services. Utility refers to a product’s usefulness to customers so that they are convinced enough to make a purchase. In other words, when you hear “utility” in marketing, think “usefulness to customers.”

Marketing creates several different types of utility:

- **Form utility**. Form utility refers to how well an organization can increase the value of its product in the customer’s eyes by making changes and altering its physical appearance (Bhasin, 2020). For example, when you want a donut or a pastry, you don’t want to buy the ingredients to make it; you want a donut in its final form so you can eat it. That’s where the bakery and form utility come into play. The bakery combines flour, sugar, eggs, and other ingredients to make the cakes, donuts, and pastries you purchase.
- **Time utility**. Marketing creates time utility when it makes products and services available to customers so that they can buy them when it is most convenient. Consider how many stores are open evenings, weekends, or even 24/7 to make it convenient for customers to shop there!
- **Place utility**. Marketing creates place utility when it makes goods or services physically available, convenient, and accessible to customers. Consider the ease a company like Uber Eats adds to your life when you’re craving tacos in the middle of the night and you don’t feel like getting dressed and driving to go get them. You can have your food delivered to you!

- **Possession utility**. Marketers facilitate possession utility by ensuring that a product is relatively easy to acquire. For example, many automobile manufacturers offer low (or sometimes no) interest rates on car loans to make it easy for you to walk out the door with a new set of car keys. Possession utility also encompasses the pride or satisfaction you get from owning a new product, such as a great-fitting pair of running shoes or a smartphone with all the features you've been wanting.

Marketing's primary benefit to society is that it drives the consumer economy. Marketing leads to increased sales and revenue for a business, which enables it to expand operations and create more internal and external jobs for partners such as suppliers. Marketing also contributes tax revenue to local, state, and federal governments, ultimately leading to overall economic growth.

The Marketing Process Defined

The marketing process refers to the series of steps that assist businesses in planning, analyzing, implementing, and adjusting their marketing strategy. Do an internet search for "steps in the marketing process," and you'll immediately see that some websites outline a 10-step process, whereas others propose a four-step or six-step process. For our purposes, we're going to use a five-step process.

Steps in the Marketing Process

The five-step process (see Figure 2.4.2) involves understanding the marketplace and customers, developing a marketing strategy, delivering value, growing customer relations, and capturing value from customers (iEduNote, 2020).

Figure 2.4.2: Steps in the Marketing Process (CC BY 4.0; Rice University & OpenStax)

Step 1: Understand Both the Marketplace and Customers

Before you can start the marketing process, you must have a good idea of what your marketplace looks like. This means answering some basic questions about your customers, like who they are, their income and purchasing power, and how much they're likely to spend (particularly on your products or services). If you decide to sell at lower prices to attain higher unit sales volume, your marketing strategy would look very different than if you decided to sell fewer products at a higher price.

Another way to approach this is to create separate brands and compete in both arenas. Consider Volkswagen. You might think immediately of the VW Beetle or the Jetta, but the company's brand portfolio extends beyond VW passenger cars and SUVs. It's also the parent company for Audi, Bentley, Lamborghini, Porsche, and others, and these vehicles sell at very different price points from those of VW passenger cars (Lindsay Volkswagen of Dulles, 2021).

Step 2: Develop a Customer-Driven Marketing Strategy

Marketing strategy refers to a business's overall "game plan" to focus its limited resources to reach prospective customers and turn them into paying customers, hopefully for the long run.

It's said that there are two basic types of marketing strategy: a product-driven, "build-it-and-they-will-come" strategy and a customer-driven strategy, in which you analyze prospective consumers and then—and only then—create something they want or need. We're going to focus on the latter strategy. What happens in a customer-driven marketing strategy is that the company shifts the focus from the product or service itself to its users. Customers' needs are the central focus and the point of beginning, not an afterthought. Your primary goal in a customer-driven marketing strategy is to determine what users want and/or need and then satisfy those users. Instead of being product-centric, it's about being customer-centric and developing a mutually beneficial relationship with customers (Khlystova, 2019).

In a nutshell, it's about establishing a connection and a relationship. It's about understanding who your customers are, what their needs and wants are, and how you can best meet those needs and wants. It's about knowing your target market better than your competitors and creating a strong value proposition for those users—a promise of value that communicates the benefits of your company's products or services. In short, it's what makes your product or service desirable to potential customers, helps them understand why they should buy it, how your company's product or service differs from those of its competitors, and how your offerings are superior to similar offerings from your competitors (CFI Team, n.d.)

Step 3: Deliver High Customer Value

Customers have myriad buying options and alternatives today. Given that, how can a company attract and—even more importantly—retain its customers? The answer is relatively simple: you give them value for their money. By definition, customer value is the ratio between the perceived benefits and costs incurred by the customer in acquiring your products or services.

The mathematical formula is simple:

$$\text{Value} = \frac{\text{Benefits}}{\text{Price}}$$
$$\left(V = B/P\right)$$

But "value" from the customer's perspective is a complex term because we're really considering four different value types:

- **Functional value**: what the product "does" for the customer in terms of solving a particular want or need
- **Monetary value**: what the product actually costs relative to its perceived worth
- **Social value**: how much owning the product allows the customer to connect with others
- **Psychological value**: how much that product allows the customer to "feel better" (Boedecker, 2020)

Value is increased by boosting the benefits (in the form of product, place, or promotion) or minimizing the price.

Step 4: Grow Profitable Customer Relations

The bottom line is that profitable customer relationships are the "secret sauce" of any business. This step in the marketing process is where marketers acquire, keep, and grow customer relationships. Successful marketers know that acquiring customers is one of the hardest (not to mention one of the most expensive) elements of marketing. However, when you know clearly who those potential customers are, you can more effectively determine how to reach them, thus maximizing your marketing dollars.

It isn't enough to have a one-and-done sale. You want repeat buyers, so marketers must remind customers about the company's products and/or services and how those products and services have met their needs and improved their lives so they make repeat purchases. Marketers must consider how to reach customers about their offerings and make it easy and convenient for those customers to make continued purchases.

When customers have a positive relationship with a company or its products or services, they're more likely to become repeat buyers. Satisfied customers are also more likely to be interested in buying additional products or services from your company, and they tend to recommend products to others, further reducing the company's costs of getting new customers (Traynor, 2019).

Step 5: Capture Customer Value in the Form of Profits

The goal of successful customer relationship management (CRM) is creating high customer equity—the potential profits a company earns from its current and potential customers. It's a relatively simple concept: increasing customer loyalty results in higher customer equity.

Increasing customer equity is the goal of marketers because it's a bellwether for financial success. Think about it in simple terms: the higher a company's customer equity, the more profit the company generates, and the more valuable that company (and its products or services) becomes on the market (SendPulse, n.d.).

Careers In Marketing: Marketing Jobs

In every chapter of this book, you'll find this Careers in Marketing section. It's meant to outline various jobs so you can be well informed about all the things marketers do. These sections will outline various job roles, what you do day-to-day, qualifications needed, and sometimes even salary information.

If you've decided you want a job in marketing, it's important to know what kinds of jobs exist and what's expected in each role. Google and YouTube searches will bring you all kinds of information. You should check out the insights from people in these roles and maybe even connect with them to ask them questions. Please do your homework and determine what you like to do with your day, what you're good at, and how to build a network to find the right job for you.

Here are a handful of resources to get your thinking started:

- HubSpot: "How to Start Your Marketing Career When You Know Nothing About Marketing"
- Setup: "The Marketing Career Path: From Entry-Level to Chief Marketing Officer"
- Coursera: "Your Guide to Landing an Entry-Level Marketing Job"
- Skillshare: "12 Entry-Level Marketing Jobs You Can Pursue Right Now"
- Indeed: "Entry Level Marketing Salary in the United States"

Whatever job role you choose, marketing is a creative, interesting, and, at times, exciting role where you can make a real impact on people's lives. Enjoy!

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2.5: The Marketing Mix and the 4Ps of Marketing

Learning Objectives

By the end of this section, you will be able to

- Define and describe the marketing mix.
- List and explain the 4Ps of marketing.

Marketing Mix Defined

Having a great product or service is just the first step in establishing a successful business or building a successful brand. The best product or service in the world won't translate to profits unless people know about it. How do you reach customers and help them connect with your product? That's the role of the marketing mix.

The marketing mix is commonly referred to as the tactics a company can use to promote its products or services in the market to influence consumers to buy. The marketing mix is also known as the 4Ps: product, price, place, and promotion (see 2.5.1). Let's take a closer look.

- The **product** is the good or service that the company provides.
- The **price** is what the consumer pays in exchange for the product.
- The **place** is where the product is purchased.
- **Promotion** consists of advertising, sales, and other communication efforts the company utilizes to attract customers.

Figure 2.5.1: The Marketing Mix and the 4Ps of Marketing (CC BY 4.0; Rice University & OpenStax)

The 4Ps of Marketing

Up to this point, we have been talking about marketing in a somewhat abstract manner. Instead of continuing with a theoretical discussion of the marketing mix and the 4Ps of marketing, we will approach these topics using an example of a product you probably already own—a backpack. Let's get started.

Product

Remember, product refers to a good or service that a company offers to its customers. Let's consider a product that many of you likely own as college students: a backpack (Figure 2.5.2).

Figure 2.5.2: Marketing analyzes customer product needs to determine new product models or features that customers would value, such as a padded computer sleeve in a backpack for students. (credit: "Incase Backpacks" by albertoziveri/flickr, CC BY 2.0)

In terms of the first of the 4Ps, marketing analyzes the needs of consumers who buy backpacks and decides if they want more and/or different bags. For example, marketing will analyze what features consumers want in the bag. Do they want a water bottle pocket, padded shoulder straps, reflective tape, a padded laptop sleeve, or organizer pockets? Think about your own bag for a moment: why did you buy this particular product? What features did it have that made it appealing to you?

Armed with market research knowledge, marketing then attempts to predict what types of backpacks different consumers will want and which of these consumers they will try to satisfy. For example, are you selling bags to adults for their children's use? Are you selling them to young adults who might want more (or different) graphics on the bag? Are you selling to adults who will use these bags for work or school?

Marketing will then estimate how many consumers will purchase backpacks over the next several years and how many bags they'll likely purchase. Marketing will also estimate how many competitors will produce backpacks, how many they'll produce, and what types.

Price

Price is the amount consumers pay for a product or service. There's a delicate balance here. On one hand, marketers must link the price to the product's real or perceived benefits while at the same time taking into consideration factors like production costs, seasonal and distributor discounts, and pricing product lines and different models within the line.

Marketers attempt to estimate how much consumers are willing to pay for the backpack and—perhaps more importantly—if the company can make a profit selling at that price. Pricing products or services can be both an art and a science. In the case of our backpack example, the company wants to determine two things:

- What's the minimum price the company can charge for the backpack and still make a profit?
- What's the maximum price the company can charge for the backpack without losing customers?

The "correct" answer usually lies somewhere in between those points on the price continuum.

Promotion

Promotion includes advertising, public relations, and many other promotional strategies, including television and print advertisements, internet and social media advertising, and trade shows. A company's promotional efforts must increase awareness of the product and articulate the reasons why customers should purchase their product. Remember: the goal of any promotional activity is to reach the "right" consumers at the right time and the right place.

In terms of our backpack example, marketing now needs to decide which kinds of promotional strategies should be used to tell potential customers about the company's backpacks. For instance, should you use TV advertisements to make customers aware of the backpack? If so, you'll want to run your commercials during programs your target audience watches. For example, if you're

selling backpacks to children (or trying to entice them to badger their parents to purchase them), children's cartoons may be the most cost-effective avenue to reach your target market. If your backpacks are designed for work or school, you'll likely decide to advertise on television programs that target younger adults.

Link to Learning: Netflix, JanSport, and *Stranger Things*

A real-world promotional example is the recent brand partnership between Netflix and JanSport, the backpack company. These two companies collaborated on a *Stranger Things*-branded backpack with the launch of the fourth season of *Stranger Things* in 2022. This collaboration created five Hawkins-inspired backpacks centered on various *Stranger Things* themes. Read more about this promotion and see the backpacks here.

Perhaps you'll decide to run magazine print ads. If so, you'll need to decide which magazines you'll place the ads in. Most magazines have a very specific readership demographic consisting of factors such as age, gender, and interests. If you plan to advertise those backpacks with print ads, you'll want to leverage readership demographics to ensure that your message is being seen by the right consumers—those who are most likely to buy your backpacks (Gaebler Ventures, 2022).

What about internet advertising? Internet advertising (sometimes known as online advertising or digital advertising) is a promotional strategy in which the company utilizes the internet as a medium to deliver its marketing messages. If you plan to go the digital route, what types of internet advertising will you use? Search engine marketing? Email marketing? Social media ads? TikTok videos?

Place

Place considerations focus on how and where to deliver the product to the consumer most likely to buy it. Where did you buy your backpack? Did you buy it in a big box store, online, in an office products store, or perhaps even in the school bookstore? Once again, through market research, marketers determine where potential customers will be and how to get the company's backpacks to them.

One important factor to note about the importance of place in the marketing mix is that it doesn't refer to the location of the company itself but rather to the location of the customers or potential customers. Place deals with strategies the marketer can employ to get those backpacks from their present location—a warehouse, for example—to the customers' location.

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2.6: Understanding Consumer Markets and Buying Behavior

Learning Objectives

By the end of this section, you will be able to

- Define consumer buying behavior.
- Explain the nature of the buyer's black box.
- Describe how consumer behavior is characterized into types.

Consumer Markets and Consumer Buying Behavior Defined

How many buying decisions did you make today? Perhaps you stopped on the way to work or class to buy a soft drink or coffee, went to the grocery store on the way home to get bread or milk, or ordered something online. You likely make buying decisions nearly every day and probably don't give most of those decisions much thought. However, how you make those decisions is significant for marketers because if they can understand *why* you buy what you buy and *when* you buy it, they can use that information to boost revenue.

Consumer buying behavior refers to the decisions and actions people undertake to buy products or services for personal use. In other words, it's the actions you take before buying a product or service; as you will see, many factors influence that behavior. You and all other consumers combine to make up the consumer market.

The Buyer's Black Box

It stands to reason that the hundreds of millions of people who make up the global consumer market don't all buy the same products and services. Why do certain people prefer different items than others? The answer lies in the factors that influence consumer buying behavior. One model of consumer buying behavior is what's known as the buyer's black box, called such because little is known about what goes on in the human mind. It's also known as the stimulus–response model.

As the model shown in Figure 2.6.1 illustrates, consumer buying behavior is based on stimuli from a variety of sources—marketers in terms of the 4Ps (product, price, promotion, and place) and environmental stimuli, such as economic factors, legal/political factors, and technological and cultural factors.

These stimuli go into your "black box," which consists of two parts: buyer characteristics such as beliefs and attitudes, motives, perceptions, and values, and the buyer decision-making process, later covered in this chapter. Your response is the outcome of the thinking that takes place in that black box. What will you buy, where, when, how often, and how much?

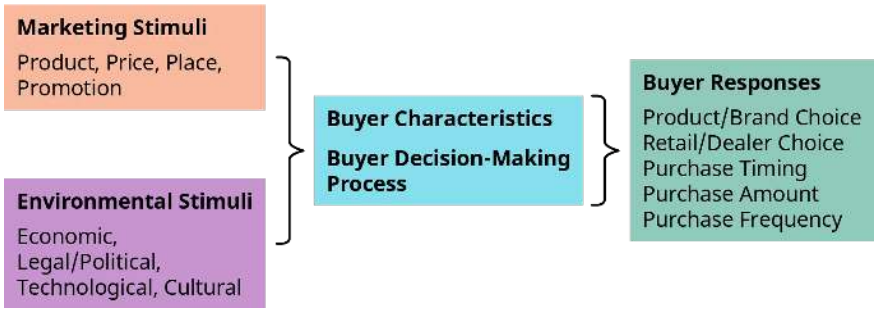

Figure 2.6.1: Stimulus-Response Model/Buyer's Black Box (CC BY 4.0; Rice University & OpenStax)

Types of Consumer Buying Behavior

Buying behavior is not influenced solely by the external environment but is also determined by your level of involvement in a purchase and the amount of risk involved. There are four types of consumer buying behavior, as shown in Figure 2.6.2.

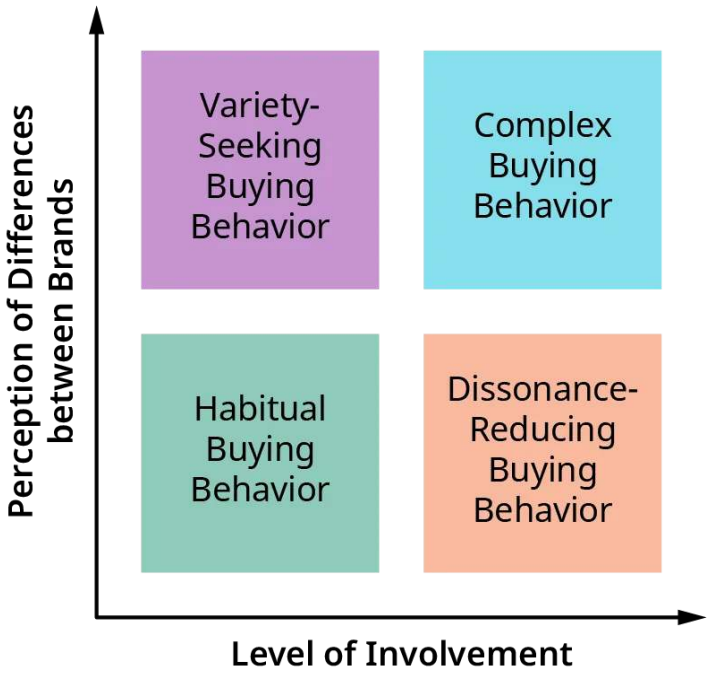

Figure 2.6.2: Types of Consumer Buying Behavior (CC BY 4.0; Rice University & OpenStax)

Complex buying behavior occurs when you make a significant or expensive purchase, such as buying a new car. Because you likely don't buy a new car frequently, you're highly involved in the buying decision, and you probably research different vehicles or talk with friends or family before reaching your decision. By then, you're likely convinced that there's a significant difference among cars, and you've developed your own unique set of criteria that helps you decide on your purchase.

Dissonance-reducing buying behavior occurs when you're highly involved in a purchase but see little difference among brands. Let's say you're replacing the flooring in your kitchen with ceramic tile—another expensive, infrequent purchase. You might think that all ceramic tile brands in a certain price range are "about the same," so you might shop around to see what's available, but you'll probably buy rather quickly, perhaps because of a good price or availability. However, after your purchase, you may experience post-purchase dissonance (also known as buyer's remorse) when you notice some disadvantages of the tile you purchased or hear good things about a brand you didn't purchase.

Habitual buying behavior is low in the purchase decision because it's often a repeat buy, and you don't perceive much brand differentiation. Perhaps you usually buy a certain brand of organic milk, but you don't have strong brand loyalty. If your regular brand isn't available at the store or another brand is on sale, you'll probably buy a different brand.

Variety-seeking buying behavior has the lowest customer involvement because brand switching is your norm. You may not be unhappy with your last purchase of tortilla chips, but you simply want to try something new. It's a matter of brand switching for the sake of variety rather than because of dissatisfaction with your previous purchase.

Link to Learning: The 4Ps and Consumer Behavior

Watch this short, humorous 4Ps video to help you remember the concept. This video also includes several examples of target markets and how a marketer might respond.

Consumer behavior is an important marketing topic, and depending on the marketing program at your institution, you may have the opportunity to take a consumer behavior course and learn more about the topics covered above. Studying consumer behavior is important in marketing because it will teach you how to best know your customer, an integral aspect to marketing a product or service.

As mentioned, environmental factors have an impact on consumer behavior. Can you think of a recent environmental influence that has had a significant impact? The coronavirus pandemic has probably been the most influential in recent years and for many reasons! We still have a lot to learn about the impacts of the pandemic, and new information is being released daily about changing human behavior and the impact on marketing. For example, in this Google article, the author shares a cultural anthropologist's insights for understanding consumer behavior and how it relates to three core needs all people experience—self-care, social connection, and identity—and how these needs correlate to recent YouTube video trends. Learn about how marketers can respond to this trend.

Continually trying to understand environmental influences will keep you on the cutting edge and ahead of the competition. It's a great practice to always be looking for the latest information so that you can shift your strategies as needed. Bain & Company is an

example of one company that wanted to understand how the pandemic changed consumer behavior. The company ran a survey in 2021 to better understand the impact of the pandemic, and it found five trends from the data.

A survey from Accenture, one of the top-ranked consulting firms in the world, found that the pandemic caused 50 percent of consumers to evaluate their purpose and what's important to them. Read more about the findings in this article.

Always be looking for information to be the best marketer you can be!

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2.7: Product Positioning

Learning Objectives

By the end of this section, you will be able to

- Define product positioning.
- Explain approaches to product positioning.
- Describe the positioning statement and perceptual maps.

Product Positioning Defined

So far, you've segmented the market by dividing the market into distinct groups of customers using the segmentation process and you've determined which customer group(s) you want to focus your marketing efforts on—the target marketing process. **Product positioning** is the process of deciding and communicating how an organization wants its market to think and feel about a product or service.

This third and final step is contained in what's known as the segmenting, targeting, and positioning model, the STP model. With the STP model, a company segments the market, selects the target market, and positions its products and services in the existing marketplace (see Figure 2.7.1). In their book *Positioning: The Battle for Your Mind*, marketing gurus Al Ries and Jack Trout write, "The basic approach of positioning is not to create something new and different, but to manipulate what's already up there in the mind" (Ries & Trout, 2001).

Figure 2.7.1: The STP Model (CC BY 4.0; Rice University & OpenStax)

The STP model helps identify your most valuable customers and develop products and marketing messages targeted specifically toward those customers. This allows you to interact with each market segment in a more meaningful way by personalizing your messages (and hopefully selling more of your product!).

For example, Marriott International owns several different hotel chains that target specific consumer groups:

- Courtyard by Marriott focuses on over-the-road travelers who aren't looking for luxury and all the amenities; they just want a basic, clean hotel in which to stay during their trip.
- Ritz-Carlton hotels are by their nature more luxurious and target those travelers who don't mind paying a premium price for more luxury and amenities.
- Marriott ExecuStay hotels are aimed at professionals who need a longer-term place to stay (i.e., an extended stay hotel).

Since these target groups are seeking vastly different things from a hotel stay, Marriott tailors its marketing messages (and hotels) to appeal to the unique wants and needs of each specific group (Marriott International, 2022).

As you can see, in this last step of the STP process, you want first to identify how you can most effectively position your product to target the customer segments that you've determined to be most valuable and then tailor the marketing mix that will be most effective in reaching them.

Approaches to Product Positioning

There are two main types of product positioning in marketing: head-to-head and differentiation. Let's take a look at both.

Head-to-Head Positioning

Head-to-head positioning focuses on comparison. It involves directly competing with competitors on similar product attributes in the same market. For instance, imagine you have a small kiosk in a shopping mall where you serve freshly baked pretzels. If your kiosk makes different flavors of dough from scratch, and your competitors use only processed frozen dough, you can set your pretzel business apart from your competitors in your customers' minds by emphasizing that selling point.

A classic example is when Avis (the car rental company) launched an advertising campaign that went head-to-head with Hertz, the market leader. Avis made a point of comparing itself to Hertz and made its position in the market a selling point using the slogan "When you're only No. 2, you try harder. Or else." This campaign positioned Avis as a direct competitor of Hertz and also did something unique: it highlighted its underdog status, turning it from a liability into an asset. The results? Before the ads, Avis was losing $3.2 million a year; after the ads, Avis improved its performance and earned $1.2 million. Remarkably, that was the first time in over a decade that Avis had been profitable (Stevenson, 2013).

Link to Learning: Example of Head-to-Head Positioning

Another good example of head-to-head positioning is Wendy's, which launched an advertising campaign a few years ago saying that its beef is fresh, never frozen, versus its competitors, particularly McDonald's. Check out this Wendy's Super Bowl commercial from 2018 where it goes head-to-head with McDonald's.

Differentiation Positioning

Differentiation positioning is all about emphasizing your product or service's unique qualities vis-à-vis the competition. Similar to head-to-head positioning, you'll focus on your offerings and attempt to convince customers to buy your products or services instead of those of the competition. However, unlike head-to-head positioning, instead of competing in the same market, you'll attempt to identify new markets and seek out customers who may be interested in your offerings because of those unique qualities you've identified (Gartenstein, 2019). Common differentiation strategies are intended to draw consumers' attention to the value, quality, or uniqueness of your offering.

For instance, Curves, the largest women's fitness franchise in the world, succeeded by offering a fitness alternative to both home-based exercise routines and traditional health clubs. The experience of a Curves facility was entirely different from that of a typical health club. Instead of machines arranged in rows facing a TV, Curves arranged its machines in a circle to facilitate interaction among members. There were few (if any) mirrors and no men staring. The result was that Curves did not compete head-to-head with other health and exercise concepts; rather, it created new demand (Kim & Mauborgne, 2022).

Positioning Statements

In your other college courses, you may have heard terms such as *vision statement* and *mission statement*. We're going to add a third term to your vocabulary—*positioning statement*. Essentially, a positioning statement briefly describes your brand, product, service, and target market. Not only does it define how your brand meets the customer's needs, but it also tries to clarify why it does so better than your competition. It answers the question, "What experience do you want your customers to have with this product or service?"

Templates for writing your positioning statement abound. Here are just a few examples:

- [Your brand] provides [your offering/benefit that makes you better than competitors] for [your customers] who [customer needs] because [the reason why your customers should believe you are better than competitors] (Tow, 2019).
- For [target audience], [brand name] is the [your market] that delivers [your points of differentiation] so they can [end benefit] because [your evidence] (SharkByte, Inc., 2021).

Now let's take a look at some examples of positioning statements for companies with which you're likely familiar so that you can see these templates in action:

- Amazon: "For consumers who want to purchase a wide range of products online with quick delivery, Amazon provides a one-stop online shopping site. Amazon sets itself apart from other online retailers with its customer obsession, passion for innovation, and commitment to operational excellence" (SharkByte, Inc., 2021).
- Apple: "For individuals who want the best personal computer or mobile device, Apple leads the technology with the most innovative products. Apple emphasizes technological research and advancement and takes an innovative approach to business best practices—it considers the impact our products and processes have on its customers and the planet" (SharkByte, Inc., 2021).
- McDonald's: "For individuals looking for a quick-service restaurant with an exceptional customer experience, McDonald's is a leader in the fast-food industry, with friendly service and consistency across thousands of convenient locations. McDonald's dedication to improving operations and customer satisfaction sets it apart from other fast-food restaurants" (SharkByte, Inc., 2021).
- Coca-Cola: "For individuals looking for high-quality beverages, Coca-Cola offers a wide range of the most refreshing options—each creates a positive experience for customers when they enjoy a Coca-Cola brand drink. Unlike other beverage options, Coca-Cola products inspire happiness and make a positive difference in customers' lives, and the brand is intensely focused on the needs of consumers and customers" (Hart, 2023).

Perceptual Positioning Maps and How They Are Used

A perceptual map is a visual diagram that shows how the average target market consumer perceives your product versus those of your competitors (Market Segmentation Study Guide, 2023).

A perceptual map uses two determinant attributes on a graph. Determinant attributes are those attributes that a customer uses in making their purchase decision. In other words, what do you believe consumers' "hot buttons" are concerning your product or service offering? You've got a vast array of determinant attributes to use. You could use price versus quality, sugar versus protein, or any number of other attributes. The bottom line is that these attributes should reflect what customers are looking for in the product or service.

Once you've established the determinant attributes, you plot your product offering onto the map. Let's imagine that your company is getting ready to introduce a new nutritional drink for seniors. You might start out with determinant attributes such as high/low sugar and high/low protein (although you could use other determinant attributes such as price, taste, etc.). Step one of your perceptual map might look something like Figure 2.7.2.

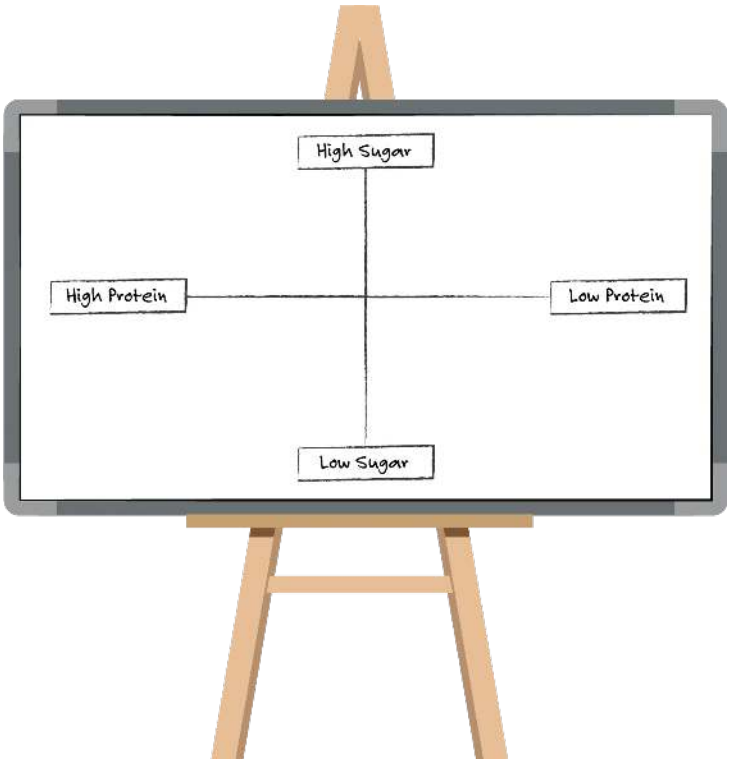


Figure 2.7.2: Perceptual Map Skeleton (CC BY 4.0; Rice University & OpenStax)

Now it's time to map both your offering and the competitors' offerings on the perceptual map. The simple combination of these two scores places the product offering on the map. It's not necessary to list every single competitor on this perceptual map, but you should try for a list of at least 5 to 10 competitors.

Once you've mapped your competitors' offerings on the perceptual map, it may look something like Figure 2.7.3 (although you would have brand names in the circles instead of "Brand A," "Brand B," etc.).

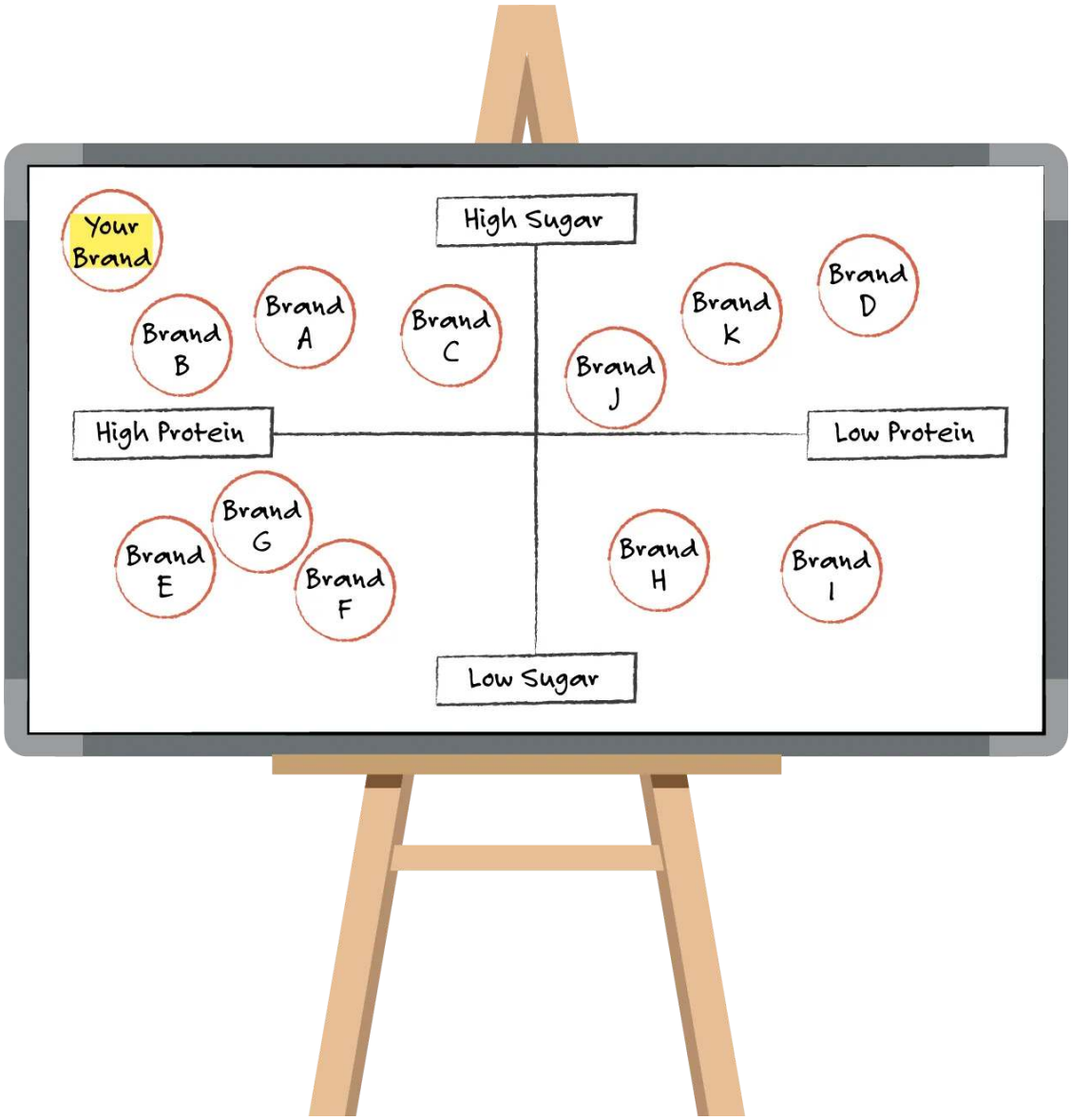


Figure 2.7.3: Sample Perceptual Map (CC BY 4.0; Rice University & OpenStax)

Once you have developed the perceptual map, you will have a clearer idea of where your product or service offering stands vis-à-vis your competition. You will look at which brands occupy the same space as your offering (or a nearly identical space) based on consumer attitudes. Here are some things to look for on your perceptual map:

- Do consumer attitudes toward your offering align with what you want them to think about it?
- Do consumer attitudes toward your competitors' offerings align with what you thought consumers would think about them?
- Look at the map closely and determine which of your competitors' offerings consumers perceive as being closest to yours.
- Perceptual maps are also an opportunity to determine if there are any holes or gaps in the map. This may signal a potential for new offerings (Hausman, 2020).

Some other things to think about once you've completed your perceptual map:

- If consumer attitudes toward your offering aren't what you expected, it may be necessary to change your marketing actions to correct or modify these consumers' attitudes.
- Let's assume for a minute that consumers view your competitors' offerings as similar to yours. If this is the case, you may want to think about ways to make your offering stand out from the competition rather than going head-to-head with competitors.

- If there are gaps in the map that you think you can fill based on your company's capabilities, you may want to consider introducing a new offering or moving your offering into an unfilled position by modifying its features and attributes (Hausman, 2020).

Let's Talk Simulation

Foundation® companies manufacture electronic sensors. Other manufacturers install these as components in their products, where sensors measure physical conditions such as speed, temperature and pressure.

Manufacturers with similar sensor needs fall into Market Segments. In Foundation® the segments are called:

- Low Tech
- High Tech

The criteria from the year prior to Round 1 (Round 0) display below.

In Foundation®, price ranges remain constant round after round.

Positioning criteria for Foundation® change each round.

Age and reliability (MTBF) criteria remain constant round after round for Foundation®.

Low Tech

Low Tech customers seek proven products, are indifferent to technological sophistication and are price motivated.

1. Price, $15.00-$35.00- 41% of decision
2. Age, 3 years- 29% of decision
3. Reliability (MTBF), 14,000-20,000- 21% of decision
4. Ideal Position (at the end of Round 0/Beginning of Round 1), performance 4.8 size 15.2- 9% of decision

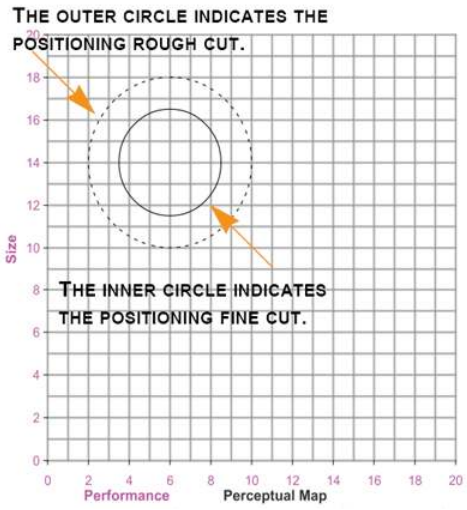
High Tech

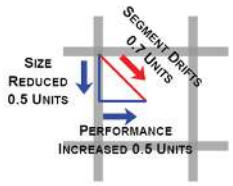
High Tech customers seek cutting-edge technology in both size and performance.

1. Ideal Position (at the end of Round 0/Beginning of Round 1), performance 7.4 size 12.6- 33% of decision
2. Age, 0 years- 29% of decision
3. Price, $25.00-$45.00- 25% of decision
4. Reliability (MTBF), 17,000-23,000- 13% of decision.

A perceptual map is a tool used by marketers to graphically compare characteristics of competing sets of products. The Foundation® perceptual map compares sensor weight and girth, measured as size on the vertical axis, and speed of operation, measured as performance on the horizontal axis.

Each segment has its own preference for sensor size and performance, which are defined by segment circles on the map. The inner fine cut circle has a radius of 2.5 units. It represents the heart of the segment where demand is strong. In addition, each inner circle has an ideal spot, a location where demand is strongest. The larger outer rough cut circle has a radius of 4.0 units. It represents the outer fringe of the segment, where demand is weak.



	Each year, customers demand smaller, better performing products. This causes the segments to move or drift across the map. For example, in the Low Tech (Foundation®) segments, size expectations decrease by 0.5 units and performance expectations increase by 0.5 units, moving the segment center 0.7 units across the map.

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CHAPTER OVERVIEW

3: Marketing

Operational Decision Making

Operational decision making is a critical aspect of managing any organization. It involves making choices that affect the day-to-day functioning and long-term strategy of the business. Understanding and utilizing financial data is essential in this process, as it provides a quantitative basis for evaluating options and making informed decisions.

Financial data serves as the backbone of operational decision making. It includes information on costs, revenues, profits, and other key financial metrics. By analyzing this data, managers can identify trends, forecast future performance, and assess the financial impact of different decisions. This helps in setting realistic goals, allocating resources efficiently, and ensuring the financial health of the organization.

When making operational decisions, organizations often face tradeoffs. These tradeoffs can involve balancing short-term gains against long-term sustainability, cost reduction against quality improvement, or speed of implementation against thoroughness of planning. For example, a company might need to decide whether to invest in new technology that could improve efficiency but requires significant upfront costs. Understanding the financial implications of these tradeoffs is crucial for making decisions that align with the organization's strategic objectives.

The function of operations is a significant cost component for businesses. This includes expenses related to production, logistics, labor, and maintenance. Managing these costs effectively is essential for maintaining profitability. Operational decisions, such as optimizing supply chain processes, improving production techniques, or outsourcing certain functions, can have a substantial impact on the overall cost structure of the organization.

Operational decision making is a complex process that requires careful consideration of financial data. By understanding the financial implications of different options, organizations can make informed decisions that balance various tradeoffs and support their strategic goals. Effective management of operational costs is also critical for ensuring long-term success and competitiveness in the market.

3.1: Why Does Understanding Costs Matter?
3.2: Understanding the Cost Equation
3.3: Contribution Margin - the Foundation for CVP
3.4: Understanding the Degree of Operating Leverage
3.5: Pricing and Its Role in the Marketing Mix
3.6: The Five Critical Cs of Pricing
3.7: The Five-Step Procedure for Establishing Pricing Policy
3.8: Introduction to Forecasting
3.9: Forecasting Assumptions and Demand Patterns
3.10: Time Series Methods

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3.1: Why Does Understanding Costs Matter?

Figure 3.1.1: Balancing Cost, Volume, and Profit. Managers employ cost-volume-profit (CVP) analysis to determine the sales level at which they break even or balance their revenue with their expenses. Credit: modification of "Balance Swing Equality" by "Mediamodifier"/Pixabay, CC0

As president of the Business Students Club, you are working on a fundraiser selling T-shirts on campus, with the funds going towards OzHarvest – a charity providing meals to the less fortunate. You have gotten quotes from several suppliers ranging from $8 to $10 per shirt and now have to select a vendor. The prices vary based on whether the T-shirts have pockets, have long sleeves or short sleeves, and are printed on one side or both. You are confident that you can sell them for $15 each. However, the university will charge a fee of $100 to have a stall on-campus, and your T-shirt sales must cover this cost and any net profit will be donated to charity.

In addition, several of the vendors will give volume discounts—the more shirts you purchase, the less each shirt costs. In short, you need to know exactly which style of T-shirt, vendor, and quantity will allow you to reach your desired net profit and cover your fixed expense of $100. You decide on a short-sleeve shirt with a pocket that costs $10 each and that you can sell for $15.

This $5 per shirt "gross profit" will first go toward covering the $100 student sale fee. That means you will have to sell 20 shirts to pay the fee ($100/$5 = 20 shirts). After selling the first 20 shirts, the $5 profit will be available to start contributing towards your OzHarvest donation. Your goal is to donate $750, which will provide 1500 meals to those in need. This means the t-shirt stall will need to generate an additional $750 on top of the first 20 shirts.

At $5 per shirt you will need to sell 150 shirts to reach your donation target ($750/$5). How many shirts will the club need to sell overall? You will need to sell a total of 170 shirts: 20 to cover your fixed cost of $100 and an additional 150 to cover the donation target ($750).

What you have just completed is a cost-volume-profit analysis. In this chapter, we will explore how managers can use this type of analysis to make a wide range of decisions about their business operations.

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3.2: Understanding the Cost Equation

To be able to complete any cost-volume-profit (CVP) analysis, first we must understand some basic information about costs that businesses incur.

Costs can be classified in many ways – and there can be many starting points in terms of categorizing costs – but let's start with the following classifications:

1. Variable costs
2. Fixed costs
3. Mixed costs

Variable costs change as the quantity of goods or services produced or provided changes. **Fixed costs** are exactly as the name implies – they remain the same regardless of the quantity/volume of goods or services produced within the period. **Mixed costs** are those that are a combination of variable and fixed components (and when conducting CVP analysis, we will break mixed costs into fixed and variable components).

Consider the following example. Amantha's Artistry (AA) makes sweet treats. Amantha's variable costs are flour, butter, sugar, vanilla essence, and other ingredients in her cupcakes. The fixed costs are the rent for her store and public liability insurance. Amantha's mixed costs include her utilities. Electricity, for example, has a fixed component (a monthly access charge) and a variable component based on how much electricity is used (which is dependent on how many hours a day the ovens are in use).

> This can be represented in an equation: **Y=a+bx**
>
> where Y is the total cost, a is the fixed cost, b is the variable cost per unit, and x is the level of activity.

The cost equation is a linear equation that takes into consideration total fixed costs, the fixed component of mixed costs, and variable cost per unit. Cost equations can use past data to determine patterns of past costs that can then project future costs, or they can use estimated or expected future data to estimate future costs.

Let's take a more in-depth look at the cost equation by examining the costs incurred by Amantha's Artistry in the manufacture of sweet treats, as shown in the table below.

Table 3.2.1: Cost Information for Amantha's Artistry

Cost Incured	Fixed or Variable	Cost
Rent on premises	Fixed	$20,000 per year
Public liability insurance	Fixed	$15,000 per year
Ingredients	Variable	$2 per treat
Staff labor	Variable	$1 per treat

By applying the cost equation, Amantha's Artistry can predict its costs at any level of activity (x) as follows:

1. Determine total fixed costs: $30,000 + $15,000 = $35,000
2. Determine variable costs per unit: $2 + $1 = $3
3. Complete the cost equation: Y = $35,000 + 3x$

Using this equation, Amantha's Artistry can now predict its total costs (Y) for any given level of activity (x), as shown in the table below:

Table 3.2.2: Total Costs for Amantha's Artistry

Treats Produced per Annum	Cost Equation	Total Costs
5,000	Y = $35,000 + ($3 x 5,000)	$50,000
12,000	Y = $35,000 + ($3 x 12,000)	$71,000
20,000	Y = $35,000 + ($3 x 20,000)	$95,000

When using this approach, Amantha's Artistry must be certain that it is only predicting costs for its relevant range. For example, if the business expands over 40,000 treats, the business would need to expand and rent a larger premises.

Why Do We Need to Distinguish between Fixed and Variable Costs?

Distinguishing between fixed and variable costs is critical because the total cost is the sum of all fixed costs (the total fixed costs) and all variable costs (the total variable costs). For every unit produced, every customer served, or every hotel room rented, for example, managers can determine their total costs both per unit of activity and in total by combining their fixed and variable costs together.

Figure 3.2.1 illustrates the concept of total costs.

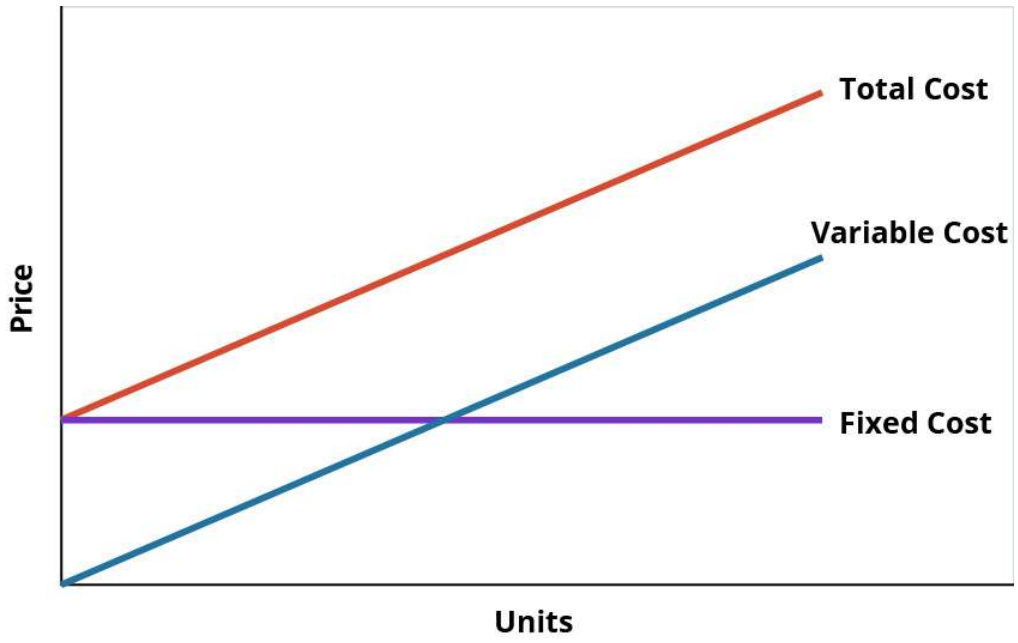


Figure 3.2.1: Total Cost as the Sum of Total Fixed Costs and Total Variable Costs. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Remember that the reason that businesses take the time and effort to classify costs as either fixed or variable is to be able to control costs. When they classify costs properly, managers can use cost data to make decisions and plan for the future of the business.

Example - Boeing

If you've ever flown on an airplane, there's a good chance you know Boeing. The Boeing Company generates around $90 billion each year from selling thousands of airplanes to commercial and military customers around the world. It employs around 200,000 people, and it's indirectly responsible for more than a million jobs through its suppliers, contractors, regulators, and others. Its main assembly line in Everett, WA (USA), is housed in the largest building in the world, a colossal facility that covers nearly a half-trillion cubic feet. Boeing is, simply put, a massive enterprise.

And yet, Boeing's managers know the exact cost of everything the company uses to produce its airplanes: every propeller, flap, seat belt, welder, computer programmer, and so forth. Moreover, they know how those costs would change if they produced

more airplanes or fewer. They also know the price at which they sold each plane and the profit the company made on each sale. Boeing's executives expect their managers to know this information, in real time, if the company is to remain profitable.

Test Your Understanding

Test your understanding of fixed, variable and mixed costs before we move onto using these costs to conduct cost-volume-profit (CVP) analysis.

3.2: Understanding the Cost Equation is shared under a CC BY-NC 4.0 license and was authored, remixed, and/or curated by Amanda White, Mitchell Franklin, Patty Graybeal, Dixon Cooper, and the CDU Business School.

3.3: Contribution Margin - the Foundation for CVP

Fixed Costs, Relevant Range and Variable Costs

To be able to conduct Cost Volume Profit (CVP) analysis, we need to understand something called the **contribution margin**. However, before examining contribution margins, let's review some key concepts: fixed costs, relevant range and variable costs.

Fixed costs are those costs that will not change within a given range of production. For example, in the current case, the fixed costs will be the student sales staff fee of $100. No matter how many shirts the club sells within the relevant range, the fee will be locked in at $100. The relevant range is the anticipated production activity level. Fixed costs remain constant within a relevant range. If production levels exceed expectations, then additional fixed costs will be required (e.g., have two stalls).

For example, assume that the Club is going to hire a people mover van to get students to a weekend study camp. A people-mover van like a Toyota HiAce People mover will hold twelve passengers, at a cost of $200 per van. If they send one to twelve participants, the fixed cost for the van would be $200. If they send thirteen to twenty-four students, the fixed cost would be $400 because they will need two vans. We would consider the relevant range to be between one and twelve passengers, and the fixed cost in this range would be $200. If they exceed the initial relevant range, the fixed costs would increase to $400 for thirteen to twenty-four passengers.

Variable costs are those costs that vary per unit of production. Direct materials are often typical variable costs, because you normally use more direct materials when you produce more items. In our example, if the students sold 100 shirts, assuming an individual variable cost per shirt of $10, the total variable costs would be $1,000 (100 × $10). If they sold 250 shirts, again assuming an individual variable cost per shirt of $10, then the total variable costs would be $2,500 (250 × $10).

Defining the Contribution Margin

Contribution margin is the amount by which a product's selling price exceeds its total variable cost per unit. This difference between the sales price and the per unit variable cost is called the contribution margin because it is the per unit contribution toward covering the fixed costs. It typically is calculated by comparing the sales revenue generated by the sale of one item versus the variable cost of the item:

> Contribution Margin = Sales - Variable Costs

In our example, the sales revenue from one shirt is $15 and the variable cost of one shirt is $10, so the individual contribution margin is $5. This $5 contribution margin is assumed to first cover fixed costs, and then any contribution after fixed costs are covered can be considered profit.

As you will see, it is not just small operations, such as the Business Students Club scenario, that benefit from cost-volume-profit (CVP) analysis. At some point, all businesses find themselves asking the same basic questions: How many units must be sold in order to reach a desired income level? How much will each unit cost? How much of the sales price from each unit will help cover our fixed costs?

For example, **Starbucks** faces these same questions every day, only on a larger scale. When they introduce new menu items, such as seasonal specialty drinks, they must determine the fixed and variable costs associated with each item. Adding menu items may not only increase their fixed costs in the short run (via advertising and promotions) but will bring new variable costs. Starbucks needs to price these drinks in a way that covers the variable costs per unit and additional fixed costs and contributes to overall net income. Regardless of how large or small the enterprise, understanding how fixed costs, variable costs, and volume are related to income is vital for sound decision-making.

Starbucks. Large corporations like Starbucks use cost-volume-profit analysis to make decisions about their products and services to ensure that they are maximizing their revenues.

Figure 3.3.1: Interior of Starbucks. Credit: modification of “StarbucksVaughanMills” by “Raysonho”/Wikimedia Commons, CC0

Understanding how to use fixed costs, variable costs, and sales in CVP analyses requires an understanding of the term **margin**. You may have heard that restaurants and supermarkets have very low margins, while jewelry stores and furniture stores have very high margins. What does “margin” mean? In the broadest terms, margin is the difference between a product or service’s selling price and its cost of production. Recall the accounting club’s T-shirt sale. The difference between the sales price per T-shirt and the purchase price of the T-shirts was the accounting club’s margin:

> Sales Price ($15)
>
> - Cost per T-Shirt ($10)
>
> Margin ($5)

Recall that in the previous section, we explained the characteristics of fixed and variable costs and introduced the basics of cost behavior. Let’s now apply these behaviors to the concept of contribution margin. The company will use this “margin” to cover fixed expenses and hopefully to provide a profit. There are multiple ways to analyze the contribution margin

1. by unit of production
2. as a ratio
3. in total.

Let’s begin by examining contribution margin on a per unit basis.

Unit Contribution Margin

When the contribution margin is calculated on a per unit basis, it is referred to as the contribution margin per unit or unit contribution margin. You can find the contribution margin per unit using the equation shown below:

> Contribution margin per unit = Per unit sales price – Variable cost per unit

It is important to note that this unit contribution margin can be calculated either in dollars or as a percentage. To demonstrate this principle, let’s consider the costs and revenues of Leung Manufacturing, a small company that manufactures and sells birdbaths to specialty retailers. The birdbaths are named after recognizable Australian birds such as the Rosella and the Cockatoo.

Figure 3.3.2: Adult Crimson Rosella JJ Harrison (https://www.jjharrison.com.au/), CC BY-SA 3.0 <https://creativecommons.org/licenses/by-sa/3.0>, via Wikimedia Commons

Leung Manufacturing sells its Rosella Model for $100 and incurs variable costs of $20 per unit. In order to calculate their per unit contribution margin, we use the formula in the table below to determine that on a *per unit* basis, their contribution margin is:

Table 3.3.1: Leung Manufacturing - ROSELLA Model for year ending 30 June 2022

Sales price per unit	$100
– Variable cost per unit	$20
= Contribution margin per unit	**$80**

This means that for every Rosella model they sell, they will have $80 to *contribute* toward covering fixed costs, such as rent, insurance, and manager salaries.

But Leung Manufacturing manufactures and sells more than one model of birdbath. They also sell a Cockatoo Model for $75, and these birdbaths incur variable costs of $15 per unit. For the Cockatoo Model, their contribution margin on a per unit basis is the $75 sales price less the $15 per unit variable costs is as follows:

Table 3.3.2: Leung Manufacturing - COCKATOO Model for year ending 30 June 2022

Sales price per unit	$75
– Variable cost per unit	$15
= Contribution margin per unit	**$60**

This demonstrates that, for every Cockatoo model they sell, they will have $60 to *contribute* toward covering fixed costs and, if there is any left, toward profit. Every product that a company manufactures or every service a company provides will have a unique contribution margin per unit.

In these examples, the contribution margin per unit was calculated in dollars per unit, but another way to calculate contribution margin is as a ratio (percentage).

Contribution Margin Ratio

The contribution margin ratio (CMR) is the percentage of a unit's selling price that exceeds total unit variable costs. In other words, contribution margin is expressed as a percentage of sales price and is calculated using this formula:

$$\text{Contribution Margin Ratio} = \frac{\text{Contribution Margin per Unit}}{\text{Sales Price per Unit}}$$

Figure 3.3.3: Contribution margin ratio formula.

For Leung Manufacturing and their ROSELLA Model, the contribution margin ratio will be:

$$\frac{\$80 \text{ Contribution Margin per Unit}}{\$100 \text{ Sales Price per Unit}} = 0.80$$

Figure 3.3.4: Contribution margin ratio for Leung Manufacturing Rosella model.

At a contribution margin ratio of 80%, approximately $0.80 of each sales dollar generated by the sale of a Rosella Model is available to cover fixed expenses and contribute to profit. The contribution margin ratio for the birdbath implies that, for every $1 generated by the sale of a Rosella Model, they have $0.80 that contributes to fixed costs and profit. Thus, 20% of each sales dollar represents the variable cost of the item and 80% of the sales dollar is margin. Just as each product or service has its own contribution margin on a per unit basis, each has a unique contribution margin ratio. Although this process is extremely useful for analyzing the profitability of a single product, good, or service, managers also need to see the "big picture" and will examine contribution margin in total across all products, goods, or services.

Another Example of Contribution Margin

You rent a kiosk (a free standing stall) in the local shopping centre for $300 a month and use it to sell T-shirts with sporting team logos from all over the world. You sell each T-shirt for $25, and your cost for each shirt is $15 (including appropriate licensing and royalty fees for using the sporting team logos). You also pay your sales person a commission of $0.50 per T-shirt sold in addition to a salary of $400 per month. Construct a contribution margin income statement for two different months: in one month, assume 100 T-shirts are sold, and in the other, assume 200 T-shirts are sold.

Solution

Table 3.3.3: Contribution margin income statements for kiosk.

Pertinent Information		Contribution Margin Income Statement 100 Units Sold		Contribution Margin Income Statement 200 Units Sold	
Sales price per unit	$25	Sales Revenue	$2,500	Sales Revenue	$5,000
Variable costs: Per shirt cost Per shirt commission	15 0.50	Variable costs per unit ($15 + 0.50) x 100 units	1,550	Variable costs per unit ($15 + 0.50) x 200 units	3,100
		Contribution margin	950	Contribution margin	1,900
Fixed costs: Kiosk rental Salary	300 400	Fixed costs	700	Fixed costs	700
		Net operating income	$250	Net operating income	$1,200

Total Contribution Margin

This "big picture" is gained by calculating total contribution margin – the total amount by which total sales exceed total variable costs. We calculate total contribution margin by multiplying per unit contribution margin by sales volume or number of units sold. This approach allows managers to determine how much profit a company is making before paying its fixed expenses. For Leung Manufacturing, if the managers want to determine how much their Rosella Model contributes to the overall profitability of the company, they can calculate total contribution margin as follows:

Table 3.3.4: Leung Manufacturing - ROSELLA Model for month ending 31 May 2022

Units sold	500 units
Contribution margin per unit	$80
= **Total contribution margin** (500 x $80)	**$40,000**

For the month of May, sales from the Rosella Model contributed $40,000 toward fixed costs. Looking at contribution margin in total allows managers to evaluate whether a particular product is profitable and how the sales revenue from that product contributes

to the overall profitability of the company. In fact, we can create a specialized income statement called a contribution margin income statement to determine how changes in sales volume impact the bottom line.

To illustrate how this form of income statement can be used, contribution margin income statements for Leung Manufacturing are shown for the months of May and June, where fixed costs are $23,000 per month.

In May, Leung sold 500 Rosella Models at $100 per unit, which resulted in the operating income shown on the contribution margin income statement:

Table 3.3.5: Leung Manufacturing - Contribution Margin Income Statement for month ending 31 May 2022

Sales (500 units x $100/unit)	$50,000
Less Variable costs (500 units x $20/unit)	$10,000
CONTRIBUTION MARGIN	**$40,000**
Less Fixed costs	$23,000
Net profit	**$17,000**

In June, 750 of the Rosella models were sold. When comparing the two statements, take note of what changed and what remained the same from May to June.

Table 3.3.6: Leung Manufacturing - Contribution Margin Income Statement for month ending 30 June 2022

Sales (750 units x $100/unit)	$75,000
Less Variable costs (750 units x $20/unit)	$15,000
CONTRIBUTION MARGIN	**$60,000**
Less Fixed costs	$23,000
Net profit	**$37,000**

Using this contribution margin format makes it easy to see the impact of changing sales volume on operating income. Fixed costs remained unchanged; however, as more units are produced and sold, more of the per-unit sales price is available to contribute to the company's net income.

Before going further, let's note several key points about CVP and the contribution margin income statement.

- First, the contribution margin income statement is used for *internal* purposes and is not shared with external stakeholders.
- Secondly, in this specialized profit and loss/income statement, when net profit is shown, it actually refers to net profit *without regard to income taxes*. Companies can also consider taxes when performing a CVP analysis to project both pre-tax and post-tax profit; however, that is beyond the scope of this introductory course on accounting.

Why Use Three Different Methods to Discuss Contribution Margin?

Regardless of whether contribution margin is calculated on a per-unit basis, calculated as a ratio, or incorporated into an income statement, all three express how much sales revenue is available to cover fixed expenses and contribute to profit. Let's examine how all three approaches convey the same financial performance, although represented somewhat differently.

You will recall that the per-unit contribution margin was $80 for a Leung Rosella birdbath. When Leung sold 500 units in May, each unit contributed $80 to fixed expenses and profit.

Now, let's use June's Contribution Margin Income Statement as previously calculated to verify the contribution margin based on the contribution margin ratio previously calculated, which was 80%, by applying this formula:

> Total Sales x Contribution Margin Ratio = Total Contribution Margin

June sales were $75,000. The Contribution Margin Ratio (CMR) is $0.80. Therefore,

Total Contribution Margin = Total Sales x CMR = $75,000 x $0.80 = $60,000.

This matches with the Contribution margin income statement for June shown above.

Regardless of how contribution margin is expressed, it provides critical information for managers. Understanding how each product, good, or service contributes to the business's profitability allows managers to make decisions such as which product lines they should expand or which might be discontinued. When allocating scarce resources, the contribution margin will help them focus on those products or services with the highest margin, thereby maximizing profits.

The Evolution of Cost-Volume-Profit Relationships

The CVP relationships of many organizations have become more complex recently because many labour-intensive jobs have been replaced by or supplemented with technology, changing both fixed and variable costs. For those organizations that are still labour-intensive, the labour costs tend to be variable costs, since at higher levels of activity there will be a demand for more labour usage. For example, assuming one worker is needed for every 50 customers per hour, we might need two workers for an average sales season, but during the Christmas season, the store might experience 250 customers per hour and thus would need five workers.

However, the growing trend in many segments of the economy is to convert labour-intensive enterprises (primarily variable costs) to operations heavily dependent on equipment or technology (primarily fixed costs). For example, in retail, many functions that were previously performed by people are now performed by machines or software, such as the self-checkout machines in stores such as **Woolworths** and **Coles**. Since machine and software costs are often depreciated or amortized, these costs tend to be the same or fixed, no matter the level of activity within a given relevant range.

In China, completely unmanned grocery stores have been created that use facial recognition for accessing the store. Patrons will shop, bag the purchased items, leave the store, and be billed based on what they put in their bags. Along with managing the purchasing process, inventory is maintained by sensors that let managers know when they need to restock an item.

In the United States, Amazon uses Amazon Go stores to offer the same service. Check out this video (copyright owned by CNET) for an example of an Amazon Go store. Note that there are currently 25 Amazon Go stores in the USA, but none in Australia or Asia.

In Australia, COVID-19 accelerated the click-and-collect service offered by retailers. Customers can order online from most stores and have it ready to pick up in just a few hours (avoiding potentially long wait times for courier or postal delivery). In some instances, you don't even need to enter the store. Woolworths offers a direct-to-boot service – order your items online and book a window to pick them up. When you arrive, click a button on the app or in the text message you received letting you know your groceries are ready – and someone will bring out your order and place it directly in your boot.

Another major innovation affecting labor costs is the development of driverless cars and trucks (primarily fixed costs), which will have a major impact on the number of taxi and truck drivers in the future (primarily variable costs). The first to be approved for use is the Nuro system in the USA (you can read more about Nuro in this article from CNET). Do these labour-saving processes change the cost structure for the company? Are variable costs decreased? What about fixed costs? Let's look at this in more detail.

When ordering food through an app, there is no need to have an employee take the order, but someone still needs to prepare the food and package it for the customer. The variable costs associated with the wages of order takers will likely decrease, but the fixed costs associated with additional technology to allow for online ordering will likely increase. When grocery customers place their orders online, this not only requires increased fixed costs for the new technology, but it can also increase variable labor costs, as employees are needed to fill customers' online orders. Many stores may move customer-facing positions to online order fulfillment rather than hiring additional employees. Other stores may have employees fill online grocery orders during slow or down times. Both Woolworths and Coles operate "dark stores" in Australia – stores that have no customers and are designed only for online order fulfillment.

Using driverless cars and trucks decreases the variable costs tied to the wages of the drivers but requires a major investment in fixed-cost assets – the autonomous vehicles – and companies would need to charge prices that allowed them to recoup their expensive investments in the technology as well as make a profit. Alternatively, companies that rely on shipping and delivery companies that use driverless technology may be faced with an increase in transportation or shipping costs (variable costs). These

costs may be higher because technology is often more expensive when it is new than it will be in the future, when it is easier and more cost effective to produce and also more accessible. A good example of the change in cost of a new technological innovation over time is the personal computer, which was very expensive when it was first developed but has decreased in cost significantly since that time. The same will likely happen over time with the cost of creating and using driverless transportation.

You might wonder why a company would trade variable costs for fixed costs. One reason might be to meet company goals, such as gaining market share. Other reasons include being a leader in the use of innovation and improving efficiencies. If a company uses the latest technology, such as online ordering and delivery, this may help the company attract a new type of customer or create loyalty with longstanding customers. In addition, although fixed costs are riskier because they exist regardless of the sales level, once those fixed costs are met, profits grow. All of these new trends result in changes in the composition of fixed and variable costs for a company, and it is this composition that helps determine a company's profit.

In order for businesses to remain profitable, it is important for managers to understand how to measure and manage fixed and variable costs for decision-making. In this chapter, we begin examining the relationship among sales volume, fixed costs, variable costs, and profit in decision-making. We will discuss how to use the concepts of fixed and variable costs and their relationship to profit to determine the sales needed to break even or to reach a desired profit. You will also learn how to plan for changes in selling price or costs, whether a single product, multiple products, or services are involved.

What Sort of Decisions Can Be Made With CVP Analysis?

Once you understand variable costs, fixed costs and CVP – the application to internal decision making is vast. The table below provides some examples.

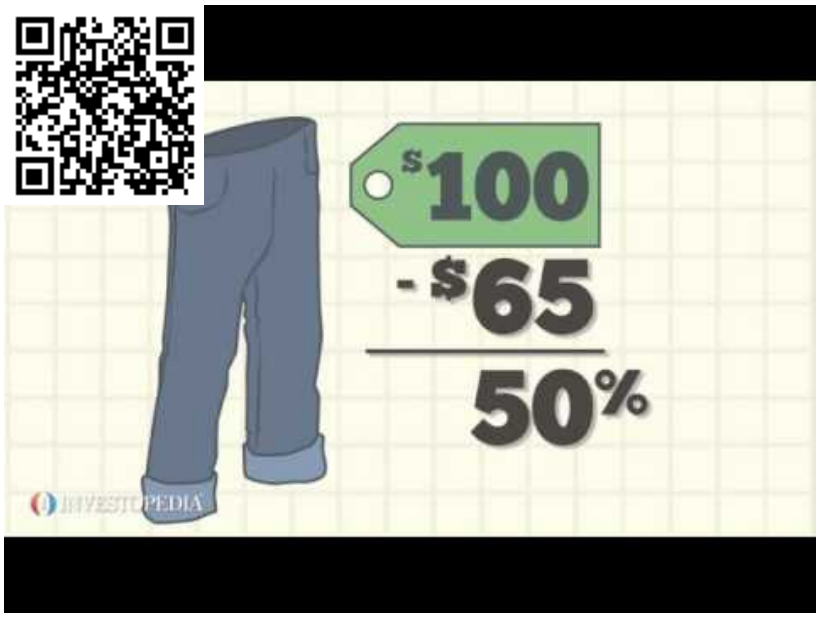
Table 3.3.6: Link between business decision and cost information used

Decision	Cost Information
Discontinue a product line	Variable costs, overhead directly tied to product, potential reduction in fixed costs
Add second production shift	Labor costs, cost of fringe benefits, potential overhead increases (utilities, security personnel)
Open additional retail outlets	Fixed costs, variable operating costs, potential increases in administrative expenses at corporate headquarters

Deciding Between Orders

You are evaluating orders from two new customers, but you will only be able to accept one of the orders without increasing your fixed costs. Management has directed you to choose the one that is most profitable for the company. Customer A is ordering 500 units and is willing to pay $200 per unit, and these units have a contribution margin of $60 per unit. Customer B is ordering 1,000 units and is willing to pay $140 per unit, and these units have a contribution margin ratio of 40%. Which order do you select and why?

Watch this video from Investopedia reviewing the concept of contribution margin to learn more. Keep in mind that contribution margin per sale first contributes to meeting fixed costs and then to profit.



Video Transcript

Key Concepts and Summary

- Contribution margin can be used to calculate how much of every dollar in sales is available to cover fixed expenses and contribute to profit.
- Contribution margin can be expressed on a per-unit basis, as a ratio, or in total.
- A specialized profit and loss/income statement, the Contribution Margin Income Statement, can be useful in looking at total sales and total contribution margin at varying levels of activity.

Check Your Understanding

By completing the following activity:

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3.4: Understanding the Degree of Operating Leverage

What Is the Degree of Operating Leverage?

Degree of Operating Leverage (DOL) is a measure of the proportion of fixed costs to a business's overall cost structure. OL tells a business how sensitive profit is to changes in sales volume. The formula for DOL is as follows:

> Degree of Operating Leverage = Contribution Margin / Net Profit or Income

How Can We Use the Operating Leverage Statistic?

The Degree of Operating Leverage (DOL) statistic is most often used to compare different businesses, rather than as a tool for sensitivity analysis for a single firm. Let's try an example using two cafes – Stockmarket Cafe and Universal Cafe.

Table 3.4.1: Degree of Operating Leverage (DOL) calculations for Stockmarket Cafe and Universal Cafe.

	Stockmarket Cafe	Universal Cafe
Total contribution margin	180,000	180,000
Net income or profit	90,000	120,000
Operating leverage (= CM / Net income)	2	1.5

Now we have our DOL for both firms – Stockmarket is 2 and Universal is 1.5. What on earth does this mean? It means that for Stockmarket Cafe, if sales increase (or decrease), net income or profit will increase (or decrease) by 2 times the percentage change. That is, if sales increase by 10%, then profit will increase by 20%. Looking at Universal Cafe, if sales increase (or decrease), net income or profit will increase (or decrease) by 1.5 times the percentage change. Using the same 10% increase in sales, at Universal Cafe, profit will increase by 15% (1.5 x 10%).

Which of these two firms is the better investment? Stockmarket Cafe or Universal Cafe?

Is It as Simple as Higher Is Better?

No! Remember that Operating Leverage uses contribution margin, and does not take into account any fixed costs. So while OL is one number, it should be looked at in conjunction with other measures. Businesses that have high fixed costs and lower variable costs (one reason could be high levels of automated machinery) will have a higher operating leverage. Businesses that have higher variable costs and therefore lower operating leverage, may have lower fixed costs. To make a more informed decision – examining the number of units to be sold to break even could be useful in assessing which firm may be a better investment.

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3.5: Pricing and Its Role in the Marketing Mix

Learning Objectives

By the end of this section, you will be able to

- Define pricing.
- Explain pricing and its role in the marketing mix.
- Explain the psychology of pricing.

Pricing Defined

Anytime anything is sold, a price is involved. Recall that during the exchange process, a seller is offering something of value to a buyer in exchange for something also of value. This value to the seller is often referred to as price. The practice of pricing is not a new concept. Some of the oldest records of prices ever discovered were found on clay tablets with symbols in Uruk, located in modern-day Iraq. The records are written receipts of exchanges of sheep, beer, and barley and date back to 3300 BCE (Fishman, 2003)!

You may recall that price is one of the 4Ps of marketing, or one element in the marketing mix. Once a product has been developed, marketers must determine at which price the product or service will be offered to the target market. Today, pricing is one of the more difficult decisions that marketers must make in the marketing mix because it directly impacts the perception of value from the customer as well as the company's bottom line. Poor pricing decisions can have immediate and catastrophic effects on profits that are difficult for companies to recover from. Price decisions must be linked to a product or service's real and perceived value while considering competition, supply costs, and when discounts should be offered.

Simply put, price refers to the exchange of something of value between a buyer and a seller. The price determines how much revenue the company will earn and drives the organization's financial health. However, marketers cannot simply price products and services based on the organization's expected revenue. The price must be set so that the buyer sees value in the product offering and the price they will pay for it. In other words, marketers must put the perception of value in the product's price at the forefront while also considering the financial impact on the organization.

While price is what is referred to when discussing most goods and services, price can take on many terms depending on the exchange that is taking place. In higher education, you are paying tuition—the price—in exchange for your education. If you need an attorney, you will likely pay a fee—the price—for services rendered. When you are traveling and must pay a toll, it is the price you pay for using the road or bridge. Regardless of the exact terminology used, the pricing of goods and services shares the same basic elements.

Elements of Pricing

While a marketer is determining the price of goods and services, they must keep in mind that pricing must benefit both parties involved in the exchange process: the seller (company) and the buyer (customer). Both parties must see value in the product process through pricing for the exchange process to be successful. We'll first discuss how price is an indicator of value to the buyer and then turn our attention to the seller.

Price as an Indicator of Value

When a buyer purchases a product or service, they seek to satisfy a need through the purchase. The customer will, consciously or not, use several criteria to determine the amount they are willing to spend to satisfy that need. These criteria ultimately lead to the value that the customer sees in the product.

The price-value equation is the consumer's subjective assessment of what they consider a value. The price-value equation states that, as a customer's expectations are met at what they consider an acceptable price, value is realized. Value is related to the quality and price of the product, and the formula is:

$$\text{Value} = \frac{\text{Quality}}{\text{Price}}$$

For example, if a consumer purchases a high-end designer Chanel handbag for $11,000, they might equate the value to a beautiful, high-end, well-made handbag that will last for many years. They may also subconsciously believe the bag will portray a certain social status while carrying it. For them, the product has value and quality, and they are willing to pay a high price.

Consider another example: you are fixing dinner and realize you don't have enough milk for the dish you are preparing. There is a convenience store just a block away from your house and a grocery store five miles away. If you send your partner to walk to the closer convenience store, they will pay more for the milk than if they were to drive the extra five miles to the grocery store, which would be less expensive. With the higher-priced item at the convenience store, you are paying for the convenience. The value in this scenario is in the time saved, even at a higher price.

In these two examples, the perceived benefits are directly related to the price-value equation. Perceived benefits can include status, convenience, brand, and quality, and vary from buyer to buyer or even situation to situation.

Perceived costs can also include a host of criteria in addition to the price printed on the price tag. Let's return to the milk purchase example. If the situation were different—say you were not in the middle of cooking dinner—would your decision change? Perhaps. You will still consider other factors before making the decision. How long does it take for you to drive that extra five miles? Is the grocery store known for having long lines during the time you will be shopping? Do you need other items you can only get at that store? Does the store carry the brand of milk you prefer? These are only a few of the many considerations you make before you decide to make the purchase. These are all perceived costs and are weighed against the perceived benefits the buyer considers when determining value.

Marketing in Practice: Upside

Figure 3.5.1: Upside is an app that benefits both customers and businesses by playing on the psychological effects of pricing. (credit: "iPhone Home Screen" by freestocks.org/flickr, Public Domain)

Founded in 2016, Upside is an app that promotes itself as saving customers money on purchases at gas stations as well as helping local brick-and-mortar businesses earn more profit. Here's how it works: Upside links to gas stations, restaurants, and grocery stores within a specified mile radius of the user. The user chooses to claim an offer on the app and has four hours to upload the receipt. The linked businesses have contracted with Upside to drive business to their establishment. Once redeemed, cash is deposited into the user's account and can be cashed out for gift cards or to a PayPal account.

Upside is banking on the value equation as well as psychological factors of pricing to attract both buyers and sellers. Gas prices, for example, are relatively unchanged from station to station in a small geographical area. If the user can get 25 cents cash back per gallon on their fill-up, they may swap the convenience of the closer station with that of getting a cash reward at a station a few miles away. If the buyer chooses the station with cash back over one without, the seller (gas station) also finds value in a one-time or new customer.

For more information about Upside, visit the app's website.

Price in the Marketing Mix

Recall that the marketing mix elements include product, price, promotion, and place. Marketers create value by maximizing of benefits within an acceptable price point using the marketing mix elements. Price, however, is the only element of the marketing mix that directly produces revenue for the company. The other elements are considered costs to the organization. Another way to think of price as differing from the other elements is to understand the price not only creates perceived value for the customer but also harvests monetary value for the company. Because price is the revenue-generating element of the marketing mix, it is vital that marketers set the right price both to match buyer perceptions and to maximize company profits. Profit is determined by subtracting total expenses from total revenue.

The Profit Equation

Recall that the goal of any for-profit company is to make a profit. The price marketers set for goods and services offered will have a direct impact on the company's profit-making ability. Therefore, the price set must be one that achieves value not only for the buyer but also for the company. Certainly, buyers would prefer a lower price—or even free—for goods and services. It's simply not feasible for a company to give its products and services away for free; the company would cease to exist very quickly, which does not serve either the company or the buyer well. Rather, it is in the company's interest to set prices that create value for the buyer and profit maximization for the company, as this gives the organization the best chance of continuing to create value in the long term.

So what is the best price that creates value for the seller? In short, it's the one that creates value for the buyer while simultaneously generating the maximum profit. If a price is set too high, the buyer may refuse to purchase because they do not see the value; in turn, the company loses out on profit. Alternatively, if the price is set too low, the company may lose out on profits when a buyer would be willing to pay a higher price.

Profit is the financial gain of a company, or the difference between the amount earned and the amount spent in buying, operating, or producing something. It is the difference between total revenue and total costs and is calculated with the profit equation.

$$\text{Profit} = \text{Total Revenue} - \text{Total Costs}$$

Let's look at this formula more closely.

- Total revenue is the money generated from normal business operations. It is calculated by the sales price of a product times the quantity of units sold. For example, a company selling wireless earbuds for $19.99 that has sold 5,000 units in one period has revenues of $99,950.
- Total costs of a company are the costs of sales and operating expenses. It is all expenses related to operating the business that are directly related to producing a good or service, and indirectly related to producing goods and services. In other words, it includes items such as building leases, employee salaries, and electricity, as well as direct costs in producing the product, such as parts and equipment.

  Total costs can be categorized as either fixed or variable. Fixed costs are those expenses that do not change regardless of the number of units sold. For example, if the company selling wireless earbuds makes one unit or one million units, the company still has to pay the mortgage for the building it is occupying; the mortgage payment does not increase or decrease based on the number of units produced. Alternatively, variable costs do change based on the number of units produced. In the wireless earbud example, the company would spend more per unit if it ordered fewer units. If it ordered a higher quantity of units, the unit price would decrease.

In determining profit, the total costs include both the fixed and variable costs. The formula is

$$\text{Total Costs} = \text{Fixed Costs} + \text{Variable Costs}$$

When setting prices, the marketer must determine how much profit can be made from the sale of goods and services. However, as mentioned earlier, profit is not the only deciding factor in price. Much research has been done on how psychology also affects the perception of pricing.

The Psychology of Pricing

From a marketer's standpoint, these are all factors that must be considered when setting price. In addition to the value perceived by the buyer, the marketer must also understand other psychological factors that influence the buyer's perception of price. Several psychological pricing examples are discussed next.

Price Anchoring

When Steve Jobs introduced the Apple iPad during a Keynote in 2010, he showed off the high-resolution screen and talked about its revolutionary features. "What should we price it at?" he asked. "If you listen to the pundits, we're going to price it at under $1,000, which is code for $999." He put a giant $999 on the screen. He said, "I am thrilled to announce to you that iPad pricing starts not at $999, but at just $499." The screen then showed the $999 price being crushed with the $499 price (Jobs, 2010). The crowd went wild!

The concept of price anchoring relies on the first piece of information a buyer sees. This acts as an anchor, or a frame of reference for what the buyer expects a price to be. Steve Jobs used this concept in his introduction of the iPad. The anchor price he quoted was $999. This immediately made buyers believe the product should be priced around $999. However, when Jobs showed the actual price, starting at $499, the buyers immediately believed, psychologically, that it was a great deal. Viewers did not know what the worth of the iPad was; they just believed they were saving nearly $500 by having the initial anchor of $999.

Artificial Time Constraints

Marketers—particularly retailers—often use the psychological strategy of artificial time constraints. These trigger a sense of urgency in the buyer; if they don't buy today, they'll miss out on a great deal. Whereas a consumer may have been on the fence about spending money, these artificial time constraints act as a catalyst for consumers to spend money right now. And there is a lot of power in artificial constraints: consumers are afraid of missing out and don't want to later regret not buying. But consumers can often find the same prices many times throughout the year because retailers use this tactic frequently.

Price Appearance

A study on the effects of auditory representation in pricing showed that buyers believed $1,555.83 was a very complicated price and difficult to comprehend quickly. The study further outlined that a price of $1,555 (no cents) was *better* but that buyers were able to more easily and quickly comprehend a price of $1555 (no commas) and thus more likely to pause and consider the product (Coulter, Choi, & Monroe, 2012).

If you've ever gone to a fancy restaurant, you may have noticed the prices on the menu are in a small font and don't have zeros at the end. The price will be listed as $29 instead of $29.00. Psychologically, longer prices appear more expensive because they take longer to read. This effect is augmented by the use of a dollar sign. Similarly, using prices with multiple syllables seems more expensive because consumers pronounce the prices in their heads. In short, the longer it takes to read and pronounce, the more impact the buyer believes it has on their wallet, which is explained by price appearance (Yu, 2021).

Price Gouging

Price gouging occurs when companies or individuals take advantage of a situation, typically an emergency or natural disaster, and charge exceptionally high prices for products or services. In some states, like New York, it's illegal for businesses to price gouge during a state of emergency (NYC Department of Consumer and Worker Protection, 2022). In fact, New York was the first state to enact a price gouging law. In 1978, when there was a shortage of oil for heating in the winter and the lives of young and elderly people were threatened, the state created a law where companies could not sell goods or services at excessive prices (Ondeck et al., 2020).

Can you think of recent examples where price gouging was a potential concern? During the COVID-19 pandemic, several states posted on their government websites lists of items that couldn't be subject to price gouging. Currently, the U.S. Department of Justice provides a list of items that can't be hoarded or subject to price gouging due to COVID-19 precautions, including masks and other personal protective equipment (PPE), respirators, ventilators, and medical gowns (U.S. Department of Justice, 2022). There have been other instances where price gouging was an issue. According to AccuWeather, "some of the most rampant examples of price gouging came during the most destructive storms in recent years, such as Hurricane Katrina, Hurricane Sandy, Hurricane

Harvey, and Hurricane Irma" (Puleo, 2019). After Hurricane Katrina, a hotel manager boosted room prices and was sentenced to five years in jail (Puleo, 2019).

Careers In Marketing: Pricing Analyst

A pricing analyst studies the market and analyzes data to determine the best pricing for products. This article from Zippia provides helpful information about the job role, including qualifications, career paths, salary, education, resume templates, and online courses to improve skills. Indeed.com also provides a thorough job description that outlines top duties and qualifications.

The best way to understand the core of any job is to learn from people who have done the job. Watch this video from a pricing analyst who discusses his career.

Also check out this article on what makes a great pricing analyst. Some people wonder how a pricing analyst and a data analyst differ. Learn the answer to that question in this article.

Let's Talk Simulation

Just a quick reminder about Customer Buying Criteria:

An important part of maintaining sales is offering products that customers want to purchase. When pricing decisions are being made, the customer buying criteria should be at the forefront of that decision. Finding the balance between meeting these expectations while remaining profitable is a key component of operating a successful company.

<u>One area of the customer buying criteria change each year:</u>

The ideal price is another area of the customer buying criteria. The price is a range of $35-$15 for low tech. The top range is $45 for high tech. If you go over the maximum price, you will see a significant reduction in sales. If you drop your price too low too fast, you will see a reduction in profit and potentially an emergency loan. The goal is to slowly reduce your price by adjusting the product gradually, improving your automation to lower labor cost, reduce your MTBF where possible to reduce your material cost, and eventually build in TQM. Reducing price should be a gradual process. Understanding your fixed and variable costs are key to helping to determine your price. As you better utilize contribution margin, you will see that helps you make better pricing decisions (it's looking at your fixed and variable costs as well as your pice.

Example Customer Buying Criteria for Low Tech Segment

Buying Criteria	Expectations	Importance
1. Price	$15.00-$35.00	41%
2. Age	Ideal Age: 3.0	29%
3. Reliability	MTBF: 14,000-20,000	21%
4. Ideal Position	Pfmn: 5.3 Size: 14.7	9%

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3.6: The Five Critical Cs of Pricing

Learning Objectives

By the end of this section, you will be able to

- List the five critical Cs of pricing.
- Characterize the five critical Cs of pricing.

Cost

What should you charge for a product or service? As you've probably discovered by now, pricing is not something that marketers approach without a lot of research. Using the five critical Cs of pricing can help to determine the *best* price—one that provides optimal value to the buyer and profit maximization for the company. Figure 3.6.1 illustrates the five critical Cs to consider when pricing: cost, customers, channels of distribution, competition, and compatibility.

Figure 3.6.1: The Five Critical Cs of Pricing (CC BY 4.0; Rice University & OpenStax)

Cost is the most obvious element of the pricing decisions. As we've already discussed, you must know the cost of doing business—both fixed and variable—before you can set an adequate price. However, cost alone cannot be the only basis on which a pricing decision is made. After all, buyers never know (and don't care) how much it costs a business to produce its goods and services.

Link to Learning: The Five Critical Cs of Pricing

Scale Finance has provided an excellent article that may help you get your mind around the five Cs of pricing.

Customers

Customers are another key element to pricing decisions, as you've learned already in this chapter. Marketers must determine not only what customers expect a product or service to be priced at but also what those customers are willing to pay. Toyota manufactures cars and markets them toward the middle class. Through research, it has determined what its target market is willing and able to pay for a particular vehicle. Alternatively, Lexus, which is marketed as more of a luxury car, has a higher price point and is marketed to a different market than Toyota's.

Channels of Distribution

Many products are sold through channels of distribution—intermediaries who move products from manufacturer to end users. Intermediaries affect the prices of products because they also need to maximize their profits. Therefore, pricing decisions must consider profits, expenses, and the value they add to the product or service.

IKEA began as a mail-order catalog in 1953 in Älmhult, Sweden. Today, it is a global home furnishings brand that focuses on sustainability (IKEA, 2022). Its distribution channel consists of the manufacturer, dealer, wholesaler, and retailer. Each of these channel members is in business to make a profit. Therefore, the price strategy that IKEA utilizes must help to ensure that each member is financially satisfied while making a profit itself and keeping a price that is of value to the end-user. If any channel members (or end-users) do not find value in the price set by IKEA, the entire channel becomes weak and unsustainable.

Link to Learning: IKEA

IKEA is a very interesting company to study when learning about marketing and business. As this blog examines, it has 1,600 suppliers for manufacturing products that deliver to 186 global stores. That's a complex—and successful—system!

The MBA Skool website explains the IKEA marketing strategy and the four Ps, including IKEA's distribution model.

The Contact Pigeon blog outlines IKEA's strategy that made it the successful company it is today.

Competition

Every company and product faces competition. Even the most unique products are competing for buyer dollars. Buyers' perception of one product compared with alternatives has an important impact on pricing decisions. Gazelle Bikes is a top-tier manufacturer of bicycles. The bikes offered by Gazelle have a starting price point of $1,499 (Gazelle, 2022). One of Gazelle's competitors, Giant, has a starting price point of $1,720 (Liv, 2022). For bicycle enthusiasts, these price points are important when comparing one brand with another; an enthusiast who comes across a new brand of bicycles with a starting price of just $200 would not position it with Gazelle and Giant bicycles.

Let's Talk Simulation

You will see that reviewing your competition in the simulation will also help you identify where the pricing should be. Note that just because your price is lower than your competitors, doesn't mean you will sell more or have more profit. There are a lot more variables at play here. If your product is not located on the positioning map where your customers would like it to be, they will not buy it...even if it's cheap.

Compatibility

Panama City Beach has been one of the most popular spring break destinations of college students for decades. In fact, it is considered the "Spring Break Capital of the World" (PCBeach Spring Break.com, 2022). It is well-known for its late-night parties, concerts, and celebrity sightings. Hotels and clubs along the beach of Panama City drive their marketing efforts toward this market segment: college-aged spring break-goers. The prices they set for the weeks of spring break are compatible with both this segment of the market's ability to pay and the businesses' profitability. Conversely, hotels in areas of Florida that are more family-friendly set prices that are considered a value for families and promote the hotels toward families rather than college-aged partygoers.

Pricing decisions are not made in a vacuum. When marketers set a price for a good or service, it must be consistent with the other marketing objectives. Imagine if McDonald's started offering a $20.00 ribeye steak. This decision would be inconsistent with the marketing of the company's low-priced fast food, would be confusing to customers, and thus would not be successful (Scalefinance.com, 2022).

Marketing in Practice: The Five Cs of Pricing

The five Cs of pricing have long been a standard for marketing practitioners. However, some practitioners also consider another area when determining price: context. Context refers to a more complex pricing strategy where marketers set—and change—prices according to variables external to the company. For example, an ice cream truck in the U.S. Midwest would arguably have more traffic during the peak summer hours and less during the colder winter months. The owner of the ice cream truck would change their prices to best fit the context (in this case, weather). The product (ice cream) remains the same regardless of the price, but the price is changed to fit the context of the situation. The appropriateness of using this strategy depends on several factors, including the product category, market size, and other industry nuances.

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3.7: The Five-Step Procedure for Establishing Pricing Policy

Learning Objectives

By the end of this section, you will be able to

- List the five-step procedure for establishing pricing policy.
- Describe ways to determine the pricing objective.
- Identify ways to estimate demand.
- List ways to estimate costs.
- Explain how to analyze the external environment.
- Discuss selecting pricing strategies or tactics.

Determine Pricing Objectives

Whether a product is new to the market or established, marketers face the challenge of setting prices. Recall that the main objective for pricing is for the buyer to perceive value in the product while the company maximizes profits. Marketers often use a five-step approach for establishing pricing policies (see Figure 3.7.1).

Figure 3.7.1: The Five-Step Process for Establishing Pricing Policies (CC BY 4.0; Rice University & OpenStax)

During the first step in establishing pricing policies, the marketing team will set the pricing objectives (see Table 3.7.1). The most common pricing objectives are based on customer value, cost, sales orientation, market share, target return, competition, and being customer-driven. It is not uncommon for more than one objective to be set within the company. Let's take a look at each of the pricing objectives in more detail.

Pricing Objectives

Objective	Description
Customer value	Based on a product's added value
Cost	Based on the cost to produce a product
Sales orientation	Developed to boost sales volume(s) of a product
Market share	Focused on increasing market share
Target return	Focused on a specific profit at a specific time
Competition	Developed based on competitors' prices
Customer-driven	Focus on what the customer is willing to pay

Table 3.7.1: Pricing Objectives

Customer Value-Based Objective

As you've already learned, it's essential to have a deep understanding of the value a product will provide for customers. Before Jim Semick and his team launched GoToMeeting, a conferencing app, they developed the pricing of $49 "all you can meet flat-rate pricing." This pricing was unique to the industry, and Semick stated that they determined this pricing structure based on dozens of interviews with potential customers. From these interviews, the GoToMeeting team discovered key areas that would provide value to customers not only through the product itself but also through the flat-rate price structure that was easy to understand (Semick,

2015). Semick utilized the customer value–based objective, one in which the company understands the value-added benefits of a product and sets its price accordingly.

Cost-Based Objective

A fairly simple way to price products and services is to use the cost-based objective. This pricing objective sets prices based on the costs of doing business, which were explained earlier in the chapter. The biggest pitfall of utilizing this pricing objective is that it might not align well with the customer's value perception. Remember, customers don't know (or care) what the cost of doing business is, so long as they receive value in their purchase. Therefore, marketers run the risk of overpricing the product. Marketers using this objective also risk pricing their products too low and failing to maximize profits.

Consider the manufacturing of a smartphone. Assume the total cost to the manufacturer to produce one smartphone is $3,000. This cost includes all expenses to the company for producing this one smartphone (product costs, variable and fixed expenses). According to Bhasin (2021), the company chooses to set the selling price of this smartphone to include these costs plus a profit of 10 percent, which sets the final price at $\$3,300\,(3,000 + 10\% \times 3,000)$

Sales-Oriented Objective

A company may wish to seek a boost in the sales volume of a product. In this case, marketers would choose the sales-oriented objective. The goal of a sales-oriented objective is to increase the volume, or units sold, of a product against the company's sales over a period of time. This objective is achieved by raising or lowering prices to increase sales. An increase in sales assumes a direct impact on profits, thus maximizing profits. Consider the smartphone manufacturer again. Executives have set a sales goal of 1,000 units within the first quarter. Marketers may choose to lower the price of the smartphone to meet the goal. So perhaps the company changes the price from $3,300 to $3,100 for a short period until the sales goal is reached. Note that the company is still covering the cost of manufacturing the product and still making some profit.

Market Share–Oriented Objective

A market share–oriented objective is one in which the company's pricing objective is to set prices based on those of the competition. This strategy involves comparing similar products offered in the market and pricing at, below, or above those prices depending on the products offered. The cell phone market is one example of an industry that leans on market share orientation. The biggest suppliers of cell phones—Apple, Google, and Samsung —take their pricing cues from one another and are priced very similarly (Campbell, 2020).

Target Return Objective

A target return objective is one in which marketers calculate the price so that it returns a specific profit in a given period. Suppose a company has invested $1 million into a new product. Company executives wish to recuperate 10% of those costs in year one of sales. If it costs the company $2 to manufacture one unit of product and marketers estimate that it will sell 50,000 products in the first year, marketers know they will need to price the product high enough to yield the desired results. The obvious drawback to this objective is that much of the decision is based on estimations of units sold in a given time frame.

Competition Objective

A competition-based objective, as its name suggests, is when a company sets its prices according to the prices of its competitors. Amazon often uses this pricing objective for some of its most popular products. Using data intelligence, the company gathers the prices of its competitors' products and sets its prices just below the price set by competitors (Prisync, 2018).

Customer-Driven Objective

Some companies choose to set prices based on customer-driven objectives—what the customer is willing to pay for a product or service. Auctions, e-trades, and bids are common examples of customer-driven objectives. eBay, for example, allows a company (or individual) to place an item for sale on its website. The interested buyer will often bid on the item, thus stating what they are willing to pay. The highest bidder is then able to buy the product.

Estimate Demand

After setting the pricing objectives, marketers will estimate the product or service demand. Demand is an economic term that refers to the buyer's desire and willingness to purchase a product or service at various prices. All other factors being consistent, a price increase will result in a decrease in demand. The demand curve is a visual representation to understand demand.

Understanding the Demand Curve

The demand curve is a graph that shows how the demand for a product or service varies with the change in price. As you can see from Figure 3.7.2, the price (p) is located on the vertical axis, and the quantity (q) demanded is located on the horizontal axis. As the price of a product increases, demand for the product decreases.

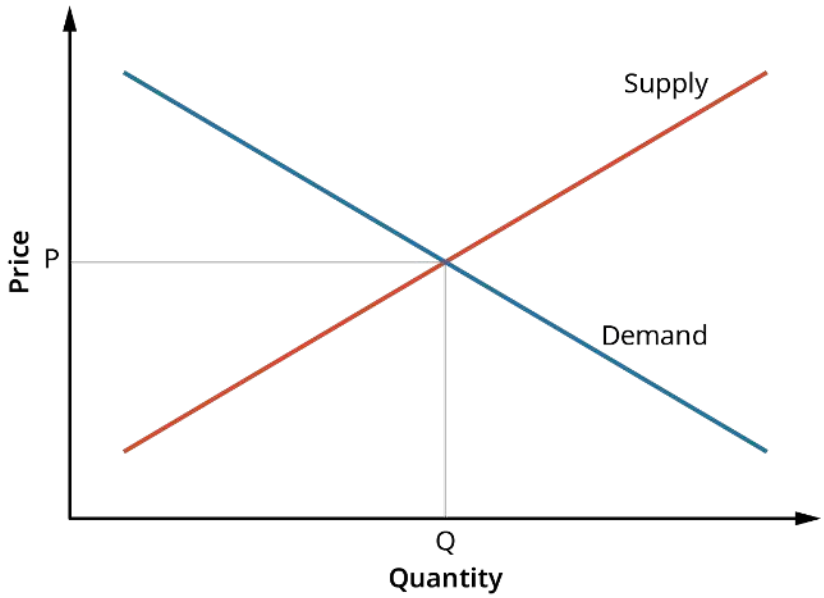

Figure 3.7.2: Demand Curve (CC BY 4.0; Rice University & OpenStax)

The relationship between price and demand shown in the figure above is contingent on certain conditions remaining constant. Such conditions include substitute goods, personal income, and consumer tastes, which are further discussed below. Changes in these conditions can cause a change in demand that might not follow this basic concept of the demand curve.

The Demand Curve for Prestige Products

One pricing strategy that negates the demand curve is prestige pricing. Prestige pricing is a strategy that marketers use to set high prices, knowing that demand will increase with higher prices because the higher price increases the perceived value of the product. Prestige pricing is closely tied to brand image and appeals to buyers who see value in elevated status. Consider these brands of shoes. The Adidas Yeezy Boost 750 costs around $76 to produce but sometimes sells for over $1,000, while the D Rose 5 Boost costs around $43 and sells for around $100. So why the large price difference? The Yeezy Boost 750 pricing strategy is that of prestige pricing. The allure and exclusivity of the Yeezy Boost 750 allowed the company to price the shoes much higher (Fuchs, 2021).

Link to Learning: Prestige Pricing

In this article, HubSpot explores the pros and cons of prestige pricing and things to consider when implementing this strategy. Included are several prestige pricing examples such as the Adidas Yeezy Boost and the D Rose 5 Boost, as well as diamonds, cars, AirPods, and T-shirts.

Demand Elasticity

What will the impact of demand for a product be if the price is changed? If the product is discounted, will demand increase? If the price goes up, will demand decrease? The concept of demand elasticity helps marketers answer these questions. In short, demand elasticity is a measure of the change in the quantity demanded in relation to the change in its price. Mathematically, it is derived

from the percentage change in quantity demanded divided by the percentage change in price. If you have been considering buying a new home, would the prices of homes sway your decision? Perhaps so. Home prices are considered elastic because the price greatly impacts the demand for new homes. Additionally, there are many options for housing, including apartments, roommates, living with relatives, condos, etc. (Hall, 2022).

As a second example, consider gasoline. Because we need gasoline to get to work, school, the grocery store, and meetups with friends, it is considered relatively inelastic. There are very few substitutes for gasoline. Because gasoline has inelastic demand, the price may fluctuate considerably, but the demand for gasoline remains relatively the same. Consider the higher gas prices of 2022, averaging over $5.00/gallon across the United States and even higher globally. Even though the prices have risen, the demand for gasoline has not changed because people still must travel to work and other essential places (Eitches & Crain, 2016).

In summary, if a product is determined to be inelastic, the demanded quantity does not change with a change in price. Conversely, if the product is elastic, the demanded quantity will change with a change in price. You might be asking: What makes a product elastic or inelastic? Several factors help determine how elastic a product or service will be.

Factors in Demand Elasticity

When determining the demand elasticity of products and services, there are several factors to keep in mind. These include substitutes, the effect of income, time, and cross-elasticity of demand (see Figure 3.7.3). Let's explore each of these in depth.

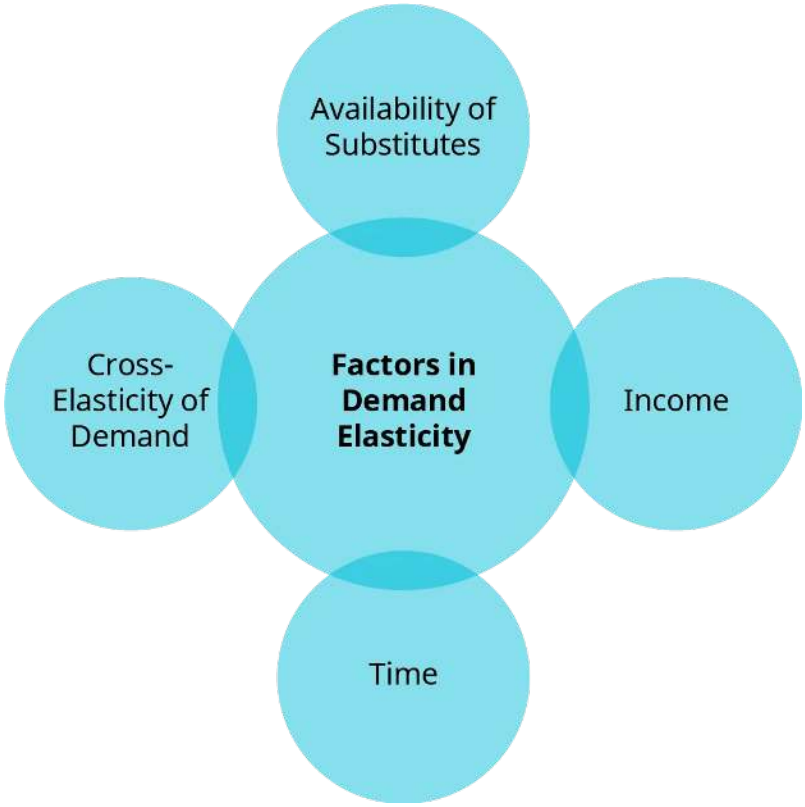

Figure 3.7.3: Factors in Demand Elasticity (CC BY 4.0; Rice University & OpenStax)

Availability of Substitutes

Substitutes are products and services that are similar to the one being offered. If a buyer can easily choose a different product when the prices change, the demand will be more elastic. For example, if you normally buy English muffins at the grocery store but the store is out, you can easily purchase bagels instead. Conversely, if there are relatively few alternatives, demand will be more inelastic. Consider the generic need for gasoline. It is fairly inelastic. The availability of substitutes for car travel is inconvenient. However, the demand for gasoline at specific gas stations is considered elastic because buyers can choose the gas station they prefer based on price. If two gas stations are located within a convenient geographic region for the buyer, they will choose the station with lower prices.

Income

Buyers have limited money to spend on their needs and must decide how purchasing goods and services will impact their total income. The income effect is how buyers see the change in price affecting their real income. Generally, a price increase indicates that the buyer will have less money left over to spend; therefore, they will choose to buy less of a product, decreasing demand. The opposite is also true: the lower the price, the more money buyers have to buy more of the product, thus increasing demand. Consider the 8.6% inflation the United States saw between May 2021 and May 2022. Because inflation is a general rise in prices, consumers noticed that their purchases of goods and services caused their real income to decline. In other words, consumers had less money to spend on products and ultimately chose to purchase less.

Time

When the price of a good or service is changed, it takes time for buyers to adjust to the change in price. The time factor of price elasticity indicates that the product's elasticity of demand is dependent upon the time it takes buyers to adjust to the new prices. For example, if there is a sharp decrease in the price of automobiles, buyers would not immediately go out and buy a new vehicle. Rather, it would take some time to save money for a down payment, secure a loan, and generally go through the buying process. Therefore, the demand for automobiles would increase, but over time rather than immediately.

Cross-Elasticity of Demand

What happens when one of two similar products has a price increase or decrease? If the price of coffee increases, it would be expected that the demand for tea (a substitute product) would also increase. Buyers see the price increase and look for lower-priced substitutes to replace the higher-priced item. The cross-elasticity of demand measures the amount demanded for one good when the price for a similar good or service changes (Hayes, 2022).

Estimate Costs

The next step in determining a pricing policy is to estimate the total cost of producing a product or service. Recall that maximizing profits is the goal of a pricing strategy and marketers must factor the cost of doing business into pricing considerations. When estimating total costs, it is important to divide costs into fixed and variable costs.

Fixed and Variable Costs

As mentioned earlier in this chapter, costs are categorized as either fixed or variable. Fixed costs are those expenses that do not change regardless of the number of units sold. Consider the example used earlier in the chapter of manufacturing a smartphone. If the company manufactures 1,000 or 100,000 smartphones, it must pay the same amount for its lease on the property on which the plant is located. The lease payment does not change based on the number of units produced. Alternatively, variable costs do change based on the number of units produced. In this example, the amount manufacturing spends depends on the number of smartphones produced.

Analyze the External Environment

The fourth step in determining prices is to analyze the external environment. The external environment comprises factors outside of the organization that impact marketing decisions. While marketers cannot directly change these factors, they should know how they might impact pricing decisions.

One way to remember the external environment factors is through the acronym PESTLE: political, economic, social, technological, legal, and environmental (Aguilar, 1967). Questions to consider in a PESTLE analysis when analyzing the external environment as it relates to pricing are included in Table 10.2.

PESTLE Factors

Factors	Question	Example
Political	What is the current political situation as it relates to the market?	A price cap on certain pharmaceuticals would limit the price a company could charge.
Economic	What is the current economic climate?	During inflation or deflation, prices may need to increase or decrease.
Social	How is culture changing or shaping the industry?	During the latter months of the year, the Indian market purchases more vehicles than at other times of the year.
Technological	What technologies are trending?	If a product's technology is becoming obsolete, a price decrease may be necessary.
Legal	What current legislation is impacting the industry?	A new vehicle emission law may require new technology, thus increasing the price of vehicles.
Environmental	What are the environmental concerns of the product?	A highly toxic product or process may need a higher price to properly and safely dispose of byproducts.

Table 3.7.2 PESTLE Factors

Link to Learning: PESTLE Analysis

Hundreds of online resources discuss PESTLE. Here are a few to start with:

- The Corporate Finance Institute provides a PESTLE walk-through.
- The Oxford College of Marketing outlines the advantages and disadvantages of a PESTLE analysis.
- Business-to-you provides a video, sample analysis, and a full list of PESTLE factors.

Competitors' Costs, Prices, and Products

It probably seems obvious by now that analyzing the competition is key in setting prices. Marketers must constantly analyze current and potential market competition to understand how their products will measure up to that of the competition. If a competitor is planning to introduce a nearly identical product to one that your organization already has on the market—but at a much lower price—you will need to consider how that will affect your sales and analyze how it is offering such a lower price. Should you lower your price? Consider changing suppliers for lowered costs? Take a cut in profits to stay competitive? All of these questions, and more, will help you as a marketer determine what pricing strategy should be used.

Stage in the Product Life Cycle

How long a product—and its substitutes—have been in the market will impact the marketer's choice of pricing strategies. Recall that the product life cycle consists of four stages: introduction, growth, maturity, and decline. During the introduction stage, marketers must choose pricing strategies wisely to capture the intended market and begin recuperating research and development costs. As a product moves through the other stages of the life cycle, prices may need to be changed to stay relevant to consumers.

Status of the Economy

As you can imagine, the state of the economy at any given time will impact the buyer's ability to purchase products and their willingness to spend. Marketers should be aware of economic factors when considering demand for products, including employment, inflation, interest rates, and consumer confidence (Maverick, 2022).

One of the main factors that influences consumer demand is the employment rate. The unemployment rate is a measure of the number of people who are not employed but are actively seeking work in a given period—usually one month. When employed and

receiving steady income, buyers are more likely to use discretionary income. Discretionary income is the money left over after all taxes and necessities—such as food and housing—are paid. When discretionary income decreases, demand for nonessential items also decreases.

Inflation is an economic measure of the rate of rising prices of goods and services in an economy. When inflation occurs, prices for most goods and services rise. Therefore, a buyer's discretionary income decreases, and demand for nonessential goods and services also decreases. Consider the high inflation in the United States economy from 2021 to 2022, which was 8.6% as of May 2022 (U.S. Inflation Calculator, 2022). The inflation rate is currently the highest that it has been since 1981. Because of the higher price of goods and services within the economy, consumers spend more of their earned income on necessities such as food and shelter. This, in turn, causes them to purchase fewer nonessential items such as vacations, toys, and the like. Inflation also impacts pensions and other retirement accounts. Hence, as inflation rises considerably, people are even less likely to spend their discretionary income and more likely to save anything left over after essentials for future use (Amadeo, 2021).

Even consumers who do not have a deep understanding of the economy have some degree of optimism regarding the overall state of the economy. This is known as consumer confidence—it measures how optimistic consumers are about the economy and their own finances (The Conference Board, 2022). When consumers have little optimism in the economy, they are more likely to save their discretionary income than spend it.

The overall status of the economy—current and future—is important for marketers to be aware of as it directly impacts buyers' ability and willingness to spend money. Choosing pricing strategies that are aligned with the health of the economy will have a greater chance of success.

Select Pricing Strategies or Tactics

After gathering all the data explained in the previous steps, marketers are ready to set specific pricing strategies or tactics. The strategies and tactics chosen for a product or service should align with the other marketing mix elements, create customer value, and maximize company profits. In the next section, we will discuss specific strategies and tactics and how to optimize each.

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3.8: Introduction to Forecasting

Forecasting is the process of making predictions of the future based on past and present data. This is most commonly by analysis of trends. A commonplace example might be estimation of some variable of interest at some specified future date. Prediction is a similar, but more general term. Both might refer to formal statistical methods employing time series, cross-sectional or longitudinal data, or alternatively to less formal judgmental methods. Usage can differ between areas of application: for example, in hydrology, the terms “forecast” and “forecasting” are sometimes reserved for estimates of values at certain specific future times, while the term “prediction” is used for more general estimates, such as the number of times floods will occur over a long period.

Risk and uncertainty are central to forecasting and prediction; it is generally considered good practice to indicate the degree of uncertainty attached to specific forecasts. In any case, the data must be up to date in order for the forecast to be as accurate as possible. In some cases, the data used to predict the variable of interest is itself forecasted.[1]

Functional strategies need to be aligned and supportive to the higher level corporate strategy of the organization. One of these functional areas is marketing. Creating marketing strategy is not a single event, nor is the implementation of marketing strategy something only the marketing department has to worry about.

When the strategy is implemented, the rest of the company must be poised to deal with the consequences. An important component in this implementation is the **sales forecast**, which is the estimate of how much the company will actually sell. The rest of the company must then be geared up (or down) to meet that demand. In this module, we explore forecasting in more detail, as there are many choices that can be made in developing a forecast.

Accuracy is important when it comes to forecasts. If executives overestimate the demand for a product, the company could end up spending money on manufacturing, distribution, and servicing activities it won’t need. Data Impact, a software developer, recently overestimated the demand for one of its new products. Because the sales of the product didn’t meet projections, Data Impact lacked the cash available to pay its vendors, utility providers, and others. Employees had to be terminated in many areas of the firm to trim costs.

Underestimating demand can be just as devastating. When a company introduces a new product, it launches marketing and sales campaigns to create demand for it. But if the company isn’t ready to deliver the amount of the product the market demands, then other competitors can steal sales the firm might otherwise have captured. Sony’s inability to deliver the e-Reader in sufficient numbers made Amazon’s Kindle more readily accepted in the market; other features then gave the Kindle an advantage that Sony is finding difficult to overcome.

The firm has to do more than just forecast the company’s sales. The process can be complex, because how much the company can sell will depend on many factors such as how much the product will cost, how competitors will react, and so forth. Each of these factors has to be taken into account in order to determine how much the company is likely to sell. As factors change, the forecast has to change as well. Thus, a sales forecast is actually a composite of a number of estimates and has to be dynamic as those other estimates change.

A common first step is to determine market potential, or total industry-wide sales expected in a particular product category for the time period of interest. (The time period of interest might be the coming year, quarter, month, or some other time period.) Some marketing research companies, such as Nielsen, Gartner, and others, estimate the market potential for various products and then sell that research to companies that produce those products.

Once the firm has an idea of the market potential, the company’s sales potential can be estimated. A firm’s sales potential is the maximum total revenue it hopes to generate from a product or the number of units of it the company can hope to sell. The sales potential for the product is typically represented as a percentage of its market potential and equivalent to the company’s estimated maximum market share for the time period. In your budget, you’ll want to forecast the revenues earned from the product against the market potential, as well as against the product’s costs.[2]

Forecasting Horizons

Long term forecasting tends to be completed at high levels in the organization. The time frame is generally considered longer than 2 years into the future. Detailed knowledge about the products and markets is required due to the high degree of uncertainty. This is

commonly the case with new products entering the market, emerging new technologies, and opening new facilities. Often no historical data is available.

Medium term forecasting tends to be several months up to 2 years into the future and is referred to as intermediate term. Both quantitative and qualitative forecasting may be used in this time frame.

Short term forecasting is daily, up to months in the future. These forecasts are used for operational decision making such as inventory planning, ordering, and scheduling of the workforce. Usually quantitative methods such as time series analysis are used in this time frame.

References

1. Wikipedia contributors. (2019). Forecasting. In Wikipedia, The Free Encyclopedia. Retrieved November 4, 2019, from Wikipedia.org (opens in new window) ↵
2. Saylor Academy. (2012). Principles of Marketing. Forecasting. Retrieved on November 4, 2019, from saylordotorg.github.io ↵

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3.9: Forecasting Assumptions and Demand Patterns

Common Forecasting Assumptions

1. Forecasts are rarely, if ever, perfect. It is nearly impossible to 100% accurately estimate what the future will hold. Firms need to understand and expect some error in their forecasts.
2. Forecasts tend to be more accurate for groups of items than for individual items in the group. The popular Fitbit may be producing six different models. Each model may be offered in several different colours. Each of those colours may come in small, large, and extra large. The forecast for each model will be far more accurate than the forecast for each specific end item.
3. Forecast accuracy will tend to decrease as the time horizon increases. The farther away the forecast is from the current date, the more uncertainty it will contain.

Demand Patterns

When we plot our historical product demand, the following patterns can often be found:

Trend – A trend is consistent upward or downward movement of the demand. This may be related to the product's life cycle.

Cycle – A cycle is a pattern in the data that tends to last more than one year in duration. Often, they are related to events such as interest rates, the political climate, consumer confidence or other market factors.

Seasonal – Many products have a seasonal pattern, generally predictable changes in demand that are recurring every year. Fashion products and sporting goods are heavily influenced by seasonality.

Irregular variations – Often demand can be influenced by an event or series of events that are not expected to be repeated in the future. Examples might include an extreme weather event, a strike at a college campus, or a power outage.

Random variations – Random variations are the unexplained variations in demand that remain after all other factors are considered. Often this is referred to as noise.

Let's Talk Simulation

When it comes to developing a forecast, it's important to understand that there is a qualitative piece as well as a quantitative piece. The quantitative aspect will focus on taking historical data from the prior year in order to estimate how much you might sell in the upcoming round. The qualitative aspect will focus on thinking about how your product has changed from the prior year. While the qualitative aspect will have to be estimated, there are two recommended forecasting methods for the quantitative aspect: the basic forecasting method and the December customer survey score method. Below, are how one might go about implementing both methods for the product Able.

1. The Basic Forecasting Method

First, you'll want to determine the total number of units that will be sold to the segment. To do this, we will use the following equation using numbers from Exhibit 1 (see below).

Total Industry Demand * (1 + [Growth Rate]) = Next Year's Demand

6,708 * 1 + 0.10

6,708 * 1.10

7,379= Next Year's Demand

Secondly, you'll want to factor in how much market share your product will take from the upcoming demand. Since Egg stocked out, you will want to look at the products potential market share. You can find this number in Exhibit 2. Notice that Able is currently selling to both markets (high-tech and low-tech) so you will need to develop a forecast for each market individually and then combine them.

Next Year's Demand * Potential Market Share = Forecast

7,379 * 0.169

1,247 This would serve as your base forecast for Able in the low-tech segment assuming that your product is meeting the customer buying criteria just as well as it was in the prior round.

2. The December Customer Survey Score Method

First, you'll want to determine the total number of units that will be sold to the segment. To do this, we will use the following equation using numbers from Exhibit 1. Think of this as your time series forecast method with emphasizing the last month (like a weighted model).

Total Industry Demand * (1 + [Growth Rate]) = Next Year's Demand

6,708 * 1 + 0.10

6,708 * 1.10

7,379 = Next Year's Demand

Secondly, you'll want to factor in how much market share your product will take from the upcoming demand. In order to estimate this number, you will look at your December survey score as a proportion to each of the survey scores in that market. You can find this information in Exhibit 3.

December Survey Score / (Sum of all Survey Scores in Segment) = Potential Market Share

29 + 25 + 20 + 24 + 30 + 22 + 6 + 1 + 1 = 158

30 / 158 = 0.189 or 19% = Potential Market Share

Next Year's Demand * Potential Market Share = Forecast

7,379 * 0.19

1,402 This would serve as your base forecast assuming that your product is meeting the customer buying criteria just as well as it was in the prior round.

Here are some forecasting best practices:

- Again, keep in mind how your product is changing from one year to the next.
- Try implementing a best case and worst case scenario. In this instance, you may choose to produce a little bit more in order to avoid a stock out. It is common to take 90% of your base forecast to enter in Marketing while making sure 120% is available through production (factoring in any inventory on hand).
- Always factor in the overlap of segments. When the simulation begins your product is selling to both markets so you will want to develop a forecast for that product in each of the markets that it is selling until it focuses in on one segment specifically.
- Think about how your competitors may be changing their products.
- Check out our forecasting webinar here.

Exhibit 1

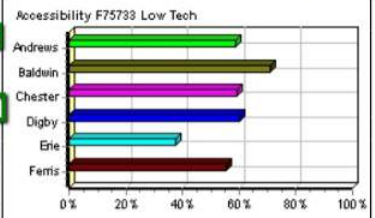
Low Tech Segment Analysis — Foundation FastTrack — **F75733** — **Round: 3 Dec. 31, 2018**

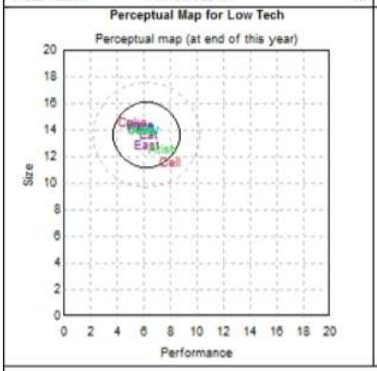
Low Tech Statistics

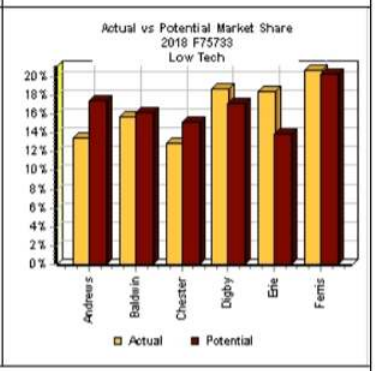
Total Industry Unit Demand	6,708
Actual Industry Unit Sales	6,667
Segment % of Total Industry	64.2%
Next Year's Segment Growth Rate	10.0%

Low Tech Customer Buying Criteria

	Expectations	*Importance*
1. Price	$15.00 - 35.00	41%
2. Age	Ideal Age = 3.0	29%
3. Reliability	MTBF 14000-20000	21%
4. Ideal Position	Pfmn 6.3 Size 13.7	9%







Top Products in Low Tech Segment

Name	Market Share	Units Sold to Seg	Revision Date	Stock Out	Pfmn Coord	Size Coord	List Price	MTBF	Age Dec.31	Promo Budget	Cust. Aware-ness	Sales Budget	Cust. Access-ibility	Dec. Cust. Survey
Fast	21%	1,379	1/29/2018	YES	5.8	14.2	$30.00	19000	4.26	$1,400	100%	$2,200	55%	29
Daze	19%	1,250	8/15/2017	YES	5.7	14.3	$32.00	17500	3.74	$1,750	100%	$2,000	60%	25
Eat	17%	1,107	7/4/2018	YES	6.4	13.7	$28.60	16500	2.37	$875	53%	$875	37%	20
Baker	16%	1,052	1/8/2018	YES	6.1	14.0	$30.25	15000	3.86	$1,700	100%	$2,500	71%	24
Able	13%	877	3/14/2018	YES	6.1	13.9	$33.75	21000	2.35	$1,600	90%	$1,600	59%	30
Cake	13%	857	1/5/2018	YES	5.3	14.5	$34.50	19700	3.68	$1,200	74%	$1,800	59%	22
East	2%	120	3/15/2018	YES	6.2	12.8	$34.00	17000	0.80	$875	42%	$875	37%	6
Atish	0%	19	3/14/2018	YES	7.4	12.6	$43.50	18000	0.80	$1,650	64%	$1,650	59%	1
Cell	0%	7	5/28/2018	YES	8.0	11.6	$44.00	20000	0.59	$1,350	57%	$2,000	59%	1

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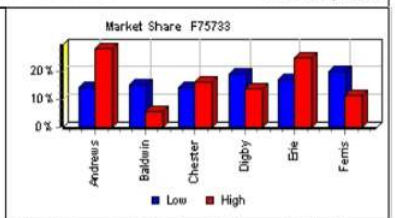
Exhibit 2

Market Share — Foundation FastTrack — F75733 — Round: 3 — Dec. 31, 2018



Actual Market Share in Units

	Low	High	Total
Industry Unit Sales	6,667	3,528	10,195
% of Market	65.4%	34.6%	100.0%
Able	13.2%	15.1%	13.8%
Atish	0.3%	10.6%	3.9%
Total	13.4%	25.8%	17.7%
Baker	15.8%	6.7%	12.6%
Total	15.8%	6.7%	12.6%
Cake	12.9%	3.8%	9.7%
Cell		9.8%	3.4%
Total	13.0%	13.5%	13.2%
Daze	18.8%	9.5%	15.5%
Douche		3.6%	1.3%
Total	18.8%	13.1%	16.8%
Eat	16.6%	18.0%	17.1%
East	1.8%	10.1%	4.7%
Total	18.4%	28.1%	21.7%
Fast	20.7%	11.4%	17.5%
Feat		1.4%	0.5%
Total	20.7%	12.8%	18.0%

Potential Market Share in Units

	Low	High	Total
Units Demanded	6,708	3,732	10,441
% of Market	64.2%	35.7%	100.0%
Able	16.9%	15.4%	16.4%
Atish	0.5%	13.2%	5.0%
Total	17.4%	28.5%	21.4%
Baker	16.1%	5.7%	12.4%
Total	16.1%	5.7%	12.4%
Cake	15.0%	4.1%	11.1%
Cell	0.2%	15.4%	5.7%
Total	15.2%	19.6%	16.8%
Daze	17.1%	7.1%	13.5%
Douche		11.3%	4.0%
Total	17.1%	18.4%	17.6%
Eat	11.4%	6.5%	9.7%
East	2.5%	10.2%	5.2%
Total	13.9%	16.7%	14.9%
Fast	20.3%	9.4%	16.4%
Feat		1.8%	0.6%
Total	20.3%	11.2%	17.1%

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Exhibit 3

Low Tech Segment Analysis — Foundation FastTrack — F75733 — Round: 3, Dec. 31, 2018

Low Tech Statistics

Total Industry Unit Demand	6,708
Actual Industry Unit Sales	6,667
Segment % of Total Industry	64.2%
Next Year's Segment Growth Rate	10.0%

Low Tech Customer Buying Criteria

	Expectations	Importance
1. Price	$15.00 - 35.00	41%
2. Age	Ideal Age = 3.0	29%
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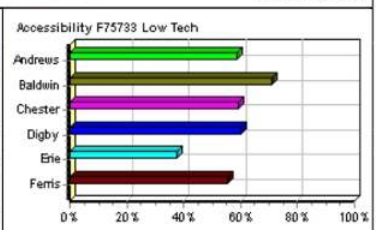

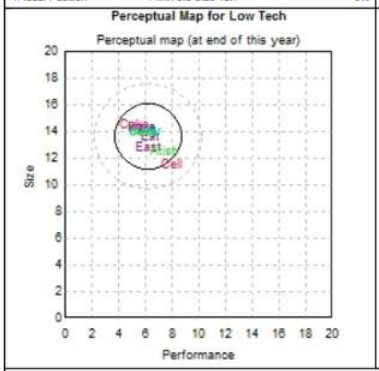

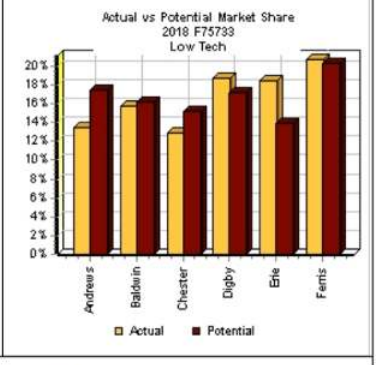

Top Products in Low Tech Segment

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Cell	0%	7	5/28/2018	YES	8.0	11.6	$44.00	20000	0.59	$1,350	57%	$2,000	59%	1

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3.10: Time Series Methods

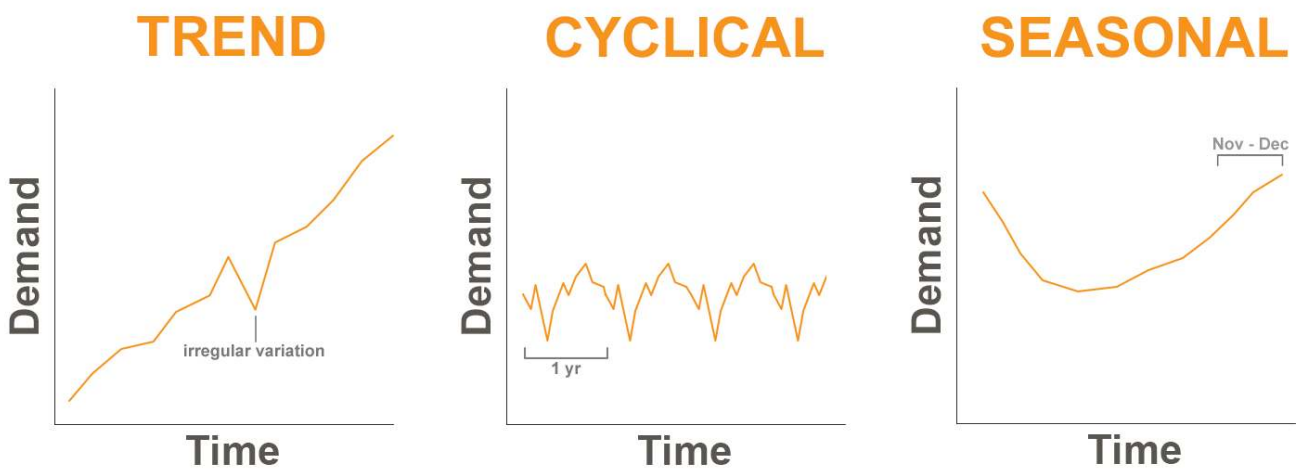

Figure 3.10.1: Diagram of trend, cyclical, and seasonal demand patterns.

Time series methods use historical data as the basis of estimating future outcomes. A time series is a series of data points indexed (or listed or graphed) in time order. Most commonly, a time series is a sequence taken at successive equally spaced points in time. Thus, it is a sequence of discrete-time data. Examples of time series are heights of ocean tides, counts of sunspots, and the daily closing value of the Dow Jones Industrial Average.

Time series are very frequently plotted via line charts. Time series are used in statistics, signal processing, pattern recognition, econometrics, mathematical finance, weather forecasting, earthquake prediction, electroencephalography, control engineering, astronomy, communications engineering, and largely in any domain of applied science and engineering which involves temporal measurements.[1]

In the following, we will elaborate more on some of the simpler time-series methods and go over some numerical examples.

Naïve Method

The simplest forecasting method is the naïve method. In this case, the forecast for the next period is set at the actual demand for the previous period. This method of forecasting may often be used as a benchmark in order to evaluate and compare other forecast methods.

Simple Moving Average

In this method, we take the average of the last “n” periods and use that as the forecast for the next period. The value of “n” can be defined by the management in order to achieve a more accurate forecast. For example, a manager may decide to use the demand values from the last four periods (i.e., n = 4) to calculate the 4-period moving average forecast for the next period.

Example 3.10.1

Some relevant notation:

D_t = Actual demand observed in period t

F_t = Forecast for period t

Using the following table, calculate the forecast for period 5 based on a 3-period moving average.

Period	Actual Demand
1	42
2	37
3	34
4	40

Solution

Forecast for period 5 = F5 = (D4 + D3 + D2) / 3 = (40 + 34 + 37) / 3 = 111 / 3 = 37

Weighted Moving Average

This method is the same as the simple moving average with the addition of a weight for each one of the last "n" periods. In practice, these weights need to be determined in a way to produce the most accurate forecast. Let's have a look at the same example, but this time, with weights:

Example 3.10.2

Period	Actual Demand	Weight
1	42	
2	37	0.2
3	34	0.3
4	40	0.5

Solution

Forecast for period 5 = F5 = (0.5 x D4 + 0.3 x D3 + 0.2 x D2) = (0.5 x 40+ 0.3 x 34 + 0.2 x 37) = 37.6

Note that if the sum of all the weights were not equal to 1, this number above had to be divided by the sum of all the weights to get the correct weighted moving average.

Exponential Smoothing

This method uses a combination of the last actual demand and the last forecast to produce the forecast for the next period. There are a number of advantages to using this method. It can often result in a more accurate forecast. It is an easy method that enables forecasts to quickly react to new trends or changes. A benefit to exponential smoothing is that it does not require a large amount of historical data. Exponential smoothing requires the use of a smoothing coefficient called Alpha (α). The Alpha that is chosen will determine how quickly the forecast responds to changes in demand. It is also referred to as the Smoothing Factor.

There are two versions of the same formula for calculating the exponential smoothing.

Here is version #1:

$F_t = (1 - \alpha) F_{t-1} + \alpha D_{t-1}$

Note that α is a coefficient between 0 and 1

For this method to work, we need to have the forecast for the previous period. This forecast is assumed to be obtained using the same exponential smoothing method. If there were no previous period forecast for any of the past periods, we will need to initiate this method of forecasting by making some assumptions. This is explained in the next example.

Example 3.10.3

Period	Actual Demand	Forecast
1	42	
2	37	
3	34	
4	40	
5		

Solution

In this example, period 5 is our next period for which we are looking for a forecast. In order to have that, we will need the forecast for the last period (i.e., period 4). But there is no forecast given for period 4. Thus, we will need to calculate the forecast for period 4 first. However, a similar issue exists for period 4, since we do not have the forecast for period 3. So, we need to go back for one more period and calculate the forecast for period 3. As you see, this will take us all the way back to period 1. Because there is no period before period 1, we will need to make some assumption for the forecast of period 1. One common assumption is to use the same demand of period 1 for its forecast. This will give us a forecast to start, and then, we can calculate the forecast for period 2 from there. Let's see how the calculations work out:

If $\alpha = 0.3$ (assume it is given here, but in practice, this value needs to be selected properly to produce the most accurate forecast)

Assume $F_1 = D_1$, which is equal to 42.

Then, calculate $F_2 = (1 - \alpha) F_1 + \alpha D_1 = (1 - 0.3) \times 42 + 0.3 \times 42 = 42$

Next, calculate $F_3 = (1 - \alpha) F_2 + \alpha D_2 = (1 - 0.3) \times 42 + 0.3 \times 37 = 40.5$

And similarly, $F_4 = (1 - \alpha) F_3 + \alpha D_3 = (1 - 0.3) \times 40.5 + 0.3 \times 34 = 38.55$

And finally, $F_5 = (1 - \alpha) F_4 + \alpha D_4 = (1 - 0.3) \times 38.55 + 0.3 \times 40 = 38.985$

Period	Actual Demand	Forecast
1	42	42 (assumed = D_1)
2	37	(1 – 0.3) x 42 + 0.3 x 42 = 42
3	34	(1 – 0.3) x 42 + 0.3 x 37 = 40.5
4	40	(1 – 0.3) x 40.5 + 0.3 x 34 = 38.55
5		(1 – 0.3) x 38.55 + 0.3 x 40 = 38.985

Figure 3.10.2: Solution for Exponential Smoothing Version 1

Accessible format for Figure 3.10.2

Here is version #2:

$F_t = F_{t-1} + \alpha(D_{t-1} - F_{t-1})$

Example 3.10.4

Assume you are given an alpha of 0.3, $F_{t-1} = 55$

Solution

Period	Actual Demand	Forecast
1	60	55 (assumed
2	55	55 + 0.3 x (60 – 55) = 56.5
3	51	56.5 + 0.3 x (55 – 56.5) = 56.05
4	58	56.05 + 0.3 x (51 – 56.05) = 54.53
5		54.54 + 0.3 x (58 – 54.53) = 55.64

Figure 3.10.3: Solution for Exponential Smoothing Version 2

Accessible format for Figure 3.10.3

Here is a video explaining moving averages using EXCEL.

https://www.linkedin.com/learning/search?keywords=moving%20averages&u=2169170

Here is a video explaining exponential smoothing using EXCEL.

https://www.linkedin.com/learning/search?keywords=exponential%20smoothing&u=2169170

Seasonal Index

Many organizations produce goods whose demand is related to the seasons, or changes in weather throughout the year. In these cases, a seasonal index may be used to assist in the calculation of a forecast.

Example 3.10.5

Season	Previous Sales	Average Sales	Seasonal Index
Winter	390	500	390 / 500 = .78
Spring	460	500	460 / 500 = .92
Summer	600	500	600 / 500 = 1.2
Fall	550	500	550 / 500 = 1.1
Total	2000		

Using these calculated indices, we can forecast the demand for next year based on the expected annual demand for the next year. Let's say a firm has estimated that next year annual demand will be 2500 units.

Solution

Season	Anticipated annual demand	Avg. Sales / Season (2500/4)	Seasonal Factor	New Forecast
Winter		625	0.78	.78 x 625 = 487.5
Spring		625	0.92	.92 x 625 = 575
Summer		625	1.2	1.2 x 625 = 750
Fall		625	1.1	1.1 x 625 = 687.5
	2500			

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CHAPTER OVERVIEW

4: Production

Learning Objectives

- What are common capacity strategies?
- Calculate efficiency and utilization measures.
- Describe factors that determine effective capacity.
- Understand the steps in the capacity planning process.
- Determine the capacity in a sequential process with a bottleneck.
- Use break even analysis to evaluate capacity alternatives.

This module examines how important strategic capacity planning is for products and services. The overall objective of strategic capacity planning is to reach an optimal level where production capabilities meet demand.

4.1: Introduction to Strategic Capacity Planning
4.2: Capacity Planning for Products and Services
4.3: Defining and Measuring Capacity
4.4: Determinants of Effective Capacity
4.5: Types of Inventory
4.6: Production Decisions in Foundation
4.7: Relevant Costs

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4.1: Introduction to Strategic Capacity Planning

This module examines how important strategic capacity planning is for products and services. The overall objective of strategic capacity planning is to reach an optimal level where production capabilities meet demand. Capacity needs include equipment, space, and employee skills. If production capabilities are not meeting demand, it will result in higher costs, strains on resources, and possible customer loss. It is important to note that capacity planning has many long-term concerns given the long-term commitment of resources.

Managers should recognize the broader effects capacity decisions have on the entire organization. Common strategies include **leading capacity**, where capacity is increased to meet expected demand, and **following capacity**, where companies wait for demand increases before expanding capabilities. A third approach is **tracking capacity**, which adds incremental capacity over time to meet demand.

Finally, the two most useful functions of capacity planning are design capacity and effective capacity. **Design capacity** refers to the maximum designed capacity or output rate, and the **effective capacity** is the design capacity minus personal and other allowances. These two functions of capacity can be used to find the efficiency and utilization. These are calculated by the formulas below:

$$\begin{gathered}\text{Efficiency} = (\text{Actual Output / Effective Capacity}) \text{ x } 100\% \\ \text{Utilization} = (\text{Actual Output / Design Capacity}) \times 100\% \\ \text{Effective Capacity} = \text{Design Capacity - allowances}\end{gathered} \tag{4.1.1}$$

Example 4.1.1

Actual production last week = 25,000 units

Effective capacity = 28,000 units

Design capacity = 230 units per hour

Factory operates 7 days/week, three 8-hour shifts

1. What is the design capacity for one week?
2. Calculate the efficiency and utilization rates.

Solution

(Using the formulas above)

1. Design capacity = (7 x 3 x 8) x (230) = 38,640 units per week
2. Utilization = 25,000 / 38,640 = 64.7%
   Efficiency = 25,000 / 28,000 = 89.3%

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4.2: Capacity Planning for Products and Services

Capacity refers to a system's potential for producing goods or delivering services over a specified time interval. Capacity planning involves long-term and short- term considerations. Long-term considerations relate to the overall level of capacity; short-term considerations relate to variations in capacity requirements due to seasonal, random, and irregular fluctuations in demand.

Excess capacity arises when actual production is less than what is achievable or optimal for a firm. This often means that the demand in the market for the product is below what the firm could potentially supply to the market. Excess capacity is inefficient and will cause manufacturers to incur extra costs. Capacity can be broken down in two categories: Design Capacity and Effective Capacity.

Three key inputs to capacity planning are:

1. The kind of capacity that will be needed
2. How much capacity will be needed?
3. When will it be needed?

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4.3: Defining and Measuring Capacity

When selecting a measure of capacity, it is best to choose one that doesn't need updating. For example, dollar amounts are often a poor measure of capacity (e.g., a restaurant may have capacity of $1 million of sales a year) because price changes over time necessitate updating of that measure.

When dealing with more than one product, it is best to measure capacity in terms of each product. For example, the capacity of a firm is to either produce 100 microwaves or 75 refrigerators. This is less confusing than just saying the capacity is 100 or 75. Another method of measuring capacity is by referring to the availability of inputs. This is usually more helpful if we are dealing with several type of output. Note that one specific measure of capacity can't be used in all situations; it needs to be tailored to the specific situation at hand. The following table shows examples of both output and input used for capacity measures.

Table 4.3.1: Various businesses and their respective input and output measures of capacity.

Type of Business	Input Measures of Capacity	Output Measures of Capacity
Car manufacturer	Labour hours	Cars per shift
Hospital	Available beds	Patients per month
Pizza parlour	Labour hours	Pizzas per day
Retail store	Floor space (sq. ft.)	Revenue per sq. ft.

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4.4: Determinants of Effective Capacity

- **Facilities:** The size and provision for expansion are key in the design of facilities. Other facility factors include locational factors, such as transportation costs, distance to market, labor supply, and energy sources. The layout of the work area can determine how smoothly work can be performed.
- **Product and Service Factors:** The more uniform the output, the more opportunities there are for standardization of methods and materials. This leads to greater capacity.
- **Process Factors:** Quantity capability is an important determinant of capacity, but so is output quality. If the quality does not meet standards, the output rate decreases because of the need for inspection and rework activities. Process improvements that increase quality and productivity can result in increased capacity. Another process factor to consider is the time it takes to change over equipment settings for different products or services.
- **Human Factors:** the tasks that are needed in certain jobs, the array of activities involved, and the training, skill, and experience required to perform a job all affect the potential and actual output. Employee motivation, absenteeism, and labour turnover all affect the output rate as well.
- **Policy Factors:** Management policy can affect capacity by allowing or disallowing capacity options such as overtime, or second, or third shifts
- **Operational Factors:** Scheduling problems may occur when an organization has differences in equipment capabilities among different pieces of equipment or differences in job requirements. Other areas of impact on effective capacity include inventory stocking decisions, late deliveries, purchasing requirements, acceptability of purchased materials and parts, and quality inspection and control procedures.
- **Supply Chain Factors:** Questions include: What impact will the changes have on suppliers, warehousing, transportation, and distributors? If capacity will be increased, will these elements of the supply chain be able to handle the increase? If capacity is to be decreased, what impact will the loss of business have on these elements of the supply chain?
- **External Factors:** Minimum quality and performance standards can restrict management's options for increasing and using capacity

Summary of Examples of Capacity Factors

- Facility Factors, e.g. expansion potential, strategic location
- Product & Service Factors, e.g. uniformity within the product manufactured or service executed
- Process Factors, e.g. reducing inspections, efficient equipment adjustments
- Human Factors, e.g. high employee motivation, low absenteeism, low labour turnover
- Policy Factors, e.g. opportunity for overtime and/or additional shifts
- Operational Factors, e.g. well-stocked inventory, minimal scheduling delays
- Supply Chain Factors, e.g. adaptable distributors
- External Factors, e.g. minimal interference with quality and performance standards

Inadequate planning can be a major limitation in determining the effective capacity.

The most important parts of effective capacity are process and human factors. Process factors must be efficient and must operate smoothly. If not, the rate of output will dramatically decrease. They must be motivated and have a low absenteeism and labour turnover. In resolving constraint issues, all possible alternative solutions must be evaluated.

Steps in the Capacity Planning Process

1. Estimate future capacity requirements
2. Evaluate existing capacity and facilities and identify gaps
3. Identify alternatives for meeting requirements
4. Conduct financial analyses of each alternative
5. Assess key qualitative issues for each alternative
6. Select the alternative to pursue that will be best in the long term
7. Implement the selected alternative
8. Monitor results

The above content is an adaptation of Saylor Academy's BUS300 course.[1]

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4.5: Types of Inventory

There are several types of inventory in any organization. Here are some that are more common:

- Raw materials or purchased parts are some of the very common types.
- Work in process (or progress) or WIP, which are the semi-finished or not completely finished items that you can find in the middle of assembly lines and manufacturing facilities.
- Finished goods or merchandise that we're all familiar with. We can find these in all the stores that we go to buy what we need.
- Spare parts or tools and supplies are also another type of inventory that companies may need.

Reasons for Keeping Inventory

There are different reasons for keeping or holding inventory. Here are some examples:

- To hold inventory simply because that inventory is still in transit. In that case, it has not got to their facility yet and because they have paid for those items, they are counted as their inventory and this is something that we also call in transit inventory holding.
- To protect against the stock outs. This is a very common or probably the most common reason for keeping inventory. That is, when the customers come to ask us for a unit of product to purchase, we want to make sure that we have enough in stock.
- To take advantage of some quantity discounts that might be available to us by our suppliers. What happens is that our suppliers may tell us that if we purchase more, they will be able to give us some discounts. Note that we did not necessarily need the extra units at this time. As a result, we will need to keep them in stock and that will be our extra inventory to hold. We're going to talk about the discount model in this video as well and over there, you'll see what kinds of trade-offs are there and in which scenario it is better to take advantage of some discount versus not.
- To smooth out the production requirements. This simply means that from time to time, if the demand goes up and down, when the demand is down, you may want to produce a little bit more and keep it in inventory, so that later on, when the demand goes back up, you don't have to necessarily ramp up your production too much. But instead, you can use the inventory that you have piled up. This helps you keep a more steady production level at all times, which is usually a less costly way of doing the production.
- To cover for any disruption in the operations. This means if anything goes wrong in a certain part of a production process, you will have enough inventory around to cover you for that part of the operation. This way, you will most likely not have to shut down the whole production line, or you can at least delay the shutdown as much as possible, until the problem gets resolved.

Please note that in any of these scenarios, we will need to pay a close attention to the holding costs of the inventory versus the other costs. For example, if the inventory holding cost is very high, we may prefer to have a potential stock out sometimes as opposed to keeping a lot more inventory in stock. In another example, we may not use the discount option from our supplier if we know that the total savings (as a result of the discount) is not worth the additional inventory holding costs. We will discuss more about the inventory holding costs later.

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4.6: Production Decisions in Foundation

There are several objective to the production decision area in the Foundation Simulation.

1. Purchase machinery to automate your facilities
2. Buy or sell capacity for your product lines
3. Set a production schedule
4. Manage the majority of your company's fixed assets
5. Staff your facility with workers

Purchase machinery to automate your facilities

The automation goal in Capsim's Foundation simulation is to manage production capacity and automation levels effectively. This involves ensuring that your company can meet demand while controlling costs. By strategically investing in automation, you can increase efficiency, reduce labor costs, and improve overall productivity[1].

In Capsim's Foundation simulation, automation primarily affects costs in two significant ways:

1. Initial Investment: Increasing automation requires an upfront investment. The cost to raise automation to a level of 10.0 is calculated using the formula:

Cost to Increase Automation=First Shift Capacity×[$4×(10−Current Automation Level)

This means that the higher the current automation level, the lower the additional cost to further increase it

2. Ongoing Savings: Higher automation levels reduce labor costs over time. As automation increases, the need for manual labor decreases, leading to significant savings in labor expenses. This can improve your company's overall cost structure and profitability.

Buy or sell capacity for your product lines

In Capsim's Foundation simulation, capacity plays a crucial role in determining production efficiency. Here's how:

1. **Meeting Demand**: Adequate capacity ensures that your company can meet customer demand without delays. If capacity is too low, you risk stockouts, which can lead to lost sales and dissatisfied customers[1].
2. **Economies of Scale**: Higher capacity can lead to economies of scale, where the cost per unit decreases as production volume increases. This can improve your profit margins[1].
3. **Flexibility**: Having sufficient capacity allows your company to be more flexible in responding to market changes and unexpected increases in demand. This flexibility can be a competitive advantage[2].
4. **Idle Capacity**: On the flip side, too much capacity can lead to inefficiencies. Idle capacity means you're paying for unused production potential, which can increase your costs without generating additional revenue[1].

Balancing capacity with demand forecasts and production schedules is key to maintaining optimal production efficiency.

In Capsim's Foundation simulation, managing capacity involves both buying and selling production capacity. Here's a summary:

Buying Capacity

- **Process**: On the Production worksheet, enter a positive number in the "Buy/Sell Capacity" line to buy capacity. For example, entering 300 means buying 300,000 units of capacity.
- **Cost**: Each new unit of capacity costs $6.00 for floor space plus $4.00 multiplied by the automation rating[1].
- **Timing**: Increases in capacity take a full year to become effective[2].

Selling Capacity

- **Process**: Enter a negative number in the "Buy/Sell Capacity" line to sell capacity. For example, entering -300 means selling 300,000 units of capacity.
- **Revenue**: Capacity can be sold at the beginning of the year for 65% of its original value[1].

- **Financial Impact**: Selling capacity for less than its depreciated value results in a loss, while selling for more results in a gain. These are reflected on your income statement[2].

Set a production schedule

Setting a Production Schedule in Capsim

1. **Forecast Demand**: Start by forecasting the demand for each product. This involves analyzing market trends, historical sales data, and competitor actions[1].
2. **Calculate Production Needs**: Use the formula: [\text{Production Schedule} = (\text{Sales Forecast} \times 1.15) - \text{Inventory On Hand}] This ensures you have enough inventory to meet demand while accounting for a buffer[1].
3. **Adjust for Inventory**: Consider your current inventory levels. If you have excess inventory, you may need to produce less. Conversely, if inventory is low, increase production[1].
4. **Set Production Levels**: Enter the calculated production numbers into the Production worksheet. Ensure these numbers align with your capacity and automation levels[1].

Importance of a Production Schedule

1. **Meeting Demand**: A well-planned production schedule ensures you can meet customer demand without stockouts, which helps maintain customer satisfaction and sales[2].
2. **Cost Efficiency**: Proper scheduling helps avoid overproduction, which can lead to excess inventory and increased holding costs. It also prevents underproduction, which can result in lost sales opportunities[2].
3. **Resource Optimization**: Efficient production scheduling optimizes the use of your resources, including labor, machinery, and materials. This leads to better utilization rates and cost savings[2].
4. **Flexibility**: A good production schedule allows your company to be more flexible and responsive to market changes, helping you stay competitive[2].

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4.7: Relevant Costs

The costs are usually defined for each item or stock keeping unit (SKU) separately. As a result, the optimal order quantities and the time of order is determined for each item specifically. The relevant costs that we have in any inventory management are as follows:

Total Purchasing or Acquisition Cost:

This refers to the total purchasing cost of an item in a year (or in a month or a quarter of the year, etc., depending on what our unit of measure is for the time). In some models, this particular cost may not change. This is because the total demand in the year is the same (in those models) and if the price is not changing (that is, there's no quantity discount available from the supplier), the total acquisition cost or purchasing cost will be fixed. As a result, in those scenarios, we ignore this cost from our mathematical model, since we are doing our calculations to find the optimal order quantities and because this is a fixed cost and it does not change based on how much we order every single time, the total acquisition cost or purchase cost in the year will stay fixed.

Total Ordering Costs:

Ordering cost usually includes the clerical and retrieval expenses. Sometimes, we include the delivery and inspection as part of this cost too. If you have your own manufacturing (instead of buying from an outside supplier), this same cost will be called **setup cost**, which we have in the model that we call Economic Production Quantity (EPQ).

Total Carrying or Holding Costs:

This refers to the total cost of holding the items as if they were kept in stock for a whole year. Since each item will usually not stay in stock for the whole year, if we are to calculate the total annual holding cost, we will need to find an average number of items that we can find in our stock every time that we check our inventory. For example, if we checked our inventory level for a certain item 20 times during a year, we would most likely get a different number every time. If we take the average of those 20 numbers, that will give us a good estimate of how many units are sitting in our warehouse at all times. Please note that the items come in and go out of our facility as we buy and sell (or use) them. So, the items that we see on the stock each time are not necessarily the same ones sitting there for so long.

The unit holding cost is defined as the cost of holding one unit of product for one unit of time. The unit of time is usually one year. But it can be based on a quarter, month, day or any other time unit. The key is to be consistent with the unit of measurement for time wherever in our calculations.

In operations management, we usually calculate the holding cost for each item as a percentage of the item's value. For example, if the value of the item that we are keeping in stock is $1000 and our inventory holding cost is 20%, this means that if we keep that item for one whole year, it will cost us 20% x 1000 = $200 per unit. If the same item sits in our inventory for only a quarter of the year, it will cost (1/4) x 200 = $50 per unit. If we had 10 of this item and they were kept for one whole year, the total annual inventory holding cost would be 10 x 200 = $2000.

Insight

"If the price or the value of the item is higher, the holding cost will be higher. That is one of the main reasons that when companies are dealing with more expensive items, they tend to keep as few units as possible for those items. Sometimes, they keep only one unit just for showing at their store, and they get the customers' orders to deliver the item to them later, or to bring it to the store for customers' pickup later. They could not afford keeping several of those very expensive items in the store, because otherwise, the cost of holding them would be very high."

The holding cost percentage represents all the costs associated with the facility in which the item is kept as well as any material handling costs within the facility. Basically, you will need to talk to the accountants in our company, if you are in charge of inventory, to get a better sense of the costs and a better idea of this percentage. In this chapter, we will have this percentage given to us in any examples that we have.

Some of the costs included in the holding cost percentage are as follows:

Cost of capital

This means that when your money is tied to the inventory that you are keeping, you cannot invest that money anywhere else. So, you are losing some sort of an opportunity out there. As a result, the estimation of an interest that you could have gained can give us a percentage which is used as a part of the holding cost percentage.

Insurances

Since we always need to have insurance for our warehouses, the cost of insurance can be calculated as a percentage for each item. This cost will in turn be used as another part of the holding cost percentage.

Storage costs

As a share of the actual cost of owning or leasing the warehouse or the facility in which we hold the inventory and the costs of running the place (e.g., material handling, utilities, etc.) are calculated per item and added to the holding cost percentage.

Breakage or spoilage

If there is any breakage, theft or spoilage that happens to our stock from time to time, we will need to add that as an additional part of the holding cost.

Shortage Costs

There could be some penalty or shortage costs if there were uncertainties in the demand. If the demand were higher than what you have available in your inventory, you would have a shortage. This cost is usually a tricky one, since it does not look like a cost for which you lose money out of your pocket right away. But in fact, you are not gaining the money that you could make if you had enough units of the item in demand available. You can also lose the sale to certain customers completely, as they may find substitute products from other companies. In addition, there is a chance for a loss of goodwill in our customers, especially if the shortage happens over and over again. In all these cases, the inventory management tries to monetize the amount of loss to plan more properly for an optimal level of product availability.

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CHAPTER OVERVIEW

5: Finance/Balanced Scorecard

5.1: Explain the Primary Roles and Skills Required of Managerial Accountants
5.2: Describe Trends in Today's Business Environment and Analyze Their Impact on Accounting
5.3: Distinguish between Merchandising, Manufacturing, and Service Organizations
5.4: Identify and Apply Basic Cost Behavior Patterns
5.5: Estimate a Variable and Fixed Cost Equation and Predict Future Costs
5.6: Explain Contribution Margin and Calculate Contribution Margin per Unit, Contribution Margin Ratio, and Total Contribution Margin
5.7: Calculate and Interpret a Company's Margin of Safety and Operating Leverage
5.8: Identify Relevant Information for Decision-Making
5.9: Evaluate and Determine Whether to Keep or Discontinue a Segment or Product
5.10: Evaluate and Determine How to Make Decisions When Resources Are Constrained
5.11: Explain the Importance of Performance Measurement
5.12: Identify the Characteristics of an Effective Performance Measure
5.13: Evaluate an Operating Segment or a Project Using Return on Investment, Residual Income, and Economic Value Added
5.14: Describe the Balanced Scorecard and Explain How It Is Used
5.15: Why It Matters
5.16: Ratios- Condensing Information into Smaller Pieces
5.17: Operating Efficiency Ratios
5.18: Liquidity Ratios
5.19: Solvency Ratios
5.20: Market Value Ratios

This section is an overview of the financial data and decisions making information you will use throughout this simulation. Business leaders are using data every day to make informed decisions for there company. You will need to do this as well. This chapter should arm you with information that you don't remember learning or perhaps wasn't covered in the detail necessary for this simulation. Please use this as an overview guide of accounting and financial principles.

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5.1: Explain the Primary Roles and Skills Required of Managerial Accountants

It is clear that management accountants must have a solid foundation in accounting, in both financial and managerial accounting, but other than accounting skills, what makes good managerial accountants?

- They must have knowledge of the business in which they are working. **Commercial awareness** is knowing how a business is run and how it is influenced by the external environment, and knowing and understanding the overall industry within which the business is operating.
- **Collaboration**, which involves working in cross-functional teams and earning the trust and respect of colleagues in order to complete a task, is vital to improving managerial accounting talents. They should be "team players."
- Management accountants should have **effective communication skills** that allow them to convey accounting information in both written and oral forms in a way that the intended audience can understand. Being able to gather the data quickly and accurately is important, but the data is meaningless if it is not presented in an intuitive style that the audience can understand.
- Strong technology skills are also essential. These skills include not only accounting and reporting software but also other programs that would assist in automating processes, improving efficiencies, and adding value to the company. For many companies, additional software and accompanying technology are often needed for both their financial and managerial accounting functions. For example, *enterprise resource planning* (ERP) systems often play a major role in the creation of comprehensive accounting systems. This additional support is often provided by outside suppliers such as Hyperion, Cognos, Sage, SAP, PeopleSoft, and Oracle.
- Managerial accountants must possess extensive analytical skills. They must regularly work with financial analysts and management personnel to find ways to reduce expenses and analyze budgets. These skills include the ability to envision, verbalize, conceptualize, or solve both multifaceted and simplistic problems by making choices that make sense with the given information.
- Managerial accountants must have ethics and values. They should be an example to others and encourage them to follow internal control practices and procedures. Ethics is discussed in more detail in Describe the role of the Institute of Management Accountants and the use of ethical standards.

Managers at all levels make many different types of decisions every day, but to make most decisions, they need specific information. Some information is easily obtainable, and some is not. Managers do not always know what information they need or what is available, and they need to know if the decisions they make are having the desired outcome and meeting specific goals.

To this point, we've described managerial accounting as a process. The following definition considers it a profession. Management accountants are the individuals who help management with this information. The Institute of Management Accountants (IMA) defines management accounting as "a profession that involves partnering in management decision making, devising planning and performance management systems, and providing expertise in financial reporting and control to assist management in the formulation and implementation of an organization's strategy."[1]

The IMA also reports that nearly 75 percent of financial professionals work in business as management accountants in positions such as financial analysts, accounting managers, controllers, and chief financial officers.[2] These professionals have a significant impact on businesses through influencing the decision-making process and business strategy.

Management accountants work at various levels of the organization, from the project level to the division level to the controller and chief financial officer. Often, management accountants work where they are needed and not necessarily at corporate headquarters. They tend to be hands-on in the decision-making process. They need many types of information to inform the many decisions they must make.

Continuing Application

Who Uses Managerial Accounting?

When most people think of an accounting job, they think of someone who does taxes or who puts together financial statements. However, almost all jobs use accounting information, particularly managerial accounting information. Table 5.1.1 shows how certain professions might use managerial accounting information. Can you think of other examples?

Table 5.1.1: Use of Managerial Accounting Information

Profession	How They Use Managerial Accounting in Their Industry
Engineer	Properly track and report the use of resources involved in an engineering project; measure and communicate costs of a project and its outcomes
Mayor	Put together a budget, a planning and control mechanism that plays an important role in every government
Nurse	Track operating or service costing per patient, or per unit
Mechanic	Use job costing to figure total costs and overall profitability on each job
Retail store manager	Forecast inventory needs, review profit margins, and track sales margins on individual products as well as entire stores
Restaurant owner	Calculate the cost of serving a single table by estimating the cost of the food, plus the time of the server. Keep food costs under control through inventory tracking.
Architect	Track direct and indirect costs for each job; track profitability per job
Farmer	Calculate yields per field, analyze fertilizer and seeding rates, and control waste

Organizational Structure

Most companies have an organizational chart that displays the configuration and the delegation of authority in the decision-making processes (Figure 5.1.1). The structure helps define roles and responsibilities. The organizational charts provide guidance to employees and other stakeholders by outlining the official reporting affiliations that direct the workflow within the organization. If the company is particularly efficient, it also will include contact information within the chart. This is a convenient directory to circulate among employees. It helps them find a particular person in a certain position, or determine whom to speak to about certain areas within the company, or even identify a specific person's supervisor to report positive or negative work behavior.

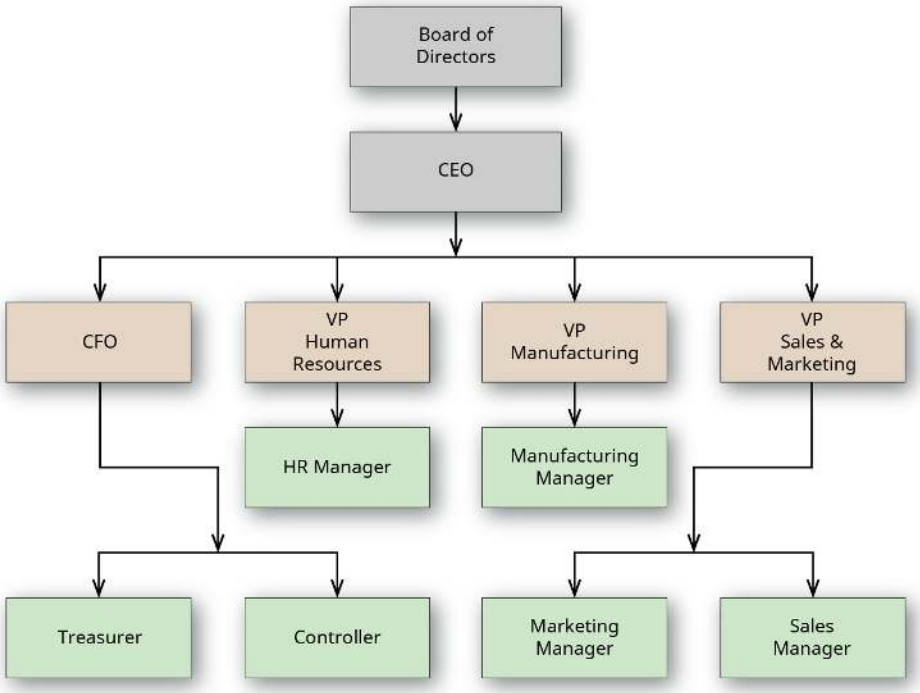

Figure 5.1.1: Sample Organizational Chart. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Stockholders of a company are the owners; however, they elect a **board of directors** to manage that company for them. The board selects the officers who will implement the policies and strategic goals that the board has set in place. The **chief executive officer (CEO)** is the corporation officer who has the overall responsibility for the management of the company. The person overseeing all of the accounting and finance concerns is the **chief financial officer (CFO)**. This individual is in charge of the financial planning and record-keeping of the organization and reports to the CEO. The **controller** is responsible for the accounting side of the business (accounting records, financial statements, tax returns, and internal reports) and reports to the CFO. Also reporting to the CFO is the **treasurer**, who is in control of the finance side of the business (cash position, corporation funds). An additional area that sometimes falls under the control of the CFO is the internal audit staff. Internal auditors supply independent assurance that a company's internal control processes are effective. However, there is strong support for keeping the internal audit staff outside of the CFO, because of a possible conflict of interest.

Think it Through: Managing Cash Flow

Assume you are the managerial accountant at Anchor Head Brewery, a Midwest craft brewery that distributes nationwide. Its year-end is December 31. Because of poor cash flow management, the CFO has some concerns about having enough cash to be able to pay the tax bill that is expected. In early December, the purchasing department bought excess hops, barley, malt, oats, and yeast in anticipation of brewing more beer for the holiday and Super Bowl seasons. In order to decrease the company's net income, thereby reducing their taxable income, the CFO tells you to enter the purchase of this inventory as part of the "Supplies Expense" in the current year.

1. In which account should these materials be recorded?
2. How should you reply to this request?
3. Should you bring this matter to another executive officer?

Footnotes

1. "Management Accounting Careers." Institute of Management Accountants. https://www.imanet.org/students/mana...areers?ssopc=1
2. "Management Accounting Careers." Institute of Management Accountants. https://www.imanet.org/students/mana...areers?ssopc=1

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5.2: Describe Trends in Today's Business Environment and Analyze Their Impact on Accounting

The business environment never rests. Regulations are always changing, global competition continues to increase, and technology provides continual disruption. Management accounting is always evolving due to changes in the business environment. The types of information needed and obtainable have changed significantly over time.

Many areas of employment are impacting businesses and the managerial accounting function today. For example, more than 60 percent of workers in the United States are employed within service industries, such as government agencies, marketing firms, accounting firms, and airlines. The health-care and social service industries have doubled in size. However, as the number of service jobs has increased, the number of manufacturing jobs, as a percentage of all jobs, has been decreasing.1 One of the primary reasons for the decline in manufacturing jobs is automation and other technological changes.

How are service industries different from manufacturing organizations? The fundamental difference is the product they sell. The service company, such as a marketing, legal, or consulting firm, produces **intangible goods**, meaning that the product has no physical substance. Manufacturing companies produce **tangible** goods, which customers can handle and see. This leads to another significant difference between manufacturing companies and service firms: inventory. Service firms, unlike manufacturing, do not have large inventories, because there is no tangible product. Manufacturing will have inventories of raw materials, of goods that are in the process of being produced and goods that have been completed but not yet sold. Managerial accountants must track all of this information for manufacturing companies. However, managerial accountants are still needed within service-based firms to track time, materials, and overhead. For example, Boeing Company is a manufacturer of airplanes. Their accountants must track several different types of inventory categories, direct labor, and overhead costs, among other things. One of Boeing's customers, Delta Air Lines, is a service-based company. The managerial accountants for the airline also are responsible for following costs, but their reports are targeted toward industry-specific measures such as operating margins, revenue from passenger miles, load factors, and passenger yield, among others.

Much of managerial accounting focuses on manufacturing. However, the techniques used for cost accounting for manufacturing companies also can be applied to service-based organizations. The former would develop a cost of goods manufactured schedule, and the latter would need a cost of service schedule. The structure of the reports is principally the same, but section headings would reflect the type of organization.

Technology

Business entities always look for ways to leverage technology. Any type of technology that can increase production, reduce costs, or increase safety will attract attention from the business world. There are many areas of technology that businesses have used already, but to continue reaping those benefits, these companies need to adjust quickly with the ever-advancing business technology.

Companies have the ability to integrate many of their business processes through **enterprise resource planning (ERP)** systems, which help companies streamline their operations and help management respond quickly to change. Although they are expensive, these systems help alleviate the complications that arise from business systems that do not coordinate with one another. For example, a company may have many different individual systems for each function: human resources may have a system to track employees' insurance benefits, training, and retirement programs, while payroll may have a program that tracks employees' earnings, taxes, deductions, and direct deposit information. Much of the information human resources and payroll collect is the same. Having one system with different silos is much more efficient than having two separate systems. Management must be aware of and adapt to whichever type of system that the business has—either one ERP or several independent systems that may not coordinate information (Figure 5.2.1).

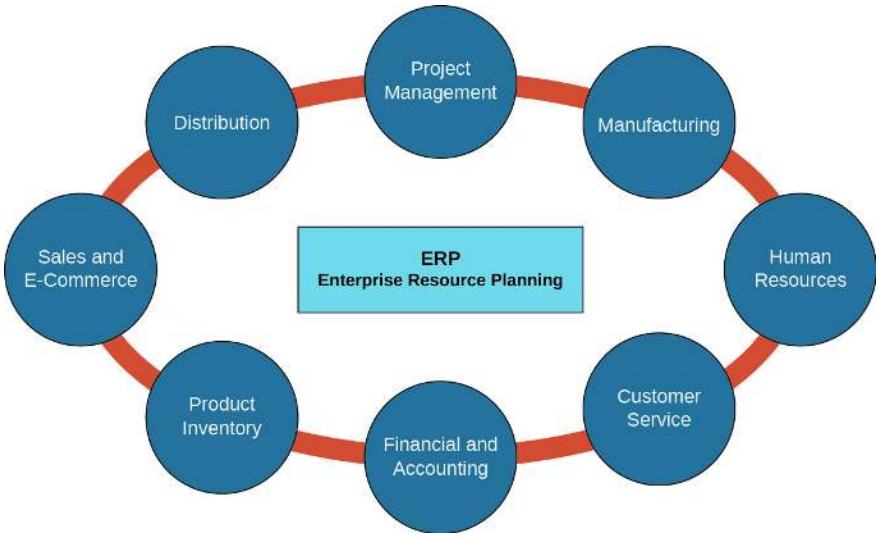

Figure 5.2.1: Eight Primary Components of Enterprise Resource Planning (ERP). The diagram shows the role of ERP in streamlining a business by coordinating the various components of that business. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Businesses have been on the forefront of advancing technology. As computer systems developed throughout the twentieth century, they brought with them the potential for many benefits, but the business world needed to adapt and transform their infrastructure. Over the last forty years, tangible assets (buildings, machinery, and vehicles) have declined from 80 percent of a company's value to 15 percent, while intangible assets (trademarks, patents, and competencies) are now at an average of 85 percent of a company's value. It can be difficult to put a value on some of the intangible assets, but it is not hard to realize they do have worth. JetBlue has the number one brand loyalty of all North American airlines. Apple has built a kingdom around brand loyalty. Intangible assets can give a company a competitive edge, entice consumers, and protect the organization's brain trust.

Technological advances can directly affect managerial accounting reports, through estimates of overhead costs. Historically, overhead was typically calculated on the basis of relatively straightforward relationships, such as direct labor costs or direct labor hours. With the advancements through automation, in many instances, direct labor costs are much lower and no longer relevant in computing overhead costs. **Automation** is a method of using systems such as computers or robots to operate different processes and machinery to improve efficiencies and lower direct labor costs. Companies use automation to remove the complex, superfluous stages from a process in order to streamline the practice. In essence, labor is being traded for machine production. Such industries as auto production are excellent examples. This exchange of direct labor for greater costs in overhead for such factors as machinery depreciation will be addressed in Job Order Costing and Process Costing on calculating production costs.

Link to Learning

Automation has changed the production of automobiles over the last 100 years. This 100-second video from Ford Motor Company on automation demonstrates this concept.

With the growth of the Internet and the speed by which information is shared, businesses can now communicate with employees from around the world within seconds. This has made outsourcing common in certain sectors. **Outsourcing** is hiring workers outside of the company who perform their tasks inside or outside of the country. Most of the exported jobs have gone to less-developed countries, where there are lower labor costs. Outsourcing saves the company money on labor and overhead costs and has become a major trend over the past several years. More and more organizations, both large and small, are now using outsourcing as a way of growing their entities without adding additional labor and overhead costs. Outsourcing allows a company to focus on its own competencies and hire those outside sources to handle other duties.

Another technology that is quickly becoming widespread is **radio-frequency identification (RFID)**. This technology uses electromagnetic fields to routinely identify and trace inventory tags that have been attached to objects. The tags contain information that has been stored by electronic means. The RFID tags can made into many shapes and sizes and enclosed in many different

materials. These tiny devices have advantages over the common bar code. They do not need to be positioned precisely over the scanner and cannot be manipulated like barcodes. This technology has been used for many years in identifying and tracking lost pets, but it was considered too expensive for more extensive use in industry. With the advancements over the last several years, RFID devices are now seen as “throwaway” control devices. One company recently signed a contract to sell 500 million RFID tags at a cost of about ten cents per device. Other current uses include antitheft tags attached to merchandise, credit card chips, and heavy-duty transponders used in shipping containers. New uses being investigated include RFID chips in passports, food, and people.

Think it Through: Outsourcing

With the increase in global businesses and competition, there has been an increased focus on outsourcing in order to reduce costs. As you’ve learned, outsourcing involves hiring an outside company to provide services or products rather than having them produced internally.

For example, you are the vice president of operations for a manufacturing firm. Other firms similar to yours have outsourced some of the product assembly. You estimate that you could save a significant amount of money on wages and benefits, as you would let go approximately ten workers if you outsource. Would you outsource? Why or why not?

Lean Practices

All companies want to be successful. This requires continuously trying to improve the function of the organization. A lean business model is one in which a company strives to eliminate waste in its products, services, and processes, while still fulfilling the company’s mission. This type of model was originally implemented by the Japanese automaker, Toyota Motor Corporation, soon after the end of World War II. The implications of an organization adopting a lean business model can be overall business improvement, but a lean business model can be difficult to implement because it often requires all systems and procedures that an organization follows to be readjusted and coordinated. Managerial accounting plays a vital role in the success and implementation of a lean business model by providing accurate cost and performance evaluation information. Entities must comprehend the nature and sources of costs and develop systems that encapsulate costs accurately. The better an organization is at controlling costs, the more it can improve its overall financial performance. **Continuous improvement** is the manufacturing process that rejects the ideas of “good enough.” It is an ongoing effort to improve processes, products, services, and practices. This philosophy has led organizations to adopt practices such as total quality management, just-in-time manufacturing, and Lean Six Sigma. The fundamental ideas of all of these involve continuous improvement; they differ only in focus.

Total quality management (TQM) concentrates on quality improvement and applies this benchmark to all aspects of business activities. In TQM, management and employees look to reveal waste and errors, streamline the supply chain, improve customer relations, and confirm that employees are informed and properly trained. The objective of TQM is continuous improvement by concentrating on systematic problem-solving and customer service. Scientific methods are used to study what succeeds and what does not, and then the best practices are implemented throughout the organization.

However, the pursuit of total quality will cost the company money. With the help of management accountants, companies can track these costs and forecast whether or not the improvements will eventually save the organization money down the road.

Just-in-time (JIT) manufacturing is an inventory system that companies use to increase efficiency and decrease waste by receiving goods only as they are needed within the production process, thereby reducing warehousing costs. This method requires accurate forecasting. Managerial accountants work together with purchasing and production schedulers in keeping the flow of materials accurate and efficient.

This method was initiated by Toyota Motor Corporation, and it has expanded to many other manufacturing organizations throughout the world. Toyota set the example by controlling their inventory levels by relying on their supply chain to deliver the raw materials it needed to build their cars. The parts arrived just as they were needed, not before or after.

One major advantage of JIT manufacturing is reducing costs by eradicating warehouse storage needs. Organizations, in turn, tend to spend less money on raw materials because of a reduction in spoilage and waste. Another advantage is that companies can easily move from the assembly of one product to the assembly of another.

Disadvantages of JIT manufacturing start with its complexity. In moving from a traditional manufacturing approach to a JIT approach, management must reconfigure the entire flow of the production process, from the initial use of the raw materials to the output of the final finished good. Another disadvantage of JIT manufacturing is that it makes organizations more susceptible to disruptions in the supply chain. If a supplier of raw materials has a labor strike, weather problems, a breakdown of machinery, or some other catastrophe and cannot deliver the materials on time, that one supplier can shut down an entire production process and delay delivery of finished goods. An example of this occurred in 2011 after a tsunami and earthquake hit Japan and disrupted production at a critical supplier of auto parts. General Motors (GM) facilities in the United States announced they would have to shut down assembly plants where they could not continue production without the parts from Japan.

Lean Six Sigma (LSS) is a quality control program that depends on a combined effort of many team members to enhance performance by analytically removing waste and diminishing variations between products. The lean component of LSS is the concept that anything that is not needed in a product or service, or any unnecessary steps that exist, add cost to the product or service and therefore should be considered waste and eliminated. The Six Sigma component of LSS has to do with the elimination of defects. Essentially, as a company becomes leaner, it should also be able to reduce defects in manufacturing or in providing a service. Fewer defects add to cost savings through the need for fewer reworked products, fewer repeat service calls, and therefore, more satisfied customers. It was developed by Motorola in 1986 and emphasized cycle-time improvement and the reduction of defects. This process has shown to be a powerful way of improving business efficiency and effectiveness. As organizations continue to modify and update their processes for optimal productivity, they must be flexible. As of 2017, LSS had developed into a business management way of thinking that focused on customer needs, customer retention, and improvement of business products and services. There are many establishments, including Motorola, that now do LSS training. There are certifications including white belt, yellow belt, green belt, black belt, and master black belt. The belts signify an employee's knowledge regarding LSS. For example, a white belt understands the terminology, structure, and idea of LSS and reports issues to green or black belts. A green belt typically manages LSS projects, and a master black belt works with upper-level management to find the areas in the business where LSS needs to be implemented, leads several LSS teams, and oversees implementation of those projects.

Kaizen (Japanese for change for the better) is another process that is often linked to Six Sigma (Figure 5.2.2). The two concepts are often used together for process improvements, as they both are designed for continuous improvement by eliminating waste and increasing efficiencies. The concept of kaizen comes from an ancient Japanese philosophy that involves continuously working toward perfection in all areas of one's life. It was adopted in the business world after World War II in an effort to rebuild Japan. It centers on making small, day-to-day changes that develop into major improvements over time. The key behind the success of kaizen comes from requiring all employees—from the CEO at the top, all the way down to the shop-floor janitors—to participate by making recommendations to improve the organization. From the start of the process, it must be well defined that all recommendations are appreciated and that there will be no adverse results for participating. Workers, instead, should be rewarded for any modifications that advance the workplace. Employees become more self-assured and invested when they help improve the company.

Figure 5.2.2: Kaizen Board Showing Kaizen Process and Some Related Tactics. (credit left: modification of "Woman Standing in Front of Sitting People" by "rawpixel.com"/Pexels, Pexels license / Public Domain; right: modification of "A few kaizen tactics" by Sacha Chua/Flickr, CC BY 2.0)

Another lean practice, the theory of constraints (TOC), involves recognizing and removing bottlenecks within the value chain that may be limiting an organization's profitability. This philosophy, developed by Dr. Eliyahu M. Goldratt, is a valuable instrument for improving the flaws in processes. The main goal of this methodology is to remove obstructions, or constraints, which are referred to as "bottlenecks." There are several types of bottlenecks that organizations must deal with endlessly. One example occurs at the grocery store when it is crowded and there are only three checkout lanes open but ten people in each line. Obviously, the bottleneck

is created by having too few checkout lanes open. The bottleneck can be mitigated by opening more checkout lanes. Other examples are listed in Table 5.2.1.

Table 5.2.1: Examples of Constraints

Bottleneck	Examples
Physical	Employee resources, limited space, equipment resources
Policy	Procedures, regulations, contracts
Culture	"It's the way we've always done it"
Market	Size of the market, demand for product, nature of competition

There are five steps in the cycle of continuous improvement under TOC:

1. Identify the system constraint.
2. Decide how best to exploit the constraint and make quick changes using existing resources.
3. Subordinate everything else to the process to ensure alignment with and support of the needs of the constraint.
4. Elevate the system's constraint, and determine if the constraint has shifted to another area in the process.
5. Repeat the process.

This is a continuous cycle; therefore, once a bottleneck is solved, the next bottleneck should be addressed immediately (Figure 5.2.3).

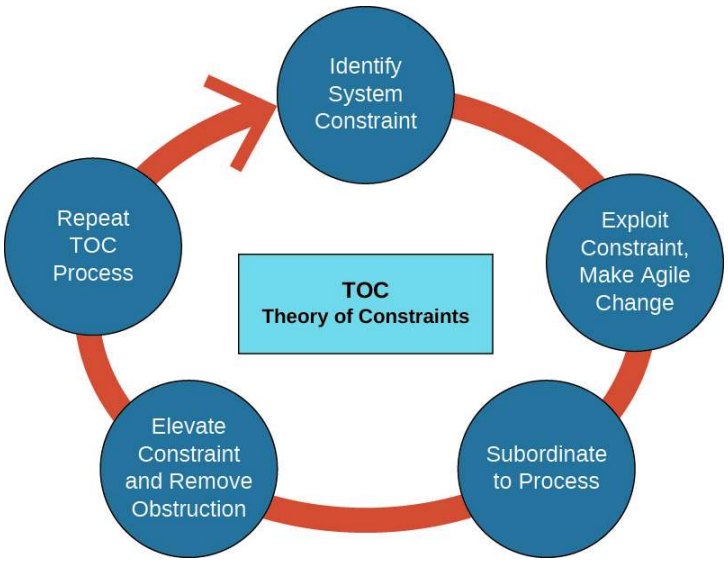

Figure 5.2.3: Five Focusing Steps of the Theory of Constraints in Its Cyclical Process. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Balanced Scorecard

The **balanced scorecard (BSC)** approach uses both financial and non-financial measures in evaluating all attributes of the organization's procedures. This approach differs from the traditional approach of only using financial measures to evaluate a company. While financial measures are essential, they are only a portion of what needs to be evaluated. The balanced scorecard focuses on both high-level and low-level measures, using the company's own strategic plan. This method assesses the organization in four separate perspectives:

- Financial. The financial measures are the major focus of the BSC—but not the only measures. This perspective asks questions like whether the organization is making money or whether the stockholders are pleased.
- Customer. The BSC also evaluates how the organization is perceived, from the customer's perspective. This measures customer satisfaction, new customer growth, and market share.

- Internal process. The internal procedures and processes perspective observes how smoothly things are running. This perspective will examine quality, efficiency, and waste as they relate directly to the products or services.
- Learning and growth/capacity. This area evaluates the entity and its performance from the standpoint of human capital, infrastructure, culture, technology, and other areas. Are employees collaborating and sharing information? Does everyone have access to the latest trends in training and continuing education in their areas?

The main advantage of this approach is that it offers organizations a way to see the cause-and-effect in the objectives. For example, if an organization would like to make more money in order to pay higher dividends to its stockholders, the organization will need to increase market share, improve customer satisfaction, or grow its customer base. In order to make customers happier or gain new customers, the organization could try to reduce defects and increase the overall quality of the products; to accomplish that, the organization could retrain or offer new training to its employees.

Globalization

The development of business through international influence or extending social and cultural aspects around the world is known as **globalization**. It has expanded our competitive borders, giving customers more alternatives. Customers can order an item from another country with the click of a button and have that item delivered in a few days or less. How has globalization affected companies? Not only must they choose between ordering goods or components globally, but they must decide in which countries to sell their goods, and in which companies they may be able to establish factories.

Globalization affects management accountants in several ways. Companies need real-time, accurate information to make good decisions, so more timely and accurate information is needed. As companies expand globally, managers need to know the cost of operating internationally, as well as the laws, rules, and customs. Globalization also can expose companies to improvements in running a business.

Debates continue as to the positive and negative consequences of globalization in all of its contexts. The advantages of globalization include helping developing countries in creating jobs, developing industries, differentiating and expanding their markets, and bettering their standard of living for their citizens. Some believe the expansion of pop culture around the globe to be an advantage of cultural globalization. It has multiplied the interchange of ideas, music, art, language, and cultural ideals. On the other side of the debate, one common criticism of globalization is that it has enhanced wealth disparity and, further, that organizations of the Western world have benefited much more than those anywhere else. There is also the argument that globalization is improving standards of living worldwide as industrialization is expanding, but it is causing global warming and climate change, due to the greenhouse gases the factories emit. Additionally, in some areas it has led to the abuse and misuse of natural resources and caused other detrimental consequences.

How do these various globalization debates affect businesses? A successful company must be profitable to stay in business, but profitability is not the single key to success. A successful company must also consider the environment in which it operates—culturally, socially, environmentally, and economically—which requires companies to evolve and adjust as each of these environments changes. This evolution means that companies must continually evaluate themselves and their impact on all of their stakeholders, which include investors, creditors, management, employees, customers, governments, and, either directly or indirectly, the world. What companies used as measures of success forty years ago are different from the measures used twenty years ago, and those are different from those that are used today, and still different from what will be needed in the future. Management accounting is the area in which many of these changing measures are either generated or evaluated. Such measures not only evaluate the cost effectiveness of products or services, but determine the best way to evaluate and reward employees and evaluate the cost-benefit of environmental protections, the impact of automation versus outsourcing, and the cost of training and educating employees.

Ethical Considerations: Global Ethics

In an article in *Business 2 Community*, Kate Gerasimova draws on her experience within the Russian and American business environments to discuss the role of ethics in global business endeavors. Ethics are the principles, and the values that underlie them, that allow us to determine what is right and wrong. According to Gerasimova, ethics fall into three categories: “code and compliance, destiny and values, and social outreach.”2 In the global business context, she also emphasizes the importance of respecting differences in values held by coworkers, communicating honestly in business dealings, and building trust. To assist

in the application of the organization's ethical approach to doing business in a different culture, it needs to develop a set of "core values as the basis for global policies and decision-making."[3] Gerasimova notes that organizations also need to consider that "clients and coworkers may have a different perspective on ethics and proper behavior than those to which you are accustomed." To address the different perspectives, an organization should train its employees to be culturally sensitive while balancing the need for rules and policies with the ability for employees to be flexible and to use their imagination.

Social Responsibility and Sustainability

What is sustainability, and what does it have to do with businesses? The United Nations definition is "the ability to meet the needs of the present without compromising the ability of future generations to meet their own needs."[4] Usually, sustainability is viewed as having three components: economic, social, and environmental. Obviously, a business cannot continue into the future unless it is economically sound; however, if it maintains its economic status by depleting too many natural resources or paying illegal wages, then that company is not practicing good social responsibility.

Corporate social responsibility (CSR) is an organization's programs that evaluate and take responsibility for the organization's effects on environmental and social welfare. There are many aspects of corporate social responsibility, including the types, locations, and wages of the labor employed; the ways in which renewable and nonrenewable resources are utilized; how charitable organizations or local areas in which the company operates are helped; and setting corporate employee policies such as maternity and paternity leave that promote family well-being. Although the causes and cures of climate change are open to discussion, most will agree that everyone, including corporations, should do their part to avoid further damage and improve any negative impact on the environment.

Concepts in Practice: Corporate Social Responsibility at New Belgium Brewing

As New Belgium Brewing Company states on their website: "We're New Belgium and we pollute. There. We said it. We are not perfect and we know it." But New Belgium Brewing has become a leader in sustainability. They preach it in every aspect of the company: production, marketing, employees, and customers. The company makes the point that being energy efficient is not only being environmentally responsible, it is being financially responsible through their "internal energy efficiency tax." The company uses many different metrics to track and improve its impact on the environment. For example, the company measures its energy usage and taxes itself on energy consumption and then saves those internal tax dollars to implement further energy savings by installing new processes and techniques. They divert 99.9 percent of the waste from their brewery away from landfills. The company makes enough in recycling revenues to pay four salaries. These are just a few ways in which New Belgium Brewing faces the challenges of social responsibility. Read more at http://www.newbelgium.com/Sustainabi...mental-Metrics.

In late 2016, the Paris Agreement (Paris Accord) brought together nations for the common cause of combating climate change. There were 197 nations in attendance, and until recently, all 197 ratified or agreed to the effort. It requires all partners to pursue specific endeavors to keep the global temperature rise to 2 degrees Celsius above that of preindustrial levels. This would be accomplished by voluntarily reducing greenhouse gas emissions. In early 2017, US President Donald Trump announced that the United States would withdraw from the agreement. At that time, only Syria and Nicaragua were holdouts. Since then, both have signed the agreement, leaving the United States now as the lone holdout, although it will take several years for the formal withdrawal. In spite of the president's announcement, there have been representatives from cities, states, corporations, and universities around the United States that have pledged to continue with the agreement and meet the greenhouse gas emission targets as set out in the Paris Accord. Many of the corporations who have promised to move forward with reducing greenhouse gases have expressed that the Paris Accord expands markets for groundbreaking clean technologies and that it creates employment opportunities alongside economic growth.

In terms of managerial accounting, sustainable business practices create many issues. Organizations need to decide what elements will be measured. For example, minimizing electricity consumption, maximizing employee safety, or reducing greenhouse gases may be the biggest issue of concern for a company. Then, the company needs to determine ways of measurement that make sense regarding those items. Companies are becoming more aware of their impact on the world, and many are creating social responsibility reports in addition to their annual reports. This type of reporting requires different types of information and analysis

than the typical financial measures gathered by companies. This is sometimes referred to as the triple bottom line, as it assesses an organization's performance not only relating to the profit, but also relating to the world and its people, and will be covered in Sustainability Reporting.

Example 5.2.1: Zaley's Machining Division

Zaley is an aerospace manufacturing firm in the southwest United States. They manufacture several products used in the aviation and aerospace industry. The company has been steadily growing over the past ten years in both sales and personnel. The engineering and design team uses computerized aided drafting (CAD) to design the various products that are produced by the machining division.

The machining division recently implemented significant technological improvements by installing an advanced technique using hard-metal and aluminum high-speed machining. The following managers are involved with the machining division:

- Alex Freedman, technical specialist (supervises all computer programs)
- Emma Vlovski, sales manager (supervises all sales agents)
- Kayla McClaughley, cost accounting director (supervises all cost accountants)
- Mwangi Kori, lead test engineer (oversees all new-product testing and design)
- Torek Sanchez, production director (supervises all manufacturing employees)

Each of these managers needs information to make decisions needed to carry out the respective jobs.

Think about what might be involved in the job of each of these managers and the types of decisions they may be required to make in order to meet the goals of the company. What information would be needed by each of the managers?

Solution

Answers will vary. Sample answer:

- Alex Freeman, technical specialist (supervises all computer programs), needs information on the hours and type of usage possibly by department or by individual to ascertain if the equipment is being used effectively or if the programs used by the company are appropriate or additions or deletions need to be made. In addition, this information is needed to address how much and what type of staffing he needs in his department.
- Emma Vlovski, sales manager (supervises all sales agents), would want information about the level and type of sales for the company as a whole as well as for the individual sales agents. She would want to know which products are selling well, which ones are not, which sales agents are being the most successful, and why they are more successful than the others. Emma would also want information on how the agents are compensated, as this may be tied to the sales agent's efforts to meet sales goals.
- Kayla McClaughley, cost accounting director (supervises all cost accountants), would want to know what tasks the cost accountants perform, how much time they spend on these tasks, and whether there are any redundancies in workload so that improvements in efficiency can be made. If any of the accountants has certifications such as CPA or CMA, she would want to know if they are keeping their certifications current through continuing professional education.
- Mwangi Kori, lead test engineer (oversees all new-product testing and design), would need information on the efficiency and effectiveness of each of the products tested, including success and failure rates. She would want information on how well the policies and procedures for design changes are being followed and if those policies and procedures need updating or rewriting.
- Thomas Sanchez, production director (supervises all manufacturing employees), would want information on hours worked, pay rates, and training (past and ongoing) for the manufacturing employees. She would also want information on how each individual employee performs his or her role in the manufacturing environment. For example, are there particular employees who have fewer defects or down time in their part of the process than others?

Footnotes

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2. Kate Gerasimova. “The Critical Role of Ethics and Culture in Business Globalization.” Business to Community. September 29, 2016. https://www.business2community.com/s...ation-01667737
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5.3: Distinguish between Merchandising, Manufacturing, and Service Organizations

Most businesses can be classified into one or more of these three categories: manufacturing, merchandising, or service. Stated in broad terms, manufacturing firms typically produce a product that is then sold to a merchandising entity (a retailer). For example, Proctor & Gamble produces a variety of shampoos that it sells to retailers, such as Walmart, Target, or Walgreens. A service entity provides a service such as accounting or legal services, or cable television and internet connections.

Some companies combine aspects of two or all three of these categories within a single business. If it chooses, the same company can both produce and market its products directly to consumers. For example, Nike produces products that it directly sells to consumers and products that it sells to retailers. An example of a company that fits all three categories is Apple, which produces phones, sells them directly to consumers, and also provides services, such as extended warranties.

Regardless of whether a business is a manufacturer of products, a retailer selling to the customer, a service provider, or some combination, all businesses set goals and have strategic plans that guide their operations. Strategic plans look very different from one company to another. For example, a retailer such as Walmart may have a strategic plan that focuses on increasing same store sales. Facebook's strategic plan may focus on increasing subscribers and attracting new advertisers. An accounting firm may have long-term goals to open offices in neighboring cities in order to serve more clients. Although the goals differ, the process all companies use to achieve their goals is the same. First, they must develop a plan for how they will achieve the goal, and then management will gather, analyze, and use information regarding costs to make decisions, implement plans, and achieve goals.

Table 5.3.1 lists examples of these costs. Some of these are similar across different types of businesses; others are unique to a particular business.

Table 5.3.1: Some Costs Incurred by a Business

Type of Business	Costs Incurred
Manufacturing Business	• Direct labor • Plant and equipment • Manufacturing overhead • Raw materials
Merchandising Business	• Lease on retail space • Merchandise inventory • Retail sales staff
Service Business	• Billing and collections • Computer network equipment • Professional staff

Some costs, such as raw materials, are unique to a particular type of business. Other costs, such as billing and collections, are common to most businesses, regardless of the type. Knowing the basic characteristics of each cost category is important to understanding how businesses measure, classify, and control costs.

Merchandising Organizations

A merchandising firm is one of the most common types of businesses. A **merchandising firm** is a business that purchases finished products and resells them to consumers. Consider your local grocery store or retail clothing store. Both of these are merchandising firms. Often, merchandising firms are referred to as *resellers* or *retailers* since they are in the business of reselling a product to the consumer at a profit.

Think about purchasing toothpaste from your local drug store. The drug store purchases tens of thousands of tubes of toothpaste from a wholesale distributor or manufacturer in order to get a better per-tube cost. Then, they add their mark-up (or profit margin) to the toothpaste and offer it for sale to you. The drug store did not manufacture the toothpaste; instead, they are reselling a toothpaste that they purchased. Virtually all of your daily purchases are made from merchandising firms such as Walmart, Target, Macy's, Walgreens, and AutoZone.

Merchandising firms account for their costs in a different way from other types of business organizations. To understand merchandising costs, Figure 5.3.1 shows a simplified income statement for a merchandising firm:

Sales Revenue
– Cost of Goods Sold
= Gross Profit
– Operating Expenses
= Operating Profit

Figure 5.3.1: Simplified Income Statement for a Merchandising Firm. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

This simplified income statement demonstrates how merchandising firms account for their sales cycle or process. **Sales revenue** is the income generated from the sale of finished goods to consumers rather than from the manufacture of goods or provision of services. Since a merchandising firm has to purchase goods for resale, they account for this cost as **cost of goods sold**—what it cost them to acquire the goods that are then sold to the customer. The difference between what the drug store paid for the toothpaste and the revenue generated by selling the toothpaste to consumers is their **gross profit**. However, in order to generate sales revenue, merchandising firms incur expenses related to the process of operating their business and selling the merchandise. These costs are called **operating expenses**, and the business must deduct them from the gross profit to determine the **operating profit**. (Note that while the terms "operating profit" and "operating income" are often used interchangeably, in real-world interactions you should confirm exactly what the user means in using those terms.) Operating expenses incurred by a merchandising firm include insurance, marketing, administrative salaries, and rent.

Figure 5.3.2: Shopping Mall. Merchandising firms must identify and manage their costs to remain competitive and attract customers to their business. (credit: "stairs shopping mall" by "jarmoluk"/Pixabay, CC0)

Concepts in Practice: Balancing Revenue and Expenses

Plum Crazy is a small boutique selling the latest in fashion trends. They purchase clothing and fashion accessories from several distributors and manufacturers for resale. In 2017, they reported these revenue and expenses:

Rent	$12,000	Sales revenue	$150,000
Advertising	4,000	Cost of goods sold	60,000
Utilities	1,500	Supplies	3,000
Salaries and wages	35,000	Miscellaneous	1,200

Figure 5.3.3: Revenue and Expenses for Plum Crazy

Before examining the income statement, let's look at Cost of Goods Sold in more detail. Merchandising companies have to account for inventory, a topic covered in Inventory. As you recall, merchandising companies carry inventory from one period to another. When they prepare their income statement, a crucial step is identifying the actual cost of goods that were sold for the period. For Plum Crazy, their Cost of Goods Sold was calculated as shown in Figure 5.3.4.

PLUM CRAZY Cost of Goods Sold For the Year Ended December 31, 2017	
Beginning Merchandise Inventory	$ 23,500
+ Purchases	115,000
Goods Available for Sale	138,500
– Ending Merchandise Inventory	(78,500)
Cost of Goods Sold	$ 60,000

Figure 5.3.4: Plum Crazy's Cost of Goods Sold Statement. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license) Figure 2.5.

Once the calculation of the Cost of Goods Sold has been completed, Plum Crazy can now construct their income statement, which would appear as shown in Figure 5.3.5.

Figure 5.3.5: Plum Crazy's Income Statement. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Since merchandising firms must pass the cost of goods on to the consumer to earn a profit, they are extremely cost sensitive. Large merchandising businesses like Walmart, Target, and Best Buy manage costs by buying in bulk and negotiating with manufacturers and suppliers to drive the per-unit cost.

Continuing Application: Introduction to the Gearhead Outfitters Story

Gearhead Outfitters, founded by Ted Herget in 1997 in Jonesboro, AR, is a retail chain which sells outdoor gear for men, women, and children. The company's inventory includes clothing, footwear for hiking and running, camping gear, backpacks, and accessories, by brands such as The North Face, Birkenstock, Wolverine, Yeti, Altra, Mizuno, and Patagonia. Ted fell in love with the outdoor lifestyle while working as a ski instructor in Colorado and wanted to bring that feeling back home to Arkansas. And so, Gearhead was born in a small downtown location in Jonesboro. The company has had great success over the years, expanding to numerous locations in Ted's home state, as well as Louisiana, Oklahoma, and Missouri.

While Ted knew his industry when starting Gearhead, like many entrepreneurs he faced regulatory and financial issues which were new to him. Several of these issues were related to accounting and the wealth of decision-making information which accounting systems provide.

For example, measuring revenue and expenses, providing information about cash flow to potential lenders, analyzing whether profit and positive cash flow is sustainable to allow for expansion, and managing inventory levels. Accounting, or the preparation of financial statements (balance sheet, income statement, and statement of cash flows), provides the mechanism for business owners such as Ted to make fundamentally sound business decisions.

Link to Learning

Walmart is inarguably a retail giant, but how did the company become so successful? Read the article about how low costs have allowed Walmart to keep prices low while still making a large profit to learn more.

Manufacturing Organizations

A **manufacturing organization** is a business that uses parts, components, or raw materials to produce finished goods (Figure 5.3.6). These finished goods are sold either directly to the consumer or to other manufacturing firms that use them as a component part to produce a finished product. For example, Diehard manufactures automobile batteries that are sold directly to consumers by retail outlets such as AutoZone, Costco, and Advance Auto. However, these batteries are also sold to automobile manufacturers such as Ford, Chevrolet, or Toyota to be installed in cars during the manufacturing process. Regardless of who the final consumer of the final product is, Diehard must control its costs so that the sale of batteries generates revenue sufficient to keep the organization profitable.

Figure 5.3.6: Manufacturing firms apply direct labor to raw materials in order to produce the finished goods purchased from retailers. (credit: "work manufactures" by "dodaning0"/Pixabay, CC0)

Manufacturing firms are more complex organizations than merchandising firms and therefore have a larger variety of costs to control. For example, a merchandising firm may purchase furniture to sell to consumers, whereas a manufacturing firm must acquire raw materials such as lumber, paint, hardware, glue, and varnish that they transform into furniture. The manufacturer incurs additional costs, such as direct labor, to convert the raw materials into furniture. Operating a physical plant where the production process takes place also generates costs. Some of these costs are tied directly to production, while others are general expenses necessary to operate the business. Because the manufacturing process can be highly complex, manufacturing firms constantly evaluate their production processes to determine where cost savings are possible.

Concepts in Practice: Cost Control

Controlling costs is an integral function of all managers, but companies often hire personnel to specifically oversee cost control. As you've learned, controlling costs is vital in all industries, but at Hilton Hotels, they translate this into the position of Cost Controller. Here is an excerpt from one of Hilton's recent job postings.

Position Title: Cost Controller

Job Description: "A Cost Controller will work with all Heads of Departments to effectively control all products that enter and exit the hotel."1

Job Requirements:

"As Cost Controller, you will work with all Heads of Departments to effectively control all products that enter and exit the hotel. Specifically, you will be responsible for performing the following tasks to the highest standards:

- Review the daily intake of products into the hotel and ensure accurate pricing and quantity of goods received
- Control the stores by ensuring the accuracy of inventory and stock control, and the pricing of goods received
- Alert relevant parties of slow-moving goods and goods nearing expiry dates to reduce waste, and alter product purchasing to accommodate
- Manage cost reporting on a weekly basis
- Attend finance meetings, as required
- Maintain good communication and working relationships with all hotel areas
- Act in accordance with fire, health and safety regulations and follow the correct procedures when required"[2]

As you can see, the individual in this position will interact with others across the organization to find ways to control costs for the benefit of the company. Some of the benefits of cost control include:

- Lowering overall company expenses, thereby increasing net income.
- Freeing up financial resources for investment in research & development of new or improved products, goods, or services
- Providing funding for employee development and training, benefits, and bonuses
- Allowing corporate earnings to be used to support humanitarian and charitable causes

Manufacturing organizations account for costs in a way that is similar to that of merchandising firms. However, as you will learn, there is a significant difference in the calculation of cost of goods sold. Figure 5.3.7 shows a simplification of the income statement for a manufacturing firm:

Sales
– Cost of Goods Sold
= Gross Profit
– Operating Expenses
= Operating Profit

Figure 5.3.7: Simplified Income Statement for a Manufacturing Firm. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

At first it appears that there is no difference between the income statements of the merchandising firm and the manufacturing firm. However, the difference is in how these two types of firms account for the cost of goods sold. Merchandising firms determine their cost of goods sold by accounting for both existing inventory and new purchases, as shown in the Plum Crazy example. It is typically easy for merchandising firms to calculate their costs because they know exactly what they paid for their merchandise.

Unlike merchandising firms, manufacturing firms must calculate their cost of goods sold based on how much they manufacture and how much it costs them to manufacture those goods. This requires manufacturing firms to prepare an additional statement before they can prepare their income statement. This additional statement is the *Cost of Goods Manufactured* statement. Once the cost of goods manufactured is calculated, the cost is then incorporated into the manufacturing firm's income statement to calculate its cost of goods sold.

One thing manufacturing firms must consider in their cost of goods manufactured is that, at any given time, they have products at varying levels of production: some are finished and others are still in process. The cost of goods manufactured statement measures the cost of the goods actually finished during the period, whether or not they were started during that period.

Before examining the typical manufacturing firm's process to track cost of goods manufactured, you need basic definitions of three terms in the schedule of Costs of Goods Manufactured: direct materials, direct labor, and manufacturing overhead. **Direct materials** are the components used in the production process whose costs can be identified on a per item-produced basis. For example, if you are producing cars, the engine would be a direct material item. The direct material cost would be the cost of one engine. **Direct labor** represents production labor costs that can be identified on a per item-produced basis. Referring to the car production example, assume that the engines are placed in the car by individuals rather than by an automated process. The direct labor cost would be the amount of labor in hours multiplied by the hourly labor cost. **Manufacturing overhead** generally includes those costs incurred in the production process that are not economically feasible to measure as direct material or direct labor costs. Examples include the department manager's salary, the production factory's utilities, or glue used to attach rubber molding in the

auto production process. Since there are so many possible costs that can be classified as manufacturing overhead, they tend to be grouped and then allocated in a predetermined manner to the production process.

Figure 5.3.8 is an example of the calculation of the Cost of Goods Manufactured for Koeller Manufacturing. It demonstrates the relationship between cost of goods manufactured and cost of goods in progress and includes the three main types of manufacturing costs.

KOELLER MANUFACTURING Schedule of Cost of Goods Manufactured For the Month Ended March 31, 2017		
Work in Process Inventory (beginning balance)		$ 75,000
Current Manufacturing Costs:		
Direct Material	$15,000	
Direct Labor	25,000	
Manufacturing Overhead	23,000	
Total Manufacturing Costs		63,000
Total Cost of Work in Process		138,000
– Work in Process, ending balance		43,000
Cost of Goods Manufactured		$ 95,000

Figure 5.3.8: Koeller Manufacturing's Cost of Goods Manufactured. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

As you can see, the manufacturing firm takes into account its work-in-process (WIP) inventory as well as the costs incurred during the current period to finish not only the units that were in the beginning WIP inventory, but also a portion of any production that was started but not finished during the month. Notice that the current manufacturing costs, or the additional costs incurred during the month, include direct materials, direct labor, and manufacturing overhead. Direct materials are calculated as

Materials Inventory (beginning balance)
+ Net Material Purchases
= Materials Available for Use
− Materials Inventory (ending balance)
= Direct Materials Used in Production

Figure 5.3.9: Direct materials calculation

All of these costs are carefully tracked and classified because the cost of manufacturing is a vital component of the schedule of cost of goods sold. To continue with the example, Koeller Manufacturing calculated that the cost of goods sold was $\$95,000$, which is carried through to the Schedule of Cost of Goods Sold (Figure 5.3.10).

KOELLER MANUFACTURING Schedule of Cost of Goods Sold For the Month Ended March 31, 2017	
Beginning Finished Goods Inventory	$ 65,000
+ Cost of Goods Manufactured	95,000
Goods Available for Sale	160,000
– Ending Finished Goods Inventory	58,000
Cost of Goods Sold	$102,000

Figure 5.3.10: Koeller Manufacturing's Cost of Goods Sold. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

KOELLER MANUFACTURING Income Statement For the Month Ended March 31, 2017	
Sales	$214,000
– Cost of Goods Sold	102,000
Gross Profit	112,000
– Operating Expenses	80,000
Operating Income	$ 32,000

Figure 5.3.11: Koeller Manufacturing's Income Statement. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

So, even though the income statements for the merchandising firm and the manufacturing firm appear very similar at first glance, there are many more costs to be captured by the manufacturing firm. Figure 5.3.12 compares and contrasts the methods merchandising and manufacturing firms use to calculate the cost of goods sold in their income statement.

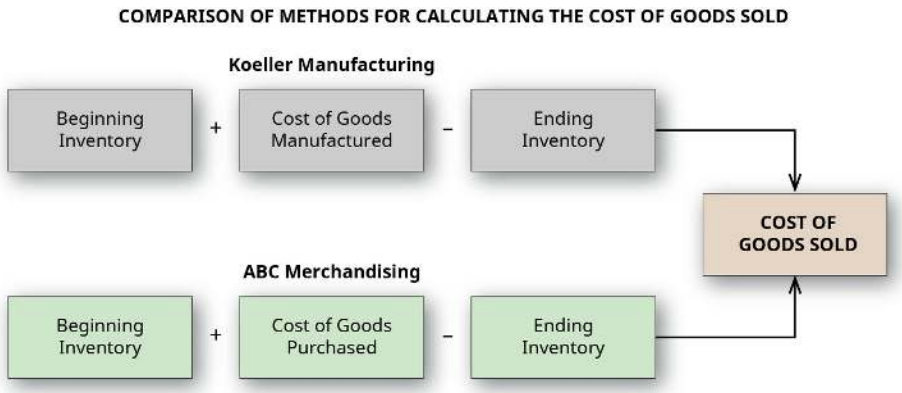

Figure 5.3.12: Merchandising firms consider the cost of goods purchased, and manufacturing firms consider the cost of goods manufactured in order to determine the cost of goods sold. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Concepts in Practice: Calculating Cost of Goods Sold in Manufacturing

Just Desserts is a bakery that produces and sells cakes and pies to grocery stores for resale. Although they are a small manufacturer, they incur many of the costs of a much larger organization. In 2017, they reported these revenue and expenses:

Office rent	$20,000	Sales revenue	$150,000
Office utilities	1,500	Cost of goods sold	70,000
Administrative salaries	35,000	Administrative expenses	12,000

Figure 5.3.13: Revenue and Expenses of Just Desserts

Their income statement is shown in Figure 5.3.14.

JUST DESSERTS Income Statement For the Year Ended December 31, 2017		
Sales Revenue		$150,000
Cost of Goods Sold		70,000
Gross Profit		80,000
Administrative Expenses	$12,000	
Administrative Salaries	35,000	
Office Utilities	1,500	
Office Rent	20,000	
Operating Expenses		68,500
Net Income		$ 11,500

Figure 5.3.14: Just Desserts' Income Statement. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

You'll learn more about the flow of manufacturing costs in Identify and Apply Basic Cost Behavior Patterns. For now, recognize that, unlike a merchandising firm, calculating cost of goods sold in manufacturing firms can be a complex task for management.

Service Organizations

A **service organization** is a business that earns revenue by providing **intangible products**, those that have no physical substance. The service industry is a vital sector of the U.S. economy, providing 65% of the U.S. private-sector gross domestic product and more than 79% of U.S. private-sector jobs.3 If **tangible products**, physical goods that customers can handle and see, are provided by a service organization, they are considered ancillary sources of revenue. Large service organizations such as airlines, insurance companies, and hospitals incur a variety of costs in the provision of their services. Costs such as labor, supplies, equipment, advertising, and facility maintenance can quickly spiral out of control if management is not careful. Therefore, although their cost drivers are sometimes not as complex as those of other types of firms, cost identification and control are every bit as important in the service industry.

For example, consider the services that a law firm provides its clients. What clients pay for are services such as representation in legal proceedings, contract negotiations, and preparation of wills. Although the true value of these services is not contained in their physical form, they are of value to the client and the source of revenue to the firm. The managing partners in the firm must be as cost conscious as their counterparts in merchandising and manufacturing firms. Accounting for costs in service firms differs from merchandising and manufacturing firms in that they do not purchase or produce goods. For example, consider a medical practice. Although some services provided are tangible products, such as medications or medical devices, the primary benefits the physicians provide their patients are the intangible services that are comprised of his or her knowledge, experience, and expertise.

Service providers have some costs (or revenue) derived from tangible goods that must be taken into account when pricing their services, but their largest cost categories are more likely to be administrative and personnel costs rather than product costs.

Service Revenue
– Operating Expenses
= Operating Profit

Figure 5.3.15: Service provider's costs (or revenue)

For example, Whichard & Klein, LLP, is a full-service accounting firm with their primary offices in Baltimore, Maryland. With two senior partners and a small staff of accountants and payroll specialists, the majority of the costs they incur are related to personnel. The value of the accounting and payroll services they provide to their clients is intangible in comparison to goods sold by a merchandiser or produced by a manufacturer, but has value and is the primary source of revenue for the firm. At the end of 2019, Whichard and Klein reported the following revenue and expenses:

Revenue from services provided	$412,000	Utilities	$11,000
Accounting personnel salaries	210,000	Miscellaneous expenses	7,500
Office expense	35,000	Administrative salaries	45,000
Office equipment	9,000		

Figure 5.3.16: Whichard and Klein's revenue and expenses

Their Income Statement for the period is shown in Figure 5.3.17.

WHICHARD & KLEIN, LLP Income Statement For the Year Ended December 31, 2019	
Service Revenue	$412,000
Operating Expenses	
Salaries	210,000
Office Expense	35,000
Office Equipment	9,000
Administrative Salaries	45,000
Utilities	11,000
Miscellaneous	7,500
Total Operating Expenses	317,500
Operating Income	$ 94,500

Figure 5.3.17: Whichard & Klein's Income Statement. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

The bulk of the expenses incurred by Whichard & Klein are in personnel and administrative/office costs, which are very common among businesses that have services as their primary source of revenue.

Concepts in Practice: Revenue and Expenses for a Law Office

The revenue and expenses for a law firm illustrate how the income statement for a service firm differs from that of a merchandising or manufacturing firm.

Welch & Graham is a well-established law firm that provides legal services in the areas of criminal law, real estate transactions, and personal injury. The firm employs several attorneys, paralegals, and office support staff. In 2017, they reported the following revenue and expenses:

Office rent	$ 20,000	Paralegal salaries	$ 100,000
Office utilities	12,500	Service revenue	1,500,000
Administrative salaries	150,000	Office expenses	12,000
Attorneys' salaries	750,000		

Figure 5.3.18: Welch & Graham's revenue and expenses

Their income statement is shown in Figure 5.3.19.

WELCH & GRAHAM, ATTORNEYS AT LAW Income Statement For the Year Ended December 31, 2017		
Service Revenue		$1,500,000
Operating Expenses		
Administrative Salaries	$ 150,000	
Attorney Salaries	750,000	
Office Expenses	12,000	
Office Rent	20,000	
Paralegal Salaries	100,000	
Office Utilities Expenses	12,500	
Total Operating Expenses		1,044,500
Net Income		$ 455,500

Figure 5.3.19: Welch & Graham's Income Statement. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

As you can see, the majority of the costs incurred by the law firm are personnel related. They may also incur costs from equipment and materials such as computer networks, phone and switchboard equipment, rent, insurance, and law library materials necessary to support the practice, but these costs represent a much smaller percentage of total cost than the administrative and personnel costs.

Think it Through: Expanding a Business

Margo is the owner of a small retail business that sells gifts and home decorating accessories. Her business is well established, and she is now considering taking over additional retail space to expand her business to include gourmet foods and gift baskets. Based on customer feedback, she is confident that there is a demand for these items, but she is unsure how large that demand really is. Expanding her business this way will require that she incur not only new costs but also increases in existing costs.

Margo has asked for your help in identifying the impact of her decision to expand in terms of her costs. When discussing these cost increases, be sure to specifically identify those costs that are directly tied to her products and that would be considered overhead expenses.

Footnotes

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5.4: Identify and Apply Basic Cost Behavior Patterns

Now that we have identified the three key types of businesses, let's identify cost behaviors and apply them to the business environment. In managerial accounting, different companies use the term **cost** in different ways depending on how they will use the cost information. Different decisions require different costs classified in different ways. For instance, a manager may need cost information to plan for the coming year or to make decisions about expanding or discontinuing a product or service. In practice, the classification of costs changes as the use of the cost data changes. In fact, a single cost, such as rent, may be classified by one company as a fixed cost, by another company as a committed cost, and by even another company as a period cost. Understanding different cost classifications and how certain costs can be used in different ways is critical to managerial accounting.

Ethical Considerations: Institute of Management Accountants and Certified Management Accountant Certification

Managerial accountants provide businesses with clear and direct insight into the monetary effects of any particular operational action under consideration. They are expected to report financial information in a transparent and ethical fashion. The Institute of Management Accountants (IMA) offers the Certified Management Accountant (CMA) certification. IMA members and CMAs agree to uphold a set of ethical principles that includes honesty, fairness, objectivity, and responsibility. Any managerial accountant, even if not an IMA member or certified CMA, should act in accordance with these principles and encourage coworkers to follow ethical principles for reporting financial results and monetary effects of financial decisions related to their organization. The IMA Committee on Ethics encourages organizations and individuals to adopt, promote, and execute business practices consistent with high ethical standards.[1]

Major Cost Behavior Patterns

Any discussion of costs begins with the understanding that most costs will be classified in one of three ways: fixed costs, variable costs, or mixed costs. The costs that don't fall into one of these three categories are hybrid costs, which are examined only briefly because they are addressed in more advanced accounting courses. Because fixed and variable costs are the foundation of all other cost classifications, understanding whether a cost is a fixed cost or a variable cost is very important.

Fixed versus Variable Costs

A **fixed cost** is an unavoidable operating expense that does not change in total over the short term, even if a business experiences variation in its level of activity. Table $5.4.1$ illustrates the types of fixed costs for merchandising, service, and manufacturing organizations.

Table $5.4.1$: Examples of Fixed Costs

Type of Business	Fixed Cost
Merchandising	Rent, insurance, managers' salaries
Manufacturing	Property taxes, insurance, equipment leases
Service	Rent, straight-line depreciation, administrative salaries, and insurance

We have established that fixed costs do not change in total as the level of activity changes, but what about fixed costs on a per-unit basis? Let's examine Tony's screen-printing company to illustrate how costs can remain fixed in total but change on a per-unit basis.

Tony operates a screen-printing company, specializing in custom T-shirts. One of his fixed costs is his monthly rent of $\$1,000$. Regardless of whether he produces and sells any T-shirts, he is obligated under his lease to pay $\$1,000$ per month. However, he can consider this fixed cost on a per-unit basis, as shown in Figure $5.4.1$.

Monthly Rent	Number of T-Shirts Manufactured	Average Rent Cost per T-Shirt
$1,000	200	$5.00
1,000	400	2.50
1,000	600	1.67

Figure 5.4.1: Individual Rent Cost per T-Shirt Produced. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Tony's information illustrates that, despite the unchanging fixed cost of rent, as the level of activity increases, the per-unit fixed cost falls. In other words, fixed costs remain fixed in total but can increase or decrease on a per-unit basis.

Two specialized types of fixed costs are committed fixed costs and discretionary fixed costs. These classifications are generally used for long-range planning purposes and are covered in upper-level managerial accounting courses, so they are only briefly described here.

Committed fixed costs are fixed costs that typically cannot be eliminated if the company is going to continue to function. An example would be the lease of factory equipment for a production company.

Discretionary fixed costs generally are fixed costs that can be incurred during some periods and postponed during other periods but which cannot normally be eliminated permanently. Examples could include advertising campaigns and employee training. Both of these costs could potentially be postponed temporarily, but the company would probably incur negative effects if the costs were permanently eliminated. These classifications are generally used for long-range planning purposes.

In addition to understanding fixed costs, it is critical to understand **variable costs**, the second fundamental cost classification. A variable cost is one that varies in direct proportion to the level of activity within the business. Typical costs that are classified as variable costs are the cost of raw materials used to produce a product, labor applied directly to the production of the product, and overhead expenses that change based upon activity. For each variable cost, there is some activity that drives the variable cost up or down. A **cost driver** is defined as any activity that causes the organization to incur a variable cost. Examples of cost drivers are direct labor hours, machine hours, units produced, and units sold. Table 5.4.2 provides examples of variable costs and their associated cost drivers.

Table 5.4.2: Variable Costs and Associated Cost Drivers

Area	Variable Cost	Cost Driver
Merchandising	Total monthly hourly wages for sales staff	Hours business is open during month
Manufacturing	Direct materials used to produce one unit of product	Number of units produced
Service	Cost of laundering linens and towels	Number of hotel rooms occupied

Unlike fixed costs that remain fixed in total but change on a per-unit basis, variable costs remain the same per unit, but change in total relative to the level of activity in the business. Revisiting Tony's T-Shirts, Figure 5.4.2 shows how the variable cost of ink behaves as the level of activity changes.

Cost of Ink per T-Shirt	Number of T-Shirts Produced	Total Variable Cost of Ink
$0.15	2,000	$300
0.15	4,000	600
0.15	6,000	900

Figure 5.4.2: Variable Costs per Unit. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Figure 5.4.2 shows the variable cost per unit (per T-shirt) does not change as the number of T-shirts produced increases or decreases. However, the variable costs change in total as the number of units produced increases or decreases. In short, total variable costs rise and fall as the level of activity (the cost driver) rises and falls.

Distinguishing between fixed and variable costs is critical because the **total cost** is the sum of all fixed costs (the **total fixed costs**) and all variable costs (the **total variable costs**). For every unit produced, every customer served, or every hotel room rented, for example, managers can determine their total costs both per unit of activity and in total by combining their fixed and variable costs together. The graphic in Figure 5.4.3 illustrates the concept of total costs.

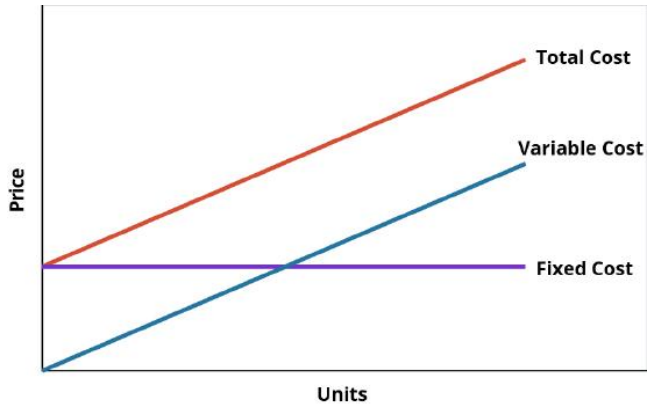

Figure 5.4.3: Total Cost as the Sum of Total Fixed Costs and Total Variable Costs. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Remember that the reason that organizations take the time and effort to classify costs as either fixed or variable is to be able to control costs. When they classify costs properly, managers can use cost data to make decisions and plan for the future of the business.

2

If you've ever flown on an airplane, there's a good chance you know Boeing. The Boeing Company generates around $90 billion each year from selling thousands of airplanes to commercial and military customers around the world. It employs around 200,000 people, and it's indirectly responsible for more than a million jobs through its suppliers, contractors, regulators, and others. Its main assembly line in Everett, WA, is housed in the largest building in the world, a colossal facility that covers nearly a half-trillion cubic feet. Boeing is, simply put, a massive enterprise.

And yet, Boeing's managers know the exact cost of everything the company uses to produce its airplanes: every propeller, flap, seat belt, welder, computer programmer, and so forth. Moreover, they know how those costs would change if they produced more airplanes or fewer. They also know the price at which they sold each plane and the profit the company made on each sale. Boeing's executives expect their managers to know this information, in real time, if the company is to remain profitable.

Table 5.4.3: Link between Business Decision and Cost Information Utilized

Decision	Cost Information
Discontinue a product line	Variable costs, overhead directly tied to product, potential reduction in fixed costs
Add second production shift	Labor costs, cost of fringe benefits, potential overhead increases (utilities, security personnel)
Open additional retail outlets	Fixed costs, variable operating costs, potential increases in administrative expenses at corporate headquarters

Average Fixed Costs versus Average Variable Costs

Another way management may want to consider their costs is as average costs. Under this approach, managers can calculate both average fixed and average variable costs. **Average fixed cost (AFC)** is the total fixed costs divided by the total number of units produced, which results in a per-unit cost. The formula is:

$$\text{Average Fixed cost (A F C)} = \frac{\text{Total Fixed costs}}{\text{Total Number of Units Produced}} \tag{5.4.1}$$

To show how a company would use AFC to make business decisions, consider Carolina Yachts, a company that manufactures sport fishing boats that are sold to consumers through a network of marinas and boat dealerships. Carolina Yachts produces 625 boats per year, and their total annual fixed costs are $\$1,560,000$. If they want to determine an average fixed cost per unit, they will find it using the formula for AFC:

$$\text{AFC} = \frac{\$1,560,000}{625} = \$2,496 \text{ per boat}$$

When they produce 625 boats, Carolina Yachts has an AFC of $\$2,496$ per boat. What happens to the AFC if they increase or decrease the number of boats produced? Figure $5.4.4$ shows the AFC for different numbers of boats.

Number of Boats Produced	Total Fixed Costs	Average Fixed Cost (per boat)
500	$1,560,000	$3,120
625	1,560,000	2,496
700	1,560,000	2,229

Figure $5.4.4$: Average Fixed Costs for Carolina Yachts. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

We see that total fixed costs remain unchanged, but the average fixed cost per unit goes up and down with the number of boats produced. As more units are produced, the fixed costs are spread out over more units, making the fixed cost per unit fall. Likewise, as fewer boats are manufactured, the average fixed costs per unit rise. We can use a similar approach with variable costs.

Average variable cost (AVC) is the total variable costs divided by the total number of units produced, which results in a per-unit cost. Like ATC, we can use this formula:

$$\text{Average Variable cost (AVC)} = \frac{\text{Total Variable Costs}}{\text{Total Number of Units Produced}} \tag{5.4.2}$$

To demonstrate AVC, let's return to Carolina Yachts, which incurs total variable costs of $\$6,875,000$ when they produce 625 boats per year. They can express this as an average variable cost per unit:

$$\text{AVC} = \frac{\$6,875,000}{625} = \$11,000 \text{ per boat}$$

Because average variable costs are the average of all costs that change with production levels on a per-unit basis and include both direct materials and direct labor, managers often use AVC to determine if production should continue or not in the short run. As long as the price Carolina Yachts receives for their boats is greater than the per-unit AVC, they know that they are not only covering the variable cost of production, but each boat is making a contribution toward covering fixed costs. If, at any point, the average

variable cost per boat rises to the point that the price no longer covers the AVC, Carolina Yachts may consider halting production until the variable costs fall again.

These changes in variable costs per unit could be caused by circumstances beyond their control, such as a shortage of raw materials or an increase in shipping costs due to high gas prices. In any case, average variable cost can be useful for managers to get a big picture look at their variable costs per unit.

Link to Learning

Watch the video from Khan Academy that uses the scenario of computer programming to teach fixed, variable, and marginal cost to learn more.

Mixed Costs and Stepped Costs

Not all costs can be classified as purely fixed or purely variable. **Mixed costs** are those that have both a fixed and variable component. It is important, however, to be able to separate mixed costs into their fixed and variable components because, typically, in the short run, we can only change variable costs but not most fixed costs. To examine how these mixed costs actually work, consider the Ocean Breeze hotel.

The Ocean Breeze is located in a resort area where the county assesses an occupancy tax that has both a fixed and a variable component. Ocean Breeze pays $\$2,000$ per month, regardless of the number of rooms rented. Even if it does not rent a single room during the month, Ocean Breeze still must remit this tax to the county. The hotel treats this $\$2,000$ as a fixed cost. However, for every night that a room is rented, Ocean Breeze must remit an additional tax amount of $\$5.00$ per room per night. As a result, the occupancy tax is a mixed cost. Figure $5.4.5$ further illustrates how this mixed cost behaves.

Number of Rooms Rented per Month (Cost Driver)	Fixed Cost Component ($2,000 per month)	Variable Cost Component ($5 per room)	Total Cost (Fixed + Variable)
0	$2,000	$ 0	$2,000
60	2,000	300	2,300
85	2,000	425	2,425
100	2,000	500	2,500

Figure $5.4.5$: Mixed Costs Example for Ocean Breeze. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Notice that Ocean Breeze cannot control the fixed portion of this cost and that it remains fixed in total, regardless of the activity level. On the other hand, the variable component is fixed per unit, but changes in total based upon the level of activity. The fixed portion of this cost plus the variable portion of this cost combine to make the total cost. As a result, the formula for total cost looks like this:

$$Y = a + bx \tag{5.4.3}$$

where Y is the total mixed cost, a is the fixed cost, b is the variable cost per unit, and x is the level of activity.

Graphically, mixed costs can be explained as shown in Figure $5.4.6$.

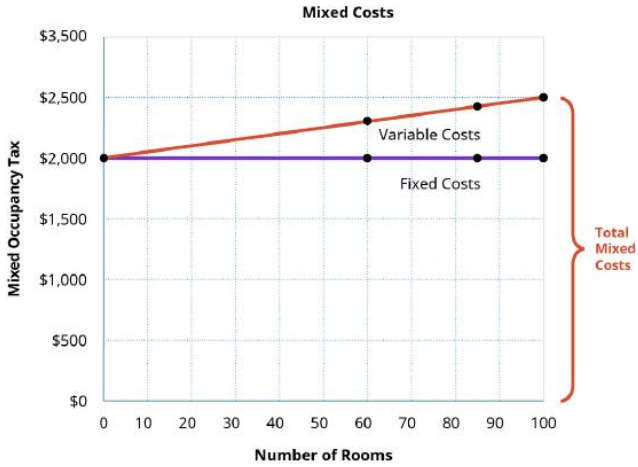

Figure 5.4.6: Ocean Breeze's Mixed Cost Graph. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

The graph shows that mixed costs are typically both fixed and linear in nature. In other words, they will often have an initial cost, in Ocean Breeze's case, the $\$2,000$ fixed component of the occupancy tax, and a variable component, the $\$5$ per night occupancy tax. Note that the Ocean Breeze mixed cost graph starts at an initial $\$2,000$ for the fixed component and then increases by $\$5$ for each night their rooms are occupied.

Some costs behave less linearly. A cost that changes with the level of activity but is not linear is classified as a stepped cost. Step costs remain constant at a fixed amount over a range of activity. The range over which these costs remain unchanged (fixed) is referred to as the relevant range, which is defined as a specific activity level that is bounded by a minimum and maximum amount. Within this relevant range, managers can predict revenue or cost levels. Then, at certain points, the step costs increase to a higher amount. Both fixed and variable costs can take on this stair-step behavior. For instance, wages often act as a stepped variable cost when employees are paid a flat salary and a commission or when the company pays overtime. Further, when additional machinery or equipment is placed into service, businesses will see their fixed costs stepped up. The "trigger" for a cost to step up is the relevant range. Graphically, step costs appear like stair steps (Figure 5.4.7).

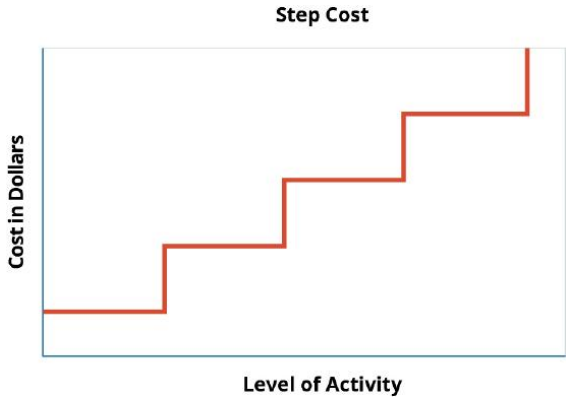

Figure 5.4.7: Step Cost Graph. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

For example, suppose a quality inspector can inspect a maximum of 80 units in a regular 8-hour shift and his salary is a fixed cost. Then the relevant range for QA inspection is from 0–80 units per shift. If demand for these units increases and more than 80 inspections are needed per shift, the relevant range has been exceeded and the business will have one of two choices:

1. Pay the quality inspector overtime in order to have the additional units inspected. This overtime will "step up" the variable cost per unit. The advantage to handling the increased cost in this way is that when demand falls, the cost can quickly be "stepped down" again. Because these types of step costs can be adjusted quickly and often, they are often still treated as variable costs for planning purposes.
2. "Step up" fixed costs. If the company hires a second quality inspector, they would be stepping up their fixed costs. In effect, they will double the relevant range to allow for a maximum of 160 inspections per shift, assuming the second QA inspector can

inspect an additional 80 units per shift. The downside to this approach is that once the new QA inspector is hired, if demand falls again, the company will be incurring fixed costs that are unnecessary. For this reason, adding salaried personnel to address a short-term increase in demand is not a decision most businesses make.

Step costs are best explained in the context of a business experiencing increases in activity beyond the relevant range. As an example, let's return to Tony's T-Shirts.

Tony's cost of operations and the associated relevant ranges are shown in Table $5.4.4$.

Table $5.4.4$: Tony's T-Shirts Cost Options

Expense	Cost	Type of Cost	Relevant Range
Lease on Screen-Printing Machine	$2,000 per month	Fixed	0–2,000 T-shirts per month
Employee	$10 per hour	Variable	20 shirts per hour
Tony's Salary	$2,500 per month	Fixed	N/A
Screen-Printing Ink	$0.25 per shirt	Variable	N/A
Building Rent	$1,500 per month	Fixed	2 screen-printing machines and 2 employees

As you can see, Tony has both fixed and variable costs associated with his business. His one screen-printing machine can only produce $2,000$ T-shirts per month and his current employee can produce 20 shirts per hour (160 per 8-hour work day). The space that Tony leases is large enough that he could add an additional screen-printing machine and 1 additional employee. If he expands beyond that, he will need to lease a larger space, and presumably his rent would increase at that point. It is easy for Tony to predict his costs as long as he operates within the relevant ranges by applying the total cost equation $Y = a + bx$. So, for Tony, as long as he produces $2,000$ or fewer T-shirts, his total cost will be found by $Y = \$6,000 + \$0.75x$, where the variable cost of $\$0.75$ is the $\$0.25$ cost of the ink per shirt and $\$0.50$ per shirt for labor ($\$10$ per hour wage/20 shirts per hour). As soon as his production passes the $2,000$ T-shirts that his one employee and one machine can handle, he will have to add a second employee and lease a second screen-printing machine. In other words, his fixed costs will rise from $\$6,000$ to $\$8,000$, and his variable cost per T-shirt will rise from $\$0.75$ to $\$1.25$ (ink plus 2 workers). Thus, his new cost equation is $Y = \$8,000 + \$1.25x$ until he "steps up" again and adds a third machine and moves to a new location with a presumably higher rent. Let's take a look at this in chart form to better illustrate the "step" in cost Tony will experience as he steps past $2,000$ T-shirts.

Tony's cost information is shown in the chart for volume between 500 and $4,000$ shirts.

Number of T-Shirts	Total Cost (rounded)
500	$ 6,375
750	6,563
1,000	6,750
1,250	6,938
1,500	7,125
1,750	7,313
2,000	7,500
2,250	10,813
2,500	11,125
2,750	11,438
3,000	11,750
3,250	12,063
3,500	12,375
3,750	12,688

Figure $5.4.8$: Tony's cost information

When presented graphically, notice what happens when Tony steps outside of his original relevant range and has to add a second employee and a second screen-printing machine:

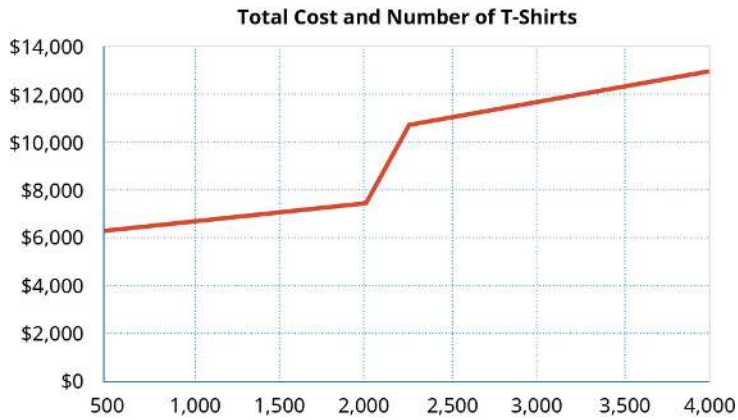

Figure 5.4.9: Stepped Variable Costs for Tony's T-Shirts. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

It is important to remember that even though Tony's costs stepped up when he exceeded his original capacity (relevant range), the behavior of the costs did not change. His fixed costs still remained fixed in total and his total variable cost rose as the number of T-shirts he produced rose. Table 5.4.5 summarizes how costs behave within their relevant ranges.

Table 5.4.5: Summary of Fixed and Variable Cost Behaviors

Cost	In Total	Per Unit
Variable Cost	Changes in response to the level of activity	Remains fixed per unit regardless of the level of activity
Fixed Cost	Does not change with the level of activity, within the relevant range, but does change when the relevant range changes	Changes based upon activity within the relevant range: increased activity decreases per-unit cost; decreased activity increases per-unit cost

Product Versus Period Costs

Many businesses can make decisions by dividing their costs into fixed and variable costs, but there are some business decisions that require grouping costs differently. Sometimes companies need to consider how those costs are reported in the financial statements. At other times, companies group costs based on functions within the business. For example, a business would group administrative and selling expenses by the period (monthly or quarterly) so that they can be reported on an Income Statement. However, a manufacturing firm may carry product costs such as materials from one period to the other in order to have the costs "travel" with the units being produced. It is possible that both the selling and administrative costs and the materials costs have both fixed and variable components. As a result, it may be necessary to analyze some fixed costs together with some variable costs. Ultimately, businesses strategically group costs in order to make them more useful for decision-making and planning. Two of the broadest and most common groupings of costs are product costs and period costs.

Product costs are all those associated with the acquisition or production of goods and products. When products are purchased for resale, the cost of goods is recorded as an asset on the company's balance sheet. It is not until the products are sold that they become an expense on the income statement. By moving product costs to the expense account for the cost of goods sold, they are easily matched to the sales revenue income account. For example, Bert's Bikes is a bicycle retailer who purchases bikes from several wholesale distributors and manufacturers. When Bert purchases bicycles for resale, he places the cost of the bikes into his inventory account, because that is what those bikes are—his inventory available for sale. It is not until someone purchases a bike that it creates sales revenue, and in order to fulfill the requirements of double-entry accounting, he must match that income with an expense: the cost of goods sold (Figure \(\PageIndex{10}\)).

JOURNAL			
Date	**Account**	**Debit**	**Credit**
	Cost of Goods Sold Finished Goods Inventory *To record the cost of products sold*	25,000	25,000

Figure 5.4.10: Journal Entry for Cost of Goods Sold. Product costs are collected in the finished goods inventory, where they remain until the goods are sold. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Some product costs have both a fixed and variable component. For example, Bert purchases 10 bikes for $\$100$ each. The distributor charges $\$10$ per bike for shipping for 1 to 10 bikes but $\$8$ per bike for 11 to 20 bikes. This shipping cost is fixed per unit but varies in total. If Bert wants to save money and control his cost of goods sold, he can order an 11th bike and drop his shipping cost by $\$2$ per bike. It is important for Bert to know what is fixed and what is variable so that he can control his costs as much as possible.

What about the costs Bert incurs that are not product costs? **Period costs** are simply all of the expenses that are not product costs, such as all selling and administrative expenses. It is important to remember that period costs are treated as expenses in the period in which they occur. In other words, they follow the rules of accrual accounting practice by recognizing the cost (expense) in the period in which they occur regardless of when the cash changes hands. For example, Bert pays his business insurance in January of each year. Bert's annual insurance premium is $\$10,800$, which is $\$900$ per month. Each month, Bert will recognize $1/12$ of this insurance cost as an expense in the period in which it is incurred (Figure \(\PageIndex{11}\)).

JOURNAL			
Date	**Account**	**Debit**	**Credit**
	Insurance Expense Prepaid Insurance *To recognize current period insurance expense*	900	900

Figure 5.4.11: Journal Entry for Insurance Expense. Bert applies $1/12$ of the prepaid insurance premium per month to the expense account in order to match period costs with period revenues. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Why is it so important for Bert to know which costs are product costs and which are period costs? Bert may have little control over his product costs, but he maintains a great deal of control over many of his period costs. For this reason, it is important that Bert be able to identify his period costs and then determine which of them are fixed and which are variable. Remember that fixed costs are fixed over the relevant range, but variable costs change with the level of activity. If Bert wants to control his costs to make his bike business more profitable, he must be able to differentiate between the costs he can and cannot control.

Just like a merchandising business such as Bert's Bikes, manufacturers also classify their costs as either product costs or period costs. For a manufacturing business, product costs are the costs associated with making the product, and period costs are all other costs. For the purposes of external reporting, separating costs into period and product costs is not all that is necessary. However, for management decision-making activities, refinement of the types of product costs is helpful.

In a manufacturing firm, the need for management to be aware of the types of costs that make up the cost of a product is of paramount importance. Let's look at Carolina Yachts again and examine how they can classify the product costs associated with building their sport fishing boats. Just like automobiles, every year, Carolina Yachts makes changes to their boats, introducing new models to their product line. When the engineers begin to redesign boats for the next year, they must be careful not to make changes that would drive the selling price of their boats too high, making them less attractive to the customer. The engineers need to know exactly what the addition of another feature will do to the cost of production. It is not enough for them to get total product cost data; instead, they need specific information about the three classes of product costs: materials, labor, and overhead.

As you've learned, direct materials are the raw materials and component parts that are directly economically traceable to a unit of production.

Table 5.4.6 provides some examples of direct materials.

Table 5.4.6: Examples of Direct Materials

Manufacturing Business	Product	Direct Materials
Bakery	Birthday cakes	Flour, sugar, eggs, milk
Automobile manufacturer	Cars	Glass, steel, tires, carpet
Furniture manufacturer	Recliners	Wood, fabric, cotton batting

In each of the examples, managers are able to trace the cost of the materials directly to a specific unit (cake, car, or chair) produced. Since the amount of direct materials required will change based on the number of units produced, direct materials are almost always classified as a variable cost. They remain fixed per unit of production but change in total based on the level of activity within the business.

It takes more than materials for Carolina Yachts to build a boat. It requires the application of labor to the raw materials and component parts. You've also learned that direct labor is the work of the employees who are directly involved in the production of goods or services. In fact, for many industries, the largest cost incurred in the production process is labor. For Carolina Yachts, their direct labor would include the wages paid to the carpenters, painters, electricians, and welders who build the boats. Like direct materials, direct labor is typically treated as a variable cost because it varies with the level of activity. However, there are some companies that pay a flat weekly or monthly salary for production workers, and for these employees, their compensation could be classified as a fixed cost. For example, many auto mechanics are now paid a flat weekly or monthly salary.

While in the example Carolina Yachts is dependent upon direct labor, the production process for companies in many industries is moving from human labor to a more automated production process. For these companies, direct labor in these industries is becoming less significant. For example, you can research the current production process for the automobile industry.

The third major classification of product costs for a manufacturing business is overhead. Manufacturing overhead (sometimes referred to as *factory overhead*) includes all of the costs that a manufacturing business incurs, other than the variable costs of direct materials and direct labor required to build products. These overhead costs are not directly attributable to a specific unit of production, but they are incurred to support the production of goods. Some of the items included in manufacturing overhead include supervisor salaries, depreciation on the factory, maintenance, insurance, and utilities. It is important to note that manufacturing overhead does not include any of the selling or administrative functions of a business. For Carolina Yachts, costs like the sales, marketing, CEO, and clerical staff salaries will not be included in the calculation of manufacturing overhead costs but will instead be allocated to selling and administrative expenses.

As you have learned, much of the power of managerial accounting is its ability to break costs down into the smallest possible trackable unit. This also applies to manufacturing overhead. In many cases, businesses have a need to further refine their overhead costs and will track indirect labor and indirect materials.

When labor costs are incurred but are not directly involved in the active conversion of materials into finished products, they are classified as **indirect labor** costs. For example, Carolina Yachts has production supervisors who oversee the manufacturing process but do not actively participate in the construction of the boats. Their wages generally support the production process but cannot be traced back to a single unit. For this reason, the production supervisors' salary would be classified as indirect labor. Similar to direct labor, on a product or department basis, indirect labor, such as the supervisor's salary, is often treated as a fixed cost, assuming that it does not vary with the level of activity or number of units produced. However, if you are considering the supervisor's salary cost on a per unit of production basis, then it could be considered a variable cost.

Similarly, not all materials used in the production process can be traced back to a specific unit of production. When this is the case, they are classified as **indirect material** costs. Although needed to produce the product, these indirect material costs are not traceable to a *specific* unit of production. For Carolina Yachts, their indirect materials include supplies like tools, glue, wax, and cleaning supplies. These materials are required to build a boat, but management cannot easily track how much of a bottle of glue they use or how often they use a particular drill to build a specific boat. These indirect materials and their associated cost represent a small fraction of the total materials needed to complete a unit of production. Like direct materials, indirect materials are classified as a variable cost since they vary with the level of production. Table 5.4.7 provides some examples of manufacturing costs and their classifications.

Table 5.4.7: Examples of Classifications of Manufacturing Costs

Cost	Classification	Fixed or Variable
Production supervisor salary	Indirect labor	Fixed
Raw materials used in production	Direct materials	Variable
Wages of production employees	Direct labor	Variable
Straight-line depreciation on factory equipment	General manufacturing overhead	Fixed
Glue and adhesives	Indirect materials	Variable

Prime Costs Versus Conversion Costs

In certain production environments, once a business has separated the costs of the product into direct materials, direct labor, and overhead, the costs can then be gathered into two broader categories: prime costs and conversion costs. **Prime costs** are the direct material expenses and direct labor costs, while **conversion costs** are direct labor and general factory overhead combined. Please note that these two categories of costs are examples of cost categories where a particular cost can be included in both. In this case, direct labor is included in both prime costs and conversion costs.

These cost classifications are common in businesses that produce large quantities of an item that is then packaged into smaller, sellable quantities such as soft drinks or cereal. In these types of production environments, it is easier to lump the costs of direct labor and overhead into one category, since these costs are what are needed to convert raw materials into a finished product. This method of costing is termed *process costing* and is covered in Process Costing.

Although it seems as if there are many classifications or labels associated with costs, remember that the purpose of cost classification is to assist managers in the decision-making process. Since this type of data is not used for external reporting purposes, it is important to understand that (1) a single cost can have many different labels; (2) the terms are used independently, not simultaneously; and (3) each classification is important to understand in order to make business decisions. Figure 5.4.12 uses some example costs to demonstrate these principles.

						Product				
Cost	**Fixed**	**Variable**	**Mixed**	**Step**	**Period**	**DM**	**DL**	**OH**	**Prime**	**Conversion**
Rent on production facility	√						OH			√
Plant supervisor salary	√						OH			√
Raw materials		√					DM		√	
Administrative salaries	√				√					
Commissioned sales staff		√	√		√					
Delivery truck			√		√					
Advertising	√				√					
Plant utilities			√				OH			√
Income tax		√		√	√					

Figure 5.4.12: Classification Based on Cost Function. Costs can fall into more than one category, sometimes making the process of cost identification complex. DM, direct materials; DL, direct labor; OH, overhead. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Effects of Changes in Activity Level on Unit Costs and Total Costs

We have spent considerable time identifying and describing the various ways that businesses categorize costs. However, categorization itself is not enough. It is important not only to understand the categorization of costs but to understand the relationships between changes in activity levels and the changes in costs in total. It is worth repeating that when a cost is considered to be fixed, that cost is only fixed for the relevant range. Once the boundary of the relevant range has been reached or moved beyond, fixed costs will change and then remain fixed for the new relevant range. Remember that, within a relevant range of activity, where the relevant range refers to a specific activity level that is bounded by a minimum and maximum amount, total fixed

costs are constant, but costs change on a per-unit basis. Let's examine an example that demonstrates how changes in activity can affect costs.

Ethical Considerations: Cost Accounting Helps Reduce Fraud and Promotes Ethical Behavior

Managerial and related cost accounting systems assist managers in making ethical and sound business decisions. Managerial accountants implement accounting reporting systems to minimize or prevent fraud and promote ethical decision-making. For example, tracking changes in costing activity and ensuring that activity remains in a relevant range, helps ensure that an organization's business activity is properly bounded within a reasonable range of expense. If the minimum or maximum expense range is exceeded, this can indicate that management is acting without authority or is pursuing unauthorized activities. Excessive costs may even be a red flag that possible fraud is occurring. Cost accounting helps ensure that financial costs are within an acceptable range and helps an organization make reliable forward-looking financial decisions.

Comprehensive Example of the Effect on Changes in Activity Level on Costs

Pat is planning a three-day ski trip on his spring break after he works on a Habitat for Humanity project in Dallas. The costs for the trip are as follows:

Car rental (up to five passengers)	$200
Condo rental (up to five occupants)	400
Gasoline	120
Food (per day)	40
Lift tickets (per day)	30

Figure 5.4.13: Costs for Pat's ski trip

He is considering his costs for the trip if he goes alone, or if he takes one, two, three, or four friends. However, before he can begin his analysis, he needs to consider the characteristics of the costs. Some of the costs will stay the same no matter how many people go, and some of the costs will fluctuate, based on the number of participants.

Those costs that do not change are the fixed costs. Once you incur a fixed cost, it does not change within a given range. For example, Pat can take up to five people in one car, so the cost of the car is fixed for up to five people. However, if he took more friends, then he would need more cars. The condo rental and the gasoline expenses would also be considered fixed costs, because they are not going to change in the reference range.

The costs that do change as the number of participants changes are the variable costs. The food and lift ticket expenses are examples of variable costs, since they fluctuate based upon the number of participants and the number of days of activities.

In analyzing the costs, Pat also needs to consider the total costs and average costs. The analysis will calculate the average fixed costs, the total fixed costs, the average variable costs, and the total variable costs.

In the analysis of total costs versus average costs, both total and average fixed costs will stay the same and total and average variable costs will change. Here are the total fixed costs:

Car rental	$200
Condo	400
Gasoline	120
Total fixed costs	$720

Figure 5.4.14: Total fixed costs for Pat's ski trip

The total fixed costs for the trip will be $\$720.00$, no matter whether Pat goes alone or takes up to 4 friends. However, the average fixed costs will be the total fixed costs divided by the number of participants. The average fixed cost could range from $\$720(720/1)$ to $\$144(720/5)$.

Here are the variable costs:

Food (per day)	$40
Lift tickets (per day)	30
Average variable cost (per day)	$70

Figure 5.4.15: Total fixed costs for Pat's ski trip

The average variable cost will be $70.00 per person per day, no matter how many people go on the trip. However, the total variable costs will range from $70.00, if Pat goes alone, to $350.00, if five people go. Figure \(\PageIndex{16}\) shows the relationships of the various costs, based on the number of participants.

Number of Skiers	Average Variable Cost	Total Variable Cost	Total Fixed Cost	Average Fixed Cost	Average Cost per Skier
1	$210	$ 210	$720	$720	$930
2	210	420	720	360	570
3	210	630	720	240	450
4	210	840	720	180	390
5	210	1,050	720	144	354

Figure 5.4.16: Comprehensive Ski Trip Cost Classification. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Looking at this analysis, it is clear that, if there is an activity that you think that you cannot afford, it can become less expensive if you are creative in your cost-sharing techniques.

Example 5.4.1: Spring Break Trip Planning

Margo is planning an 8-day spring break trip from Atlanta, Georgia, to Tampa, Florida, leaving on Sunday and returning the following Sunday. She has located a condominium on the beach and has put a deposit down on the unit. The rental company has a maximum occupancy for the condominium of seven adults. There is an amusement park that she plans to visit. She is going to use her parents' car, an SUV that can carry up to six people and their luggage. The SUV can travel an average of 20 miles per gallon, the total distance is approximately 1,250 miles (550 miles each way plus driving around Tampa every day), and the average price of gas is $3 per gallon. A season pass for an amusement park she wants to visit is $168 per person. Margo estimates spending $40 per day per person for food. She estimates the costs for the trip as follows:

Condo Rental	$1,400
Gasoline	188
Food (per person per day)	40
Amusement Park Season Pass (per person)	168

Figure 5.4.17: Margo's estimated costs

Now that she has cost estimates, she is trying to decide how many of her friends she wants to invite. Since the car can only seat six people, Marg made a list of five other girls to invite. Use her data to answer the following questions and fill out the cost table:

1. What are the total variable costs for the trip?
2. What are the average variable costs for the trip?
3. What are the total fixed costs for the trip?
4. What are the average fixed costs for the trip?
5. What are the average costs per person for the trip?
6. What would the trip cost Margo if she were to go alone?

Number of People, Including Margo	Total Variable Cost	Average Variable Cost	Total Fixed Cost	Average Fixed Cost	Average Cost per Person
1					
2					
3					
4					
5					
6					

7. What additional costs would be incurred if a seventh girl was invited on the trip? Would this be a wise decision (from a cost perspective)? Why or why not?
8. Which cost will *not* be affected if a seventh girl was invited on the trip?

Solution

Number of People, Including Margo	Total Variable Cost	Average Variable Cost	Total Fixed Cost	Average Fixed Cost	Average Cost per Person
1	$488	$488	$1,588	$1,588	$2,076
2	976	488	1,588	794	1,282
3	1,464	488	1,588	529	1,017
4	1,952	488	1,588	397	885
5	2,440	488	1,588	318	806
6	2,928	488	1,588	265	753

Answers will vary. All responses should recognize that there is no room in the car for the seventh girl and her luggage, although the condominium will accommodate the extra person. This means they will have to either find a larger vehicle and incur higher gas expenses or take a second car, which will at least double the fixed gas cost.

Footnotes

1. "Ethics Center." Institute of Management Accountants. https://www.imanet.org/career-resour...center?ssopc=1
2. Attribution: Modification of work by Sharon Kioko and Justin Marlowe. "Cost Analysis." Financial Strategy for Public Managers. CC BY 4.0. https://press.rebus.community/financ...cost-analysis/
3. Attribution: Modification of work by Roger Hermanson, James Edwards, and Michael Maher. Accounting Principles: A Business Perspective. 2011, CC BY. Source: Available at https://open.umn.edu/opentextbooks/textbooks/383.
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5.5: Estimate a Variable and Fixed Cost Equation and Predict Future Costs

Sometimes, a business will need to use cost estimation techniques, particularly in the case of mixed costs, so that they can separate the fixed and variable components, since only the variable components change in the short run. Estimation is also useful for using current data to predict the effects of future changes in production on total costs. Three estimation techniques that can be used include the scatter graph, the high-low method, and regression analysis. Here we will demonstrate the scatter graph and the high-low methods (you will learn the regression analysis technique in advanced managerial accounting courses.

Functions of Cost Equations

The cost equation is a linear equation that takes into consideration total fixed costs, the fixed component of mixed costs, and variable cost per unit. Cost equations can use past data to determine patterns of past costs that can then project future costs, or they can use estimated or expected future data to estimate future costs. Recall the mixed cost equation:

$$y = a + bx \tag{5.5.1}$$

where Y is the total mixed cost, a is the fixed cost, b is the variable cost per unit, and x is the level of activity.

Let's take a more in-depth look at the cost equation by examining the costs incurred by Eagle Electronics in the manufacture of home security systems, as shown in Table $5.5.1$.

Table $5.5.1$: Cost Information for Eagle Electronics

Cost Incurred	Fixed or Variable	Cost
Lease on manufacturing equipment	Fixed	$50,000 per year
Supervisor salary	Fixed	$75,000 per year
Direct materials	Variable	$50 per unit
Direct labor	Variable	$20 per unit

By applying the cost equation, Eagle Electronics can predict its costs at any level of activity (x) as follows:

1. Determine total fixed costs: $\$50,000 + \$75,000 = \$125,000$
2. Determine variable costs per unit: $\$50 + \$20 = \$70$
3. Complete the cost equation: $Y = \$125,000 + \$70x$

Using this equation, Eagle Electronics can now predict its total costs (Y) for any given level of activity (x), as in Figure $5.5.1$:

Units Produced	Cost Equation	Total Costs
5,000	Y = $125,000 + ($70 × 5,000)	$475,000
8,000	Y = $125,000 + ($70 × 8,000)	685,000
12,000	Y = $125,000 + ($70 × 12,000)	965,000

Figure $5.5.1$: Total Cost Estimation for Various Production Levels. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

When using this approach, Eagle Electronics must be certain that it is only predicting costs for its relevant range. For example, if they must hire a second supervisor in order to produce $12,000$ units, they must go back and adjust the total fixed costs used in the equation. Likewise, if variable costs per unit change, these must also be adjusted.

This same approach can be used to predict costs for service and merchandising firms, as shown by examining the costs incurred by J&L Accounting to prepare a corporate income tax return, shown in Table $5.5.2$.

Table $5.5.2$: Cost Information for J&L Accounting

Cost Incurred	Fixed or Variable	Cost
Building rent	Fixed	$1,000 per month
Direct labor (for CPAs)	Variable	$250 per tax return
Secretarial staff	Fixed	$2,000 per month
Accounting clerks	Variable	$100 per return

J&L wants to predict their total costs if they complete 25 corporate tax returns in the month of February.

1. Determine total fixed costs: $\$1,000 + \$2,000 = \$3,000$
2. Determine variable costs per tax return: $\$250 + \$100 = \$350$
3. Complete the cost equation: $Y = \$3,000 + \$350x$

Using this equation, J&L can now predict its total costs (Y) for the month of February when they anticipate preparing 25 corporate tax returns:

$$\begin{aligned} Y &= \$3,000 + (\$350 \times 25) \\ Y &= \$3,000 + \$8,750 \\ Y &= \$11,750 \end{aligned}$$

J&L can now use this predicted total cost figure of $\$11,750$ to make decisions regarding how much to charge clients or how much cash they need to cover expenses. Again, J&L must be careful to try not to predict costs outside of the relevant range without adjusting the corresponding total cost components.

J&L can make predictions for their costs because they have the data they need, but what happens when a business wants to estimate total costs but has not collected data regarding per-unit costs? This is the case for the managers at the Beach Inn, a small hotel on the coast of South Carolina. They know what their costs were for June, but now they want to predict their costs for July. They have gathered the information in Figure $5.5.2$.

Cost Incurred	Fixed or Variable	June Costs
Insurance	Fixed	$ 700
Loan Payment	Fixed	2,500
Front Desk Staff	Variable	3,800
Cleaning Staff	Variable	2,500
Laundry Service	Variable	1,200

Figure $5.5.2$: Monthly Total Cost Detail for Beach Inn. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

In June, they had an occupancy of 75 nights. For the Beach Inn, occupancy (rooms rented) is the cost driver. Since they know what is driving their costs, they can determine their per-unit variable costs in order to forecast future costs:

$$\begin{aligned} \frac{\text{Front Desk Staff}}{75 \text{ nights}} &= \frac{\$3,800}{75} = \$50.67 \text{ variable front desk staff costs per night} \\ \frac{\text{Cleaning Staff}}{75\text{nights}} &= \frac{\$2,500}{75} = \$33.33 \text{ variable cleaning staff costs per night} \\ \frac{\text{Laundry Service}}{75 \text{ nights}} &= \frac{\$1,200}{75} = \$16.00 \text{ variable laundry service costs per night} \end{aligned}$$

Now, the Beach Inn can apply the cost equation in order to forecast total costs for any number of nights, within the relevant range.

1. Determine total fixed costs: $\$700 + \$2,500 = \$3,200$
2. Determine variable costs per night of occupancy: $\$50.67 + \$33.33 + \$16.00 = \$100$

3. Complete the cost equation: $Y = \$3,200 + \$100x$

Using this equation, the Beach Inn can now predict its total costs (Y) for the month of July, when they anticipate an occupancy of 93 nights.

$$Y = \$3,200 + (\$100 \times 93)$$
$$Y = \$3,200 + \$9,300$$
$$Y = \$12,500$$

In all three examples, managers used cost data they have collected to forecast future costs at various activity levels.

Example 5.5.1: Waymaker Furniture

Waymaker Furniture has collected cost information from its production process and now wants to predict costs for various levels of activity. They plan to use the cost equation to formulate these predictions. Information gathered from March is presented in Table 5.5.3.

Table 5.5.3: March Cost Information for Waymaker Furniture

Cost Incurred	Fixed or Variable	March Cost
Plant supervisor salary	Fixed	$12,000 per month
Lumber (direct materials)	Variable	$75,000 total
Production worker wages	Variable	$11.00 per hour
Machine maintenance	Variable	$5.00 per unit produced
Lease on factory	Fixed	$15,000 per month

In March, Waymaker produced $1,000$ units and used $2,000$ hours of production labor.

Using this information and the cost equation, predict Waymaker's total costs for the levels of production in Table 5.5.4.

Table 5.5.4: Waymaker's Levels of Production

Month	Activity Level
April	1,500 units
May	2,000 units
June	2,500 units

Solution

$\text{Total Fixed Cost} = \$12,000 + \$15,000 = \$27,000.$

$$\text{Direct Materials per Unit } = \frac{\$75,000}{1,000} \text{ Units } = \$75 \text{ per unit.}$$

$\text{Direct Labor per Hour} = \$11.00.$

$\text{Machine Maintenance} = \$5.00\text{per unit.}$

$\text{Total Variable Cost per Unit} = \$75 + \$11 + \$5 = \$91\text{per unit.}$

Month	Activity Level	VC per Unit	Total VC	Fixed Cost	Total Cost
April	1,500 Units	$91	$136,500	$27,000	$163,500
May	2,000 Units	91	182,000	27,000	209,000
June	2,500 Units	91	227,500	27,000	254,500

Figure 5.5.3: Waymaker's total costs for the levels of production

Demonstration of the Scatter Graph Method to Calculate Future Costs at Varying Activity Levels

One of the assumptions that managers must make in order to use the cost equation is that the relationship between activity and costs is linear. In other words, costs rise in direct proportion to activity. A diagnostic tool that is used to verify this assumption is a scatter graph.

A **scatter graph** shows plots of points that represent actual costs incurred for various levels of activity. Once the scatter graph is constructed, we draw a line (often referred to as a **trend line)** that appears to best fit the pattern of dots. Because the trend line is somewhat subjective, the scatter graph is often used as a preliminary tool to explore the possibility that the relationship between cost and activity is generally a linear relationship. When interpreting a scatter graph, it is important to remember that different people would likely draw different lines, which would lead to different estimations of fixed and variable costs. No one person's line and cost estimates would necessarily be right or wrong compared to another; they would just be different. After using a scatter graph to determine whether cost and activity have a linear relationship, managers often move on to more precise processes for cost estimation, such as the high-low method or least-squares regression analysis.

To demonstrate how a company would use a scatter graph, let's turn to the data for Regent Airlines, which operates a fleet of regional jets serving the northeast United States. The Federal Aviation Administration establishes guidelines for routine aircraft maintenance based upon the number of flight hours. As a result, Regent finds that its maintenance costs vary from month to month with the number of flight hours, as depicted in Figure 5.5.4.

Month	Activity Level (Flight Hours)	Maintenance Costs
January	21,000	$84,000
February	23,000	90,000
March	14,000	70,500
April	17,000	75,000
May	10,000	64,500
June	19,000	78,000

Figure 5.5.4: Monthly Maintenance Cost and Activity Detail for Regent Airlines. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

When creating the scatter graph, each point will represent a pair of activity and cost values. Maintenance costs are plotted on the vertical axis (Y), while flight hours are plotted on the horizontal axis (X). For instance, one point will represent $21,000$ hours and $\$84,000$ in costs. The next point on the graph will represent $23,000$ hours and $\$90,000$ in costs, and so forth, until all of the pairs of data have been plotted. Finally, a trend line is added to the chart in order to assist managers in seeing if there is a positive, negative, or zero relationship between the activity level and cost. Figure \(\PageIndex{5}\) shows a scatter graph for Regent Airlines.

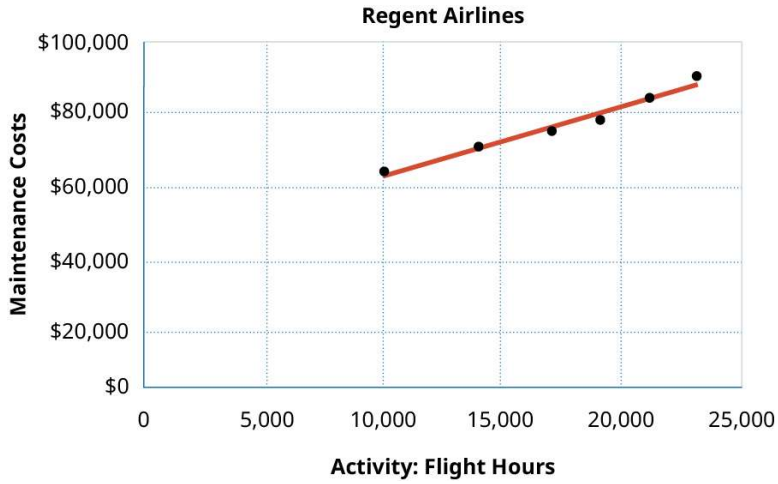

Figure 5.5.5: Scatter Graph of Maintenance Costs for Regent Airline. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

In scatter graphs, cost is considered the dependent variable because cost *depends* upon the level of activity. The activity is considered the independent variable since it is the cause of the variation in costs. Regent's scatter graph shows a positive relationship between flight hours and maintenance costs because, as flight hours increase, maintenance costs also increase. This is referred to as a positive linear relationship or a linear cost behavior.

Will all cost and activity relationships be linear? Only when there is a relationship between the activity and that particular cost. What if, instead, the cost of snow removal for the runways is plotted against flight hours? Suppose the snow removal costs are as listed in Table 5.5.5.

Table 5.5.5: Snow Removal Costs

Month	Activity Level: Flight Hours	Snow Removal Costs
January	21,000	$40,000
February	23,000	50,000
March	14,000	8,000
April	17,000	0
May	10,000	0
June	19,000	0

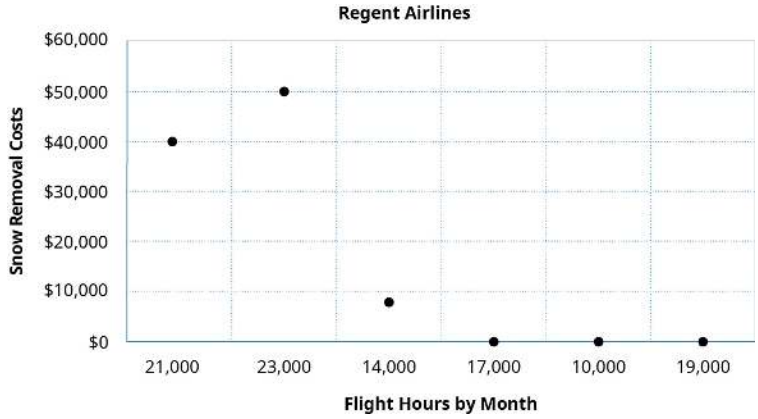

Figure 5.5.6: Scatter Graph of Snow Removal Costs for Regent Airlines. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

As you can see from the scatter graph, there is really not a linear relationship between how many flight hours are flown and the costs of snow removal. This makes sense as snow removal costs are linked to the amount of snow and the number of flights taking off and landing, but not to how many hours the planes fly.

Using a scatter graph to determine if this linear relationship exists is an essential first step in cost behavior analysis. If the scatter graph reveals a linear cost behavior, then managers can proceed with a more sophisticated analysis to separate mixed costs into their fixed and variable components. However, if this linear relationship is not present, then other methods of analysis are not appropriate. Let's examine the cost data from Regent Airline using the high-low method.

Demonstration of the High-Low Method to Calculate Future Costs at Varying Activity Levels

As you've learned, the purpose of identifying costs is to control them, and managers regularly use past costs to predict future costs. Since we know that variable costs change with the level of activity, we can conclude that there is *usually* a positive relationship between cost and activity: As one rises, so does the other. Ideally, this can be confirmed on a scatter graph. One of the simplest ways to analyze costs is to use the **high-low method**, a technique for separating the fixed and variable cost components of mixed costs. Using the highest and lowest levels of activity and their associated costs, we are able to estimate the variable cost components of mixed costs.

Once we have established that there is linear cost behavior, we can equate variable costs with the slope of the line, expressed as the rise of the line over the run. The steeper the slope of the line, the faster costs rise in response to a change in activity. Recall from the scatter graph that costs are the dependent Y variable and activity is the independent X variable. By examining the change in Y relative to the change in X, we can predict cost:

$$\text{Variable cost } = \frac{\text{Rise of the line}}{\text{Run of the line}} = \frac{Y_2 - Y_1}{X_2 - X_1} \tag{5.5.2}$$

where Y_2 is the total cost at the highest level of activity; Y_1 is the total cost at the lowest level of activity; X_2 is the number of units, labor hours, etc., at the highest level of activity; and X_1 is the number of units, labor hours, etc., at the lowest level of activity.

Using the maintenance cost data from Regent Airlines shown in Figure 5.5.7, we will examine how this method works in practice.

Month	Activity Level (Flight Hours)	Maintenance Costs
January	21,000	$84,000
February	23,000	90,000
March	14,000	70,500
April	17,000	75,000
May	10,000	64,500
June	19,000	78,000

Figure 5.5.7: Monthly Maintenance Cost and Activity Detail for Regent Airlines. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

The first step in analyzing mixed costs with the high-low method is to identify the periods with the highest and lowest levels of activity. In this case, it would be February and May, as shown in Figure 5.5.8. We always choose the highest and lowest activity and the costs that correspond with those levels of activity, even if they are not the highest and lowest costs.

	Activity Level (Flight Hours)	Cost (Maintenance Costs)
Highest level (February)	23,000	$90,000
Lowest level (May)	10,000	64,500

Figure 5.5.8: High–Low Data Points for Regent Airlines Maintenance Costs. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

We are now able to estimate the variable costs by dividing the difference between the costs of the high and the low periods by the change in activity using this formula:

$$\text{Variable cost } = \frac{\text{Change in cost}}{\text{Change in Activity}} \tag{5.5.3}$$
$$= \frac{\text{Cost at the high activity level- cost at the low activity level}}{\text{Highest activity level -Lowest activity level}}$$

For Regent Airlines, this is:

$$\text{Variable Cost} = \frac{\$90,000 - \$64,500}{23,000 - 10,000} = \$1.96 \text{ per flight hour}$$

Having determined that the variable cost per flight-hour is $\$1.96$, we can now determine the amount of fixed costs. We can determine these fixed costs by taking the total costs at *either* the high or the low level of activity and subtracting this variable component. You will recall that total cost = fixed costs + variable costs, so the fixed cost component for Regent Airlines can be isolated as shown:

$$\begin{aligned}\text{Fixed cost } &= \text{ total cost-variable cost}\\ \text{Fixed cost } &= \$90,000 - (23,000 \times \$1.96)\\ \text{Fixed cost } &= \$44,920\end{aligned}$$

Notice that if we had chosen the other data point, the low cost and activity, we would still get the same fixed cost of $\$44,920 = [\$64,500–(10,000 \times \$1.96)]$.

Now that we have isolated both the fixed and the variable components, we can express Regent Airlines' cost of maintenance using the total cost equation:

$$Y = \$44,920 + \$1.96x$$

where Y is total cost and x is flight hours.

Because we confirmed that the relationship between cost and activity at Regent exhibits linear cost behavior on the scatter graph, this equation allows managers at Regent Airlines to conclude that for every one unit increase in activity, there will be a corresponding rise in variable cost of $\$1.96$. When put into practice, the managers at Regent Airlines can now predict their total costs at any level of activity, as shown in Figure $5.5.9$.

Activity Level (Flight Hours)	Fixed Costs	Variable Cost at $1.96 per hour	Total Costs
10,000	$44,920	$19,600	$64,520
20,000	44,920	39,200	84,120
30,000	44,920	58,800	103,720
40,000	44,920	78,400	123,320

Figure $5.5.9$: Predictions of Total Cost and Cost Components at Different Levels of Activity for Regent Airlines. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Although managers frequently use this method, it is not the most accurate approach to predicting future costs because it is based on only two pieces of cost data: the highest and the lowest levels of activity. Actual costs can vary significantly from these estimates, especially when the high or low activity levels are not representative of the usual level of activity within the business. For a more accurate model, the least-squares regression method would be used to separate mixed costs into their fixed and variable components. The least-squares regression method is a statistical technique that may be used to estimate the total cost at the given level of activity based on past cost data. Least-squares regression minimizes the errors of trying to fit a line between the data points and thus fits the line more closely to all the data points.

Understanding the various labels used for costs is the first step toward using costs to evaluate business decisions. You will learn more about these various labels and how they are applied in decision-making processes as you continue your study of managerial accounting in this course.

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5.6: Explain Contribution Margin and Calculate Contribution Margin per Unit, Contribution Margin Ratio, and Total Contribution Margin

Before examining contribution margins, let's review some key concepts: fixed costs, relevant range, variable costs, and contribution margin. Fixed costs are those costs that will not change within a given range of production. For example, in the current case, the fixed costs will be the student sales fee of $\$100$. No matter how many shirts the club produces within the relevant range, the fee will be locked in at $\$100$. The **relevant range** is the anticipated production activity level. Fixed costs remain constant within a relevant range. If production levels exceed expectations, then additional fixed costs will be required.

For example, assume that the students are going to lease vans from their university's motor pool to drive to their conference. A university van will hold eight passengers, at a cost of $\$200$ per van. If they send one to eight participants, the fixed cost for the van would be $\$200$. If they send nine to sixteen students, the fixed cost would be $\$400$ because they will need two vans. We would consider the relevant range to be between one and eight passengers, and the fixed cost in this range would be $\$200$. If they exceed the initial relevant range, the fixed costs would increase to $\$400$ for nine to sixteen passengers.

Variable costs are those costs that vary per unit of production. Direct materials are often typical variable costs, because you normally use more direct materials when you produce more items. In our example, if the students sold 100 shirts, assuming an individual variable cost per shirt of $\$10$, the total variable costs would be $\$1,000$ ($100 \times \$10$). If they sold 250 shirts, again assuming an individual variable cost per shirt of $\$10$, then the total variable costs would be $\$2,500(250 \times \$10)$.

Contribution margin is the amount by which a product's selling price exceeds its total variable cost per unit. This difference between the sales price and the per unit variable cost is called the contribution margin because it is the per unit contribution toward covering the fixed costs. It typically is calculated by comparing the sales revenue generated by the sale of one item versus the variable cost of the item:

Contribution Margin = Sales – Variable Costs

Figure $5.6.1$: Contribution Margin calculation

In our example, the sales revenue from one shirt is $\$15$ and the variable cost of one shirt is $\$10$, so the individual contribution margin is $\$5$. This $\$5$ contribution margin is assumed to first cover fixed costs first and then realized as profit.

As you will see, it is not just small operations that benefit from cost-volume-profit (CVP) analysis. At some point, all businesses find themselves asking the same basic questions: How many units must be sold in order to reach a desired income level? How much will each unit cost? How much of the sales price from each unit will help cover our fixed costs? For example, Starbucks faces these same questions every day, only on a larger scale. When they introduce new menu items, such as seasonal specialty drinks, they must determine the fixed and variable costs associated with each item. Adding menu items may not only increase their fixed costs in the short run (via advertising and promotions) but will bring new variable costs. Starbucks needs to price these drinks in a way that covers the variable costs per unit and additional fixed costs and contributes to overall net income. Regardless of how large or small the enterprise, understanding how fixed costs, variable costs, and volume are related to income is vital for sound decision-making.

Figure 5.6.2: Starbucks. Large corporations like Starbucks use cost-volume-profit analysis to make decisions about their products and services to ensure that they are maximizing their revenues. (credit: modification of "StarbucksVaughanMills" by "Raysonho"/Wikimedia Commons, CC0)

Understanding how to use fixed costs, variable costs, and sales in CVP analyses requires an understanding of the term margin. You may have heard that restaurants and grocery stores have very low margins, while jewelry stores and furniture stores have very high margins. What does "margin" mean? In the broadest terms, margin is the difference between a product or service's selling price and its cost of production. Recall the accounting club's T-shirt sale. The difference between the sales price per T-shirt and the purchase price of the T-shirts was the accounting club's margin:

Sales Price	$15
Cost per T-shirt	10
Margin	$ 5

Figure 5.6.3: Margin for accounting club's T-shirt sale

Let's now apply the characteristics of fixed and variable costs and the basics of cost behaviors to the concept of contribution margin. The company will use this "margin" to cover fixed expenses and hopefully to provide a profit. Let's begin by examining contribution margin on a per unit basis.

Unit Contribution Margin

When the contribution margin is calculated on a per unit basis, it is referred to as the contribution margin per unit or unit contribution margin. You can find the contribution margin per unit using the equation shown in Figure 5.6.4.

Per Unit Sales Price – Variable Cost per Unit = Contribution Margin per Unit

Figure 5.6.4: Contribution Margin per unit using the equation

It is important to note that this unit contribution margin can be calculated either in dollars or as a percentage. To demonstrate this principle, let's consider the costs and revenues of Hicks Manufacturing, a small company that manufactures and sells birdbaths to specialty retailers.

Hicks Manufacturing sells its Blue Jay Model for $1100 and incurs variable costs of $20 per unit. In order to calculate their per unit contribution margin, we use the formula in Figure 5.6.4 to determine that on a *per unit* basis, their contribution margin is:

HICKS MANUFACTURING Blue Jay Model For Year Ended December 31, 2019	
Sales Price per Unit	$100
– Variable Cost per Unit	20
= Contribution Margin per Unit	$ 80

Figure 5.6.5: Hicks Manufacturing Blue Jay model per unit contribution margin

This means that for every Blue Jay model they sell, they will have $80 to *contribute* toward covering fixed costs, such as rent, insurance, and manager salaries. But Hicks Manufacturing manufactures and sells more than one model of birdbath. They also sell a Cardinal Model for $75, and these birdbaths incur variable costs of $15 per unit. For the Cardinal Model, their contribution margin on a per unit basis is the $75 sales price less the $15 per unit variable costs is as follows:

HICKS MANUFACTURING Cardinal Model For Year Ended December 31, 2019	
Sales Price per Unit	$75
– Variable Cost per Unit	15
= Contribution Margin per Unit	$60

Figure 5.6.6: Hicks Manufacturing Cardinal model per unit contribution margin

This demonstrates that, for every Cardinal model they sell, they will have $60 to *contribute* toward covering fixed costs and, if there is any left, toward profit. Every product that a company manufactures or every service a company provides will have a unique contribution margin per unit. In these examples, the contribution margin per unit was calculated in dollars per unit, but another way to calculate contribution margin is as a ratio (percentage).

Contribution Margin Ratio

The **contribution margin ratio** is the percentage of a unit's selling price that exceeds total unit variable costs. In other words, contribution margin is expressed as a percentage of sales price and is calculated using this formula:

$$\textbf{Contribution Margin Ratio} = \frac{\textbf{Contribution Margin per Unit}}{\textbf{Sales Price per Unit}}$$

Figure 5.6.7: Contribution margin ratio expressed as a percentage of sales price

For Hicks Manufacturing and their Blue Jay Model, the contribution margin ratio will be

$$\frac{\textbf{\$80 Contribution Margin per Unit}}{\textbf{\$100 Sales Price per Unit}} = \textbf{0.80}$$

Figure 5.6.8: Contribution margin ratio for Hicks Manufacturing Blue Jay Model

At a contribution margin ratio of 80%, approximately $0.80 of each sales dollar generated by the sale of a Blue Jay Model is available to cover fixed expenses and contribute to profit. The contribution margin ratio for the birdbath implies that, for every $1 generated by the sale of a Blue Jay Model, they have $0.80 that contributes to fixed costs and profit. Thus, 20% of each sales dollar represents the variable cost of the item and 80% of the sales dollar is margin. Just as each product or service has its own contribution margin on a per unit basis, each has a unique contribution margin ratio. Although this process is extremely useful for analyzing the profitability of a single product, good, or service, managers also need to see the "big picture" and will examine contribution margin in total across all products, goods, or services.

Example 5.6.1: Margin at the Kiosk

You rent a kiosk in the mall for $300 a month and use it to sell T-shirts with college logos from colleges and universities all over the world. You sell each T-shirt for $25, and your cost for each shirt is $15. You also pay your sales person a commission of $0.50 per T-shirt sold in addition to a salary of $400 per month. Construct a contribution margin income statement for two different months: in one month, assume 100 T-shirts are sold, and in the other, assume 200 T-shirts are sold.

Solution

Pertinent information		Contribution margin income statement 100 units sold		Contribution margin income statement 200 units sold	
Sales price per unit	$ 25	Sales revenue	$2,500	Sales revenue	$5,000
Variable costs:		Variable costs per unit ($15 + 0.50) x 100 units	1,550	Variable costs per unit ($15 + 0.50) x 200 units	3,100
Per shirt cost	15	Contribution margin	950	Contribution margin	1,900
Per shirt commission	0.50	Fixed costs	700	Fixed costs	700
Fixed costs:		Net operating income	$ 250	Net operating income	$1,200
Kiosk rental	300				
Salary	400				

Figure 5.6.9: Contribution margin income statement

Total Contribution Margin

This "big picture" is gained by calculating **total contribution margin**—the total amount by which total sales exceed total variable costs. We calculate total contribution margin by multiplying per unit contribution margin by sales volume or number of units sold. This approach allows managers to determine how much profit a company is making before paying its fixed expenses. For Hicks Manufacturing, if the managers want to determine how much their Blue Jay Model contributes to the overall profitability of the company, they can calculate total contribution margin as follows:

HICKS MANUFACTURING Blue Jay Model For Month Ended April, 2019	
Units Sold	500
Contribution Margin per Unit	×$ 80
Total Contribution Margin	$40,000

Figure 5.6.10: Total contribution margin for Hicks Manufacturing Blue Jay Model

For the month of April, sales from the Blue Jay Model contributed $36,000 toward fixed costs. Looking at contribution margin in total allows managers to evaluate whether a particular product is profitable and how the sales revenue from that product contributes to the overall profitability of the company. In fact, we can create a specialized income statement called a contribution margin income statement to determine how changes in sales volume impact the bottom line.

To illustrate how this form of income statement can be used, contribution margin income statements for Hicks Manufacturing are shown for the months of April and May.

In April, Hicks sold 500 Blue Jay Models at $100 per unit, which resulted in the operating income shown on the contribution margin income statement:

HICKS MANUFACTURING Contribution Margin Income Statement For Month Ended April, 2019	
Sales (500 units at $100 per unit)	$50,000
Variable Cost (500 units at $20 per unit)	10,000
Contribution Margin	40,000
Fixed Costs	23,000
Operating Income	$17,000

Figure 5.6.11: Contribution margin income statement for Hicks Manufacturing Blue Jay Model for April, 2019

In May, 750 of the Blue Jay models were sold as shown on the contribution margin income statement. When comparing the two statements, take note of what changed and what remained the same from April to May.

HICKS MANUFACTURING Contribution Margin Income Statement For Month Ended May, 2019	
Sales (750 units at $100 per unit)	$75,000
Variable Cost (750 units at $20 per unit)	15,000
Contribution Margin	60,000
Fixed Costs	23,000
Operating Income	$37,000

Figure 5.6.12: Contribution margin income statement for Hicks Manufacturing Blue Jay Model for May, 2019

Using this contribution margin format makes it easy to see the impact of changing sales volume on operating income. Fixed costs remained unchanged; however, as more units are produced and sold, more of the per-unit sales price is available to contribute to the company's net income.

Before going further, let's note several key points about CVP and the contribution margin income statement. First, the contribution margin income statement is used for *internal* purposes and is not shared with external stakeholders. Secondly, in this specialized income statement, when "*operating* income" is shown, it actually refers to "net operating income" *without regard to income taxes*. Companies can also consider taxes when performing a CVP analysis to project both net operating income and net income. (The preparation of contribution margin income statements with regard to taxes is covered in advanced accounting courses; here, we will consider net income as net operating income without regard to taxes.)

Regardless of whether contribution margin is calculated on a per-unit basis, calculated as a ratio, or incorporated into an income statement, all three express how much sales revenue is available to cover fixed expenses and contribute to profit. Let's examine how all three approaches convey the same financial performance, although represented somewhat differently.

You will recall that the per-unit contribution margin was $80 for a Hicks Blue Jay birdbath. When Hicks sold 500 units, each unit contributed $80 to fixed expenses and profit, which can be verified from April's income statement:

April Total Contribution Margin	$40,000
Per Unit Contribution Margin	$ 80

$$\frac{\text{Total Contribution Margin}}{\text{Per Unit Contribution Margin}} = \text{Number of Units Sold} = \frac{\$40{,}000}{80} = 500 \text{ units}$$

Figure 5.6.13: Per unit contribution to fixed expenses for Hicks Manufacturing Blue Jay Model for April, 2019

Now, let's use May's Contribution Margin Income Statement as previously calculated to verify the contribution margin based on the contribution margin ratio previously calculated, which was 80%, by applying this formula:

Total Sales × Contribution Margin Ratio = Total Contribution Margin

May Total Sales	$75,000
Contribution Margin Ratio	80%

$75,000 × 0.80 = $60,000

Figure 5.6.14: Contribution margin based on the contribution margin ratio for Hicks Manufacturing for May, 2019

Regardless of how contribution margin is expressed, it provides critical information for managers. Understanding how each product, good, or service contributes to the organization's profitability allows managers to make decisions such as which product lines they should expand or which might be discontinued. When allocating scarce resources, the contribution margin will help them focus on those products or services with the highest margin, thereby maximizing profits.

The Evolution of Cost-Volume-Profit Relationships

The CVP relationships of many organizations have become more complex recently because many labor-intensive jobs have been replaced by or supplemented with technology, changing both fixed and variable costs. For those organizations that are still labor-intensive, the labor costs tend to be variable costs, since at higher levels of activity there will be a demand for more labor usage. For example, assuming one worker is needed for every 50 customers per hour, we might need two workers for an average sales season, but during the Thanksgiving and Christmas season, the store might experience 250 customers per hour and thus would need five workers.

However, the growing trend in many segments of the economy is to convert labor-intensive enterprises (primarily variable costs) to operations heavily dependent on equipment or technology (primarily fixed costs). For example, in retail, many functions that were previously performed by people are now performed by machines or software, such as the self-checkout counters in stores such as Walmart, Costco, and Lowe's. Since machine and software costs are often depreciated or amortized, these costs tend to be the same or fixed, no matter the level of activity within a given relevant range.

In China, completely unmanned grocery stores have been created that use facial recognition for accessing the store. Patrons will shop, bag the purchased items, leave the store, and be billed based on what they put in their bags. Along with managing the purchasing process, inventory is maintained by sensors that let managers know when they need to restock an item.

In the United States, similar labor-saving processes have been developed, such as the ability to order groceries or fast food online and have it ready when the customer arrives. Another major innovation affecting labor costs is the development of driverless cars and trucks (primarily fixed costs), which will have a major impact on the number of taxi and truck drivers in the future (primarily variable costs). Do these labor-saving processes change the cost structure for the company? Are variable costs decreased? What about fixed costs? Let's look at this in more detail.

When ordering food through an app, there is no need to have an employee take the order, but someone still needs to prepare the food and package it for the customer. The variable costs associated with the wages of order takers will likely decrease, but the fixed costs associated with additional technology to allow for online ordering will likely increase. When grocery customers place their orders online, this not only requires increased fixed costs for the new technology, but it can also increase variable labor costs, as employees are needed to fill customers' online orders. Many stores may move cashier positions to online order fulfillment rather than hiring additional employees. Other stores may have employees fill online grocery orders during slow or downtime.

Using driverless cars and trucks decreases the variable costs tied to the wages of the drivers but requires a major investment in fixed-cost assets—the autonomous vehicles—and companies would need to charge prices that allowed them to recoup their expensive investments in the technology as well as make a profit. Alternatively, companies that rely on shipping and delivery companies that use driverless technology may be faced with an increase in transportation or shipping costs (variable costs). These costs may be higher because technology is often more expensive when it is new than it will be in the future, when it is easier and more cost effective to produce and also more accessible. A good example of the change in cost of a new technological innovation

over time is the personal computer, which was very expensive when it was first developed but has decreased in cost significantly since that time. The same will likely happen over time with the cost of creating and using driverless transportation.

You might wonder why a company would trade variable costs for fixed costs. One reason might be to meet company goals, such as gaining market share. Other reasons include being a leader in the use of innovation and improving efficiencies. If a company uses the latest technology, such as online ordering and delivery, this may help the company attract a new type of customer or create loyalty with longstanding customers. In addition, although fixed costs are riskier because they exist regardless of the sales level, once those fixed costs are met, profits grow. All of these new trends result in changes in the composition of fixed and variable costs for a company, and it is this composition that helps determine a company's profit.

As you will learn in future chapters, in order for businesses to remain profitable, it is important for managers to understand how to measure and manage fixed and variable costs for decision-making. In this chapter, we begin examining the relationship among sales volume, fixed costs, variable costs, and profit in decision-making. We will discuss how to use the concepts of fixed and variable costs and their relationship to profit to determine the sales needed to break even or to reach a desired profit. You will also learn how to plan for changes in selling price or costs, whether a single product, multiple products, or services are involved.

Deciding Between Orders

You are evaluating orders from two new customers, but you will only be able to accept one of the orders without increasing your fixed costs. Management has directed you to choose the one that is most profitable for the company. Customer A is ordering 500 units and is willing to pay $\$200$ per unit, and these units have a contribution margin of $\$60$ per unit. Customer B is ordering $1,000$ units and is willing to pay $\$140$ per unit, and these units have a contribution margin ratio of 40%. Which order do you select and why?

Link to Learning

Watch this video from Investopedia reviewing the concept of contribution margin to learn more. Keep in mind that contribution margin per sale first contributes to meeting fixed costs and then to profit.

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5.7: Calculate and Interpret a Company's Margin of Safety and Operating Leverage

Our discussion of CVP analysis has focused on the sales necessary to break even or to reach a desired profit, but two other concepts are useful regarding our break-even sales. Those concepts are margin of safety and operating leverage.

Margin of Safety

A company's **margin of safety** is the difference between its current sales and its break-even sales. The margin of safety tells the company how much they could lose in sales before the company begins to lose money, or, in other words, before the company falls below the break-even point. The higher the margin of safety is, the lower the risk is of not breaking even or incurring a loss. In order to calculate margin of safety, we use the following formula:

$$\begin{aligned} &\text{Margin of Safety in Dollars} \\ &= \text{Total Budgeted (or actual sales) - Break-Even Sales} \end{aligned} \tag{5.7.1}$$

Let's look at Manteo Machine, a company that machines parts that are then sold and used in the manufacture of farm equipment. For their core product, the break-even analysis is as follows:

Sales Price per Unit	$ 90
Variable Cost per Unit	$ 40
Contribution Margin per Unit	$ 50
Fixed Costs	$ 85,000
Break-Even (in units)	1700
Contribution Margin per Unit	$ 50
Selling Price per Unit	$ 90
Contribution Margin Ratio	55.55%
Break-Even (in dollars, rounded)	$153,000

Figure 5.7.1: Manteo Machine break-even analysis

Interpreting this information tells Manteo Machine that, when sales equal $\$153,000$, they will be at the break-even point. However, as soon as sales fall below this figure, they will have negative net operating income. They have decided that they want a margin of safety of $\$10,000$. They can add this as if it were a fixed cost (very much the same way we added target profit earlier) and then find a new break-even point that includes a $\$10,000$ margin of safety. If they approached it from this perspective, their new break-even would appear as follows:

Sales Price per Unit	$ 90
Variable Cost per Unit	$ 40
Contribution Margin per Unit	$ 50
Fixed Costs + Margin of Safety	$ 95,000
Break-Even (in units)	1900
Contribution Margin per Unit	$ 50
Selling Price per Unit	$ 90
Contribution Margin Ratio	55.55%
Break-Even (in dollars, rounded)	$170,000

Figure 5.7.2: Manteo Machine's Margin of Safety. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

As shown in Figure 5.7.2, the margin of safety of $1,900$ units is found from ($(\text{FC} + \text{Margin of Safety})/\text{CM per unit} = \$95,000/\$50$). Thus, $1,900$ units must be sold in order to meet fixed cost and have a $\$10,000$ margin of safety. Another way to see this is to realize the $\$10,000$ margin of safety will be met in $\$50$ increments based on the current contribution margin. This means the company will need to sell an additional 200 units, which is an additional $\$18,000$ in sales to have the desired margin of safety. The true break-even, where only fixed costs were met, was $1,700$ units, or $\$153,000$ in sales. The point at which the company would have a $\$10,000$ margin of safety is $1,900$ units, or $\$171,000$ in sales. Note that the new level of units is the break-even units of $1,700$ plus the 200 units for the margin of safety. The same can be seen for the sales dollar. The new level of desired sales dollars is the break-even sales of $\$153,000$ plus the additional $\$18,000$ in sales for the margin of safety.

The margin of safety can also be determined when a company knows its sales volume. For example, Manteo Machine sold $2,500$ units in March and wants to know its margin of safety at that sales volume:

Sales (at the current volume of 2,500 units)	$225,000
Break-Even Sales (1,900 units)	153,000
Margin of Safety (in dollars)	72,000

Figure $5.7.3$: Manteo Machine's Margin of Safety at $2,500$ sales volume

From this analysis, Manteo Machine knows that sales will have to decrease by $\$72,000$ from their current level before they revert to break-even operations and are at risk to suffer a loss.

Ethical Considerations: The Importance of Relevant Range Analysis

Ethical managerial decision-making requires that information be communicated fairly and objectively. The failure to include the demand for individual products in the company's mixture of products may be misleading. Providing misleading or inaccurate managerial accounting information can lead to a company becoming unprofitable. Ignoring relevant range(s) in setting assumptions about cost behavior and ignoring the actual demand for the product in the company's market also distorts the information provided to management and may cause the management of the company to produce products that cannot be sold.

Many companies prefer to consider the margin of safety as a percentage of sales, rather than as a dollar amount. In order to express margin of safety as a percentage, we divide the margin of safety (in dollars) by the total budgeted or actual sales volume. The formula to express margin of safety as a percentage is:

$$\text{Margin of Safety Percentage } = \frac{\text{Margin of Safety (dollars)}}{\text{Total Budget (or Actual) Sales (dollars)}} \tag{5.7.2}$$

Previously, we calculated Manteo Machine's margin of safety as $\$72,000$. As a percentage, it would be

$$\frac{\$72,000}{\$225,000} = 0.32 \text{ or } 32\%$$

This tells management that as long as sales do not decrease by more than 32%, they will not be operating at or near the break-even point, where they would run a higher risk of suffering a loss. Often, the margin of safety is determined when sales budgets and forecasts are made at the start of the fiscal year and also are regularly revisited during periods of operational and strategic planning.

Operating Leverage

In much the same way that managers control the risk of incurring a net loss by watching their margin of safety, being aware of the company's operating leverage is critical to the financial well-being of the firm. **Operating leverage** is a measurement of how sensitive net operating income is to a percentage change in sales dollars. Typically, the higher the level of fixed costs, the higher the level of risk. However, as sales volumes increase, the payoff is typically greater with higher fixed costs than with higher variable costs. In other words, the higher the risk, the greater the payoff.

First, let's look at this from a general example to understand payoff. Suppose you had $\$10,000$ to invest and you were debating between putting that money in low risk bonds earning 3% or taking a chance and buying stock in a new company that currently is not profitable but has an innovative product that many analysts predict will take off and be the next "big thing." Obviously, there is more risk with buying the stock than with buying the bonds. If the company remains unprofitable, or fails, you stand to lose all or a portion of your investment, whereas the bonds are less risky and will continue to pay 3% interest. However, the risk associated with the stock investment could result in a much higher payoff if the company is successful.

So how does this relate to fixed costs and companies? Companies have many types of fixed costs including salaries, insurance, and depreciation. These costs are present regardless of our production or sales levels. This makes fixed costs riskier than variable costs, which only occur if we produce and sell items or services. As we sell items, we have learned that the contribution margin first goes to meeting fixed costs and then to profits. Here is an example of how changes in fixed costs affect profitability.

Gray Co. has the following income statement:

Sales (10,000 units x $10 SP)	$100,000
Variable Costs (10,000 units x $4 VC)	$ 40,000
Contribution Margin	$ 60,000
Fixed Costs	$ 25,000
Net Income	$ 35,000

Figure $5.7.4$: Gray Co. income statement

What is the effect of switching $\$10,000$ of fixed costs to variable costs? What is the effect of switching $\$10,000$ of variable costs to fixed costs?

Effect of Changing $10,000 of FC to VC	
Sales (10,000 units x $10 SP)	$100,000
Variable Costs	50,000
Contribution Margin	50,000
Fixed Costs	15,000
Net Income	35,000

Effect of Changing $10,000 of VC to FC	
Sales (10,000 units x $10 SP)	$100,000
Variable Costs	30,000
Contribution Margin	70,000
Fixed Costs	35,000
Net Income	35,000

Figure $5.7.5$: Effect of switching $\$10,000$ of FC to VC

Notice that in this instance, the company's net income stayed the same. Now, look at the effect on net income of changing fixed to variable costs or variable costs to fixed costs as sales volume increases. Assume sales volume increases by 10%.

Effect of Changing $10,000 of FC to VC and 10% Increase in Sales	
Sales (11,000 units x $10 SP)	$110,000
Variable Costs (also increases 10%)	$ 55,000
Contribution Margin	$ 55,000
Fixed Costs	$ 15,000
Net Income	$ 40,000

Effect of Changing $10,000 of VC to FC and 10% Increase in Sales	
Sales (11,000 units x $10 SP)	$110,000
Variable Costs (also increases 10%)	$ 33,000
Contribution Margin	$ 77,000
Fixed Costs	$ 35,000
Net Income	$ 45,000

Figure $5.7.6$: Effect of switching $\$10,000$ of FC to VC and 10% increase in sales

As you can see from this example, moving variable costs to fixed costs, such as making hourly employees salaried, is riskier in that fixed costs are higher. However, the payoff, or resulting net income, is higher as sales volume increases.

This is why companies are so concerned with managing their fixed and variable costs and will sometimes move costs from one category to another to manage this risk. Some examples include, as previously mentioned, moving hourly employees (variable) to salaried employees (fixed), or replacing an employee (variable) with a machine (fixed). Keep in mind that managing this type of risk not only affects operating leverage but can have an effect on morale and corporate climate as well.

Concepts In Practice: Fluctuating Operating Leverage - Why Do Stores Add Self-Service Checkout Lanes?

Operating leverage fluctuations result from changes in a company's cost structure. While any change in either variable or fixed costs will change operating leverage, the fluctuations most often result from management's decision to shift costs from one category to another. As the next example shows, the advantage can be great when there is economic growth (increasing sales); however, the disadvantage can be just as great when there is economic decline (decreasing sales). This is the risk that must be managed when deciding how and when to cause operating leverage to fluctuate.

Consider the impact of reducing variable costs (fewer employee staffed checkout lanes) and increasing fixed costs (more self-service checkout lanes). A store with $\$125,000,000$ per year in sales installs some self-service checkout lanes. This increases its fixed costs by 10% but reduces its variable costs by 5%. As Figure $5.7.7$ shows, at the current sales level, this could produce a whopping 35% increase in net operating income. And, if the change results in higher sales, the increase in net operating income would be even more dramatic. Do the math and you will see that each 1% increase in sales would produce a 6% increase in net operating income: well worth the change, indeed.

	Without Self-service Checkout Lanes	With Self-service Checkout Lanes
Sales	$125,000	$125,000
Variable Costs	$ 93,750	$ 89,063
Contribution Margin	$ 31,250	$ 35,937
Fixed costs	$ 25,000	$ 27,500
Net Operating Income	$ 6,250	$ 8,437
% Increase in Income		35%

Figure 5.7.7: Impact of Self-Service Checkout Lanes. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

(in 000s) Without Selfservice Checkout Lanes, With Selfservice Checkout Lanes (respectively): Sales $\$125,000$, $125,000$; Variable Costs $93,750$, $89,063$; Contribution Margin $31,250$, $35,938$; Fixed Costs $25,000$, $27,500$; Net Operating Income $6,2508,438$; Percent Increase in Income 35 percent.

The company in this example also faces a downside risk, however. If customers disliked the change enough that sales decreased by more than 6%, net operating income would drop below the original level of $\$6,250$ and could even become a loss.

Operating leverage has a multiplier effect. A **multiplier effect** is one in which a change in an input (such as variable cost per unit) by a certain percentage has a greater effect (a higher percentage effect) on the output (such as net income). To explain the concept of a multiplier effect, think of having to open a very large, heavy wooden crate. You could pull and pull with your hands all day and still not exert enough force to get it open. But, what if you used a lever in the form of a pry bar to multiply your effort and strength? For every additional amount of force you apply to the pry bar, a much larger amount of force is applied to the crate. Before you know it, you have the crate open. Operating leverage works much like that pry bar: if operating leverage is high, then a very small increase in sales can result in a large increase in net operating income.

How does a company increase its operating leverage? Operating leverage is a function of cost structure, and companies that have a high proportion of fixed costs in their cost structure have higher operating leverage. There is, however, a cautionary side to operating leverage. Since high operating leverage is the result of high fixed costs, if the market for the company's products, goods, or services shrinks, or if demand for the company's products, goods, or services declines, the company may find itself obligated to pay for fixed costs with little or no sales revenue to spare. Managers who have made the decision to chase large increases in net operating income through the use of operating leverage have found that, when market demand falls, their only recourse is to close their doors. In fact, many large companies are making the decision to shift costs away from fixed costs to protect them from this very problem.

Link to Learning

During periods of sales downturns, there are many examples of companies working to shift costs away from fixed costs. This Yahoo Finance article reports that many airlines are changing their cost structure to move away from fixed costs and toward variable costs such as Delta Airlines. Although they are decreasing their operating leverage, the decreased risk of insolvency more than makes up for it.

In order to calculate the degree of operating leverage at a given level of sales, we will apply the following formula:

$$\text{Degree of Operating Leverage } = \frac{\text{Contribution Margin}}{\text{Net Operating Income}} \tag{5.7.3}$$

To explain further the concept of operating leverage, we will look at two companies and their operating leverage positions:

	Company A	Company B
Sales	$250,000	$315,000
Variable Costs	102,000	105,000
Contribution Margin (a)	148,000	210,000
Fixed Costs	63,000	125,000
Net Income (loss) (b)	85,000	85,000
Operating Leverage (a) ÷ (b)	**1.74**	**2.47**

Figure 5.7.8: Operating leverage positions of Company A and B

Both companies have the same net income of $\$85,000$, but company B has a higher degree of operating leverage because its fixed costs are higher than that of company A. If we want to see how operating leverage impacts net operating income, then we can apply the following formula:

$$\begin{aligned}&\text{Degree of percentage Operating Leverage } \times \text{ Percentage Change in Sales}\\&= \text{ Net Operating Income}\end{aligned} \tag{5.7.4}$$

Let's assume that both company A and company B are anticipating a 10% increase in sales. Based on their respective degrees of operating leverage, what will their percentage change in net operating income be?

$$\begin{aligned}\text{Company A}: 1.71 \times 10\% = 17.4\%\\ \text{Company B}: 2.47 \times 10\% = 24.7\%\end{aligned}$$

For company A, for every 10% increase in sales, net operating income will increase 17.4%. But company B has a much higher degree of operating leverage, and a 10% increase in sales will result in a 24.7% increase in net operating income. These examples clearly show why, during periods of growth, companies have been willing to risk incurring higher fixed costs in exchange for large percentage gains in net operating income. But what happens in periods where income declines?

We will return to Company A and Company B, only this time, the data shows that there has been a 20% decrease in sales. Note that the degree of operating leverage changes for each company. The reduced income resulted in a higher operating leverage, meaning a higher level of risk.

	Company A	Company B
Sales (20% decrease)	$200,000	$252,000
Variable Costs (20% decrease)	81,600	84,000
Contribution Margin (a)	118,400	168,000
Fixed Costs	63,000	125,000
Net Income (b)	$ 55,400	$ 43,000
Operating Leverage (a ÷ b)	2.14	3.91
% Change in Net Income (Prior Net Income – Current Net Income)/Prior Net Income	34.8% decrease	49.4% decrease

Figure 5.7.9: Operating leverage positions of Company A and B after decrease in sales

It is equally important to realize the percentage decrease in income for both companies. The decrease in sales by 20% resulted in a 31.9% decrease in net income for Company A. For Company B, the 20% decrease in sales resulted in a 46.9% decrease in net income. This also could have been found by taking the initial operating leverage times the 20% decrease:

$$\begin{aligned}&\text{Company } A: 20\% \text{ decreases } \times 1.74 \text{ operating leverage } = 34.8\% \text{ decrease in net income}\\&\text{Company } B: 20\% \text{ decreases } \times 2.47 \text{ operating leverage } = 49.4\% \text{ decrease in net income}\end{aligned}$$

This example also shows why, during periods of decline, companies look for ways to reduce their fixed costs to avoid large percentage reductions in net operating income.

Think It Through: Moving Costs

You are the managerial accountant for a large manufacturing firm. The company has sales that are well above its break-even point, but they have historically carried most of their costs as fixed costs. The outlook for the industry you are in is not

positive. How could you move more costs away from fixed costs to put the company in a better financial position if the industry does, in fact, take a downturn?

Continuing Application: Viking Grocery Stores

You might wonder why the grocery industry is not comparable to other big-box retailers such as hardware or large sporting goods stores. Just like other big-box retailers, the grocery industry has a similar product mix, carrying a vast number of name brands as well as house brands. The main difference, then, is that the profit margin per dollar of sales (i.e., profitability) is smaller than the typical big-box retailer. Also, the inventory turnover and degree of product spoilage are greater for grocery stores. Overall, while the fixed and variable costs are similar to other big-box retailers, a grocery store must sell vast quantities in order to create enough revenue to cover those costs.

This is reflected in the business plan. Unlike a manufacturer, a grocery store will have hundreds of products at one time with various levels of margin, all of which will be taken into account in the development of their break-even analysis. Review a business plan developed by Viking Grocery Stores in consideration of opening a new site in Springfield, Missouri, to see how a grocery store develops a business plan and break-even based upon multiple products.

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5.8: Identify Relevant Information for Decision-Making

Almost everything we do in life results from choosing between alternatives, and the choices we make result in different consequences. For example, when choosing whether or not to eat breakfast before going to class, you face two alternatives and two sets of consequences. Eating breakfast means you must get up a little earlier, have food available, and be willing to prepare the food. Not eating means sleeping in longer, not having to plan food, and being hungry during class. Just as our lives are fraught with decisions large and small, the same is true for businesses. Almost every aspect of being in business involves choosing between alternatives, and each alternative typically has one or more consequences. Understanding how businesses make decisions paves the way not only to better decision-making processes but potentially to better outcomes.

Decisions made by businesses can have short-term effects or long-term impacts, or in some situations, both. Short-term decisions often address a temporary circumstance or an immediate need while long-term decisions align more with permanent problem solving and meeting strategic goals. Because these two types of decisions require different types of analyses, we will consider short-term decision-making here and long-term decision-making in Capital Budgeting Decision. Accounting distinguishes between short-term and long-term decisions not only because of the difference in the general nature of these decisions but also because the types of analyses differ significantly between short-term and long-term decision categories. As the time horizon over which the decision will have an impact expands, more costs become relevant to the decision-making process. In addition, when a time element is considered, there will be additional factors such as interest (paid or received) that will have a greater influence on decisions. Table 5.8.1 provides examples of short-term and long-term business decisions.

Table 5.8.1: Examples of Short-Term and Long-Term Business Decisions

Short-Term Business Decisions	Long-Term Business Decisions
• Accepting a special production order • Determining the best product mix from current products • Outsourcing a part or service • Further processing or refining a current product	• Buying new equipment versus remodeling old equipment • Choosing which products to manufacture • Expanding into a new area or country • Diversifying by buying another business

Short-term and long-term business decisions should be analyzed using different frameworks.

Continuing Application: Short-Term Decision-Making

Considering the business challenges facing Gearhead Outfitters, what short-term decisions might the company encounter? Remember that the retailer sells men's, women's, and children's outdoor clothing, footwear, and accessories. Gearhead must carry a certain level and variety of inventory to meet the demands of its customers. The company will have to maintain appropriate accounting records to make proper business decisions to promote sustainability and growth.

How might Gearhead be able to compete with larger chains and remain profitable? Will every sale result in the anticipated profit to the company? Consider what specialized short-term decision-making processes the company may use to meet its goals. Should more of an item than normal be purchased for resale to receive a larger discount from the supplier? What information about cost, volume, and profit is needed to make a sound business decision in this case? Some items may be sold at a loss (or lesser profit) to attract customers to the store. What type of information and accounting system is needed to help in this situation? The company requires relevant, consistent, and reliable data to determine the proper course of action.

Short-term decision-making is vital in any business. Consider this concept in relation to Centralized vs. Decentralized Management and how a company's approach may affect the decision-making process. Discuss possible short-term issues and decisions, management focuses, and whether or not the centralized versus decentralized style will aid in company flexibility and success. Also, think in terms of how the decision-making process will be evaluated.

Relevant Information for Short-Term Decision-Making

Business decision-making can be outlined as a process that is applied by management with each decision that is made. The process of decision-making in a managerial business environment can be summed up in these steps.

1. Identify the objective or goal. For a business, typically the goal is to maximize revenues or minimize costs.

2. Identify alternative courses of action that can achieve the goal or address an obstacle that is hindering goal achievement.
3. Perform a comprehensive analysis of potential solutions. This includes identifying revenues, costs, benefits, and other financial and qualitative variables.
4. Decide, based upon the analysis, the best course of action.
5. Review, analyze, and evaluate the results of the decision.

The first step of the decision-making process is to identify the goal. In the decisions discussed in this course, the quantitative goal will either be to maximize revenues or to minimize costs. The second step is to identify the alternative courses of action to achieve the goal. (In the real world, steps one and two may require more thought and research than you will learn about in advanced cost accounting and management courses.). This chapter focuses on steps three and four, which involve **short-term decision analysis**: determining the appropriate information necessary for making a decision that will impact the company in the short term, usually 12 months or fewer, and using that information in a proper analysis in order to reach an informed decision among alternatives. Step five, which involves reviewing and evaluating the decision, is briefly addressed with each type of decision analyzed.

Though these same general steps could be used in long-term decision analyses, the nature of long-term decisions is different. Short-term decisions are typically operational in nature: making versus buying a component of a product, using scarce resources, selling a product as-is or processing it further into a different product. It is relatively easy to change a short-term decision with minimal impact on the company. Long-term decisions are strategic in nature and typically involve large sums of money. The effects of a long-term decision can have a significant financial impact on a company for years. Examples of long-term decisions include replacing manufacturing equipment, building a new factory, or deciding to eliminate a product line. While you've learned how managerial accounting classifies, tracks, monitors, and controls costs, managerial accountants also closely analyze revenues, which are less controllable than costs, but are important in these decisions. As stated in the first step of the decision-making process, maximizing revenues is usually one of the goals of an organization. Therefore, making some short-term decisions requires analysis of both costs and revenues.

In carrying out step three of the managerial decision-making process, a differential analysis compares the relevant costs and revenues of potential solutions. What does this involve? First, it is important to understand that there are many types of short-term decisions that a business may face, but these decisions always involve choosing between alternatives. Examples of these types of decisions include determining whether to accept a special order; making a product or component versus buying the product or component; performing additional processing on a product; keeping versus eliminating a product or segment; or determining whether to take on a new project. In each of these situations, the business should compare the relevant costs and the relevant revenues of one alternative to the relevant costs and relevant revenues of the other alternative(s). Therefore, an important step in the differential analysis of potential solutions is to identify the relevant costs and relevant revenues of the decision.

What does it mean for something to be relevant? In the context of decision-making, something is relevant if it will influence the decision being made. For example, suppose you have two options for a summer job—either flagging traffic for a road crew or working for a landscaping company doing lawn care. For either job, you will be required to have industrial grade sound protectors (plugs or headphones) for your ears. This cost would not be relevant because it is the same under either alternative, so it will not influence your decision between the two jobs; it would be considered an **irrelevant cost**. You also believe your transportation costs will be the same for either job; thus, this would also be an irrelevant cost.

However, if you are required to have steel-toed boots for the road work job but can wear any type of work boot for the landscaping job, you would need to consider the difference between the costs, or the **differential cost**, of these two types of boots. This difference in cost between the two pairs of boots would be designated as a **relevant cost** because it influences your decision.

The two jobs also may have differences in revenues, called a **differential revenue**. Because the differential revenue influences the decision, it is also a **relevant revenue**. If both jobs pay the same hourly wage, it would have an **irrelevant revenue**, but if the road crew job offers overtime for any time worked over 40 hours, then this overtime wage has the potential to be a relevant revenue if overtime is a likely occurrence. Looking only at these differences—of both costs and revenues—between the alternatives, is known as **differential analysis**.

In conducting these types of analyses between alternatives, the initial focus will be on each **quantitative factor** of the analysis—in other words, the component that can be measured numerically. Examples of quantitative factors in business include sales growth, number of defective parts produced, or number of labor hours worked. However, in decision-making, it is important also to

consider each **qualitative factor**, which is one that cannot be measured numerically. For example, using the same summer job scenario, qualitative factors may include the environment in which you would be working (road dust and tar odors versus pollen and mower exhaust fumes), the amount of time exposed to the sun, the people with whom you will be working (working with friends versus making new friends), and weather-related issues (both jobs are outdoors, but could one job send you home for the day due to weather?). Examples of qualitative factors in business include employee morale, customer satisfaction, and company or brand image. In making short-term decisions, a business will want to analyze both qualitative and quantitative factors.

In short-term decision-making, revenues are often easier to evaluate than costs. In addition, each alternative typically only has one possible revenue outcome even though there are many costs to consider for each alternative. How do we know if a cost will have an impact on the decision? The starting point is to understand the various labels that are attached to costs in these decision-making environments.

Avoidable versus Unavoidable Costs

Management must determine if a cost is avoidable or unavoidable because in the short run, only avoidable costs are relevant for decision-making purposes. An **avoidable cost** is one that can be eliminated (in whole or in part) by choosing one alternative over another. For example, assume that a bike shop offers their customers custom paint jobs for bikes that the customers already own. If they eliminate the service, the cost of the bike paint could be eliminated. Also assume that they had been employing a part-time painter to do the work. The painter's compensation would also be an avoidable cost.

An **unavoidable cost** is one that does not change or go away in the short-run by choosing one alternative over another. For example, a company might sign a long-term lease on equipment or a production facility. These types of leases typically don't allow for cancellation, so if this one does not, then their required payments are unavoidable costs for the duration of the lease.

Variable costs are avoidable costs, since variable costs do not exist if the product is no longer made, or if the portion of the business (such as a segment or division) that generated the variable costs ceases to operate. Fixed costs, on the other hand, may be unavoidable, partially unavoidable, or avoidable only in certain circumstances. Remember that fixed costs tend to remain constant for a period of time and within a relevant range of production and are not easily eliminated in the short-run. Therefore, most fixed costs also are unavoidable. If a fixed cost is specific only to one of the alternatives, then that fixed cost also may be avoidable. Avoidable costs are future costs that are relevant to decision-making. Past costs are never an avoidable cost.

Recall that we are using a short-term viewpoint to determine whether or not costs are avoidable. In the long run, virtually all costs are avoidable. For example, assume that a company has a long-term, ten-year lease on a production facility that cannot be cancelled. For the first ten years it would be non-cancellable and thus unavoidable. But after ten years it would become avoidable.

Example $5.8.1$: AlexCo's Wagons

AlexCo produces collapsible wagons that are popular with beach goers, shoppers, gardeners, parents, and tailgaters. Annual sales have been $100,000$ wagons per year. The retail selling price of each wagon is $\$67.00$. To date, AlexCo has produced each of the components used in making the wagons but has been approached by DAL, Inc. with an offer to provide the axle and wheel assembly for $\$18.75$ per assembly. AlexCo's costs to produce the axle and wheel assembly are $\$9.00$ in direct materials, $\$6.50$ in direct labor, $\$3.57$ in variable overhead, and $\$2.50$ in fixed overhead. Twenty-five percent of the fixed overhead is avoidable if the assembly is produced by DAL. Should AlexCo continue to make the axle and wheel assembly or should it buy the assembly from DAL, Inc.?

Solution

	Relevant Costs	
	Make Internally	Buy from DAL, Inc.
Direct materials	$ 9.00	
Direct labor	6.50	
Variable overhead	3.57	
Avoidable fixed costs	0.63	
Total unit relevant cost	19.70	$ 18.75
Units required	100,000	100,000
Total relevant costs	$1,970,000	$1,875,000

Ignoring qualitative factors, it would be more cost effective for AlexCo to buy the axle and wheel assembly from DAL, Inc. However, AlexCo should be certain of any qualitative issues and not solely base their decision on the quantitative analysis.

Sunk Costs

A **sunk cost** is one that cannot be avoided because it has already occurred. A sunk cost will not change regardless of the alternative that management chooses; therefore, sunk costs have no bearing on future events and are not relevant in decision-making. The basic premise sounds simple enough, but sunk costs are difficult to ignore due to human nature and are sometimes incorrectly included in the decision-making process. For example, suppose you have an old car, a hand-me-down from your grandmother, and last year you spent $\$1,600$ on repairs and new tires and were just told by your mechanic that the car needs $\$1,200$ in repairs to operate safely. Your goal is to have a safe and reliable car. Your alternatives are to get the repairs completed or trade in the car for a newer used car.

From a quantitative perspective, you have gathered the following information to help with your decision. The trade-in value of your old car will be the minimum given by the dealer, or $\$200$. The newer used car will require you to make monthly payments of $\$150$ for two years. In analyzing your two alternatives, what costs do you consider? Remember, the $\$1,600$ you have already spent (note the past tense) is a sunk cost; it is a consequence of a past decision. In this example, the relevant costs for each alternative are the following: $\$1,200$ in current repair costs to keep your current car or $\$3,400$ (from the 24 payments of $\$150$ minus $\$200$ for the trade in) to buy a newer used car. Obviously, you also would consider qualitative factors, such as the sentimental value of your grandmother's car or the excitement of having a newer car.

Sunk costs are most problematic for business decisions when they pertain to existing equipment. The book value of an asset (historical cost – accumulated depreciation) is a sunk cost regardless of whether a business keeps the asset or disposes of it in some manner. The cost of the asset occurred in the past and therefore is sunk and irrelevant to the decision at hand. Managers may be reluctant to ignore sunk costs when making decisions, especially if the prior decision to purchase the asset was an unwise one. Often, when management takes a path of action that is not achieving the desired results, managers may continue the same path in the hope that the effect of prior decisions will improve the results. The use of the word *prior* is a key indicator that information is not relevant to a current decision. Holding on to old decisions or old commitments is common because letting them go forces management to admit they made a bad decision.

Future Costs That Do Not Differ

Any future cost that does not differ between the alternatives is not a relevant cost for the decision. For example, if a company is considering baking either bagels or doughnuts and both baked goods require $\$0.30$ worth of flour, then the cost of flour would not be a relevant cost in determining which of the two had the highest production cost. As relevant information for short-term decision-making, the cost of sound protectors for your summer job would not be relevant to your decision because that cost exists in both scenarios. Another irrelevant cost would be your transportation cost, since that cost is also the same regardless of the job you choose. In another example, if a company is planning to produce either red widgets or blue wingdings and will need to hire 10 additional employees to produce either of the goods, the cost of those 10 employees is irrelevant because it does not differ between the alternatives.

Ethical Considerations: Johnson & Johnson's 1982 Recall and Replacement of All Tylenol in the World

In 1982, Johnson & Johnson was faced with a large-scale business and ethical dilemma. During the course of several days beginning on September 29, 1982, seven deaths occurred in the Chicago area that were attributed to consuming capsules of Extra-Strength Tylenol. The painkiller was, at the time, Johnson & Johnson's best-selling product. The company had to decide if the short-term cost of replacing the Tylenol was worth the future cost to their reputation and their customers' health and safety. At tremendous expense, Johnson & Johnson "placed consumers first by recalling 31 million bottles of Tylenol capsules from store shelves and offering replacement product in the safer tablet form free of charge."[1]

As it was later discovered, someone was lacing Tylenol capsules with cyanide and returning the pills in the original packages to store shelves. However, Johnson & Johnson's decision to incur short-term costs by recalling all of their pills ultimately paid off, as in the long run, the company's stock value increased and Tylenol sales recovered. One could look at the decision as an opportunity cost: Johnson & Johnson had to choose between two alternatives. The company could have chosen a short-term solution with reduced short-term losses, but by making an ethical business decision, the long-term rewards were greater than the short-term savings.

Opportunity Costs

When choosing between two alternatives, usually only one of the two choices can be selected. When this is the case, you may be faced with **opportunity costs**, which are the costs associated with not choosing the other alternative. For example, if you are trying to choose between going to work immediately after completing your undergraduate degree or continuing to graduate school, you will have an opportunity cost. If you choose to go to work immediately, your opportunity cost is forgoing a graduate degree and any potential job limitations or advancements that result from that decision. If you choose instead to go directly into graduate school, your opportunity cost is the income that you could have been earning by going to work immediately upon graduation.

Example $5.8.2$: Costs and Revenue at Carolina Clusters

Carolina Clusters, Inc., a candy manufacturer in a resort town, just bought a new taffy pulling machine for $\$27,000$ and is planning to increase the production of salt-water taffy. Due to the increased production, Carolina is deciding between hiring two part-time college students or one full-time employee. Each college student would work half days totaling 20 hours per week, and would earn $\$12$ per hour. The full-time employee would work full days 40 hours per week and would earn $\$12$ per hour plus the equivalent of $\$2$ per hour in benefits. Each employee is given two t-shirts to wear as their uniform. The t-shirts cost Carolina $\$8$ each. In addition, Carolina provides disposable hair coverings and gloves for the employees. Each employee uses, on average, six sets of gloves per eight-hour shift or four sets per four-hour shift. One hair covering per shift per person is typical. The cost of the hair covering is $\$0.05$ per covering and the cost of a pair of gloves is $\$0.02$ per pair. Identify any relevant costs, relevant revenues, sunk costs, and opportunity costs that Carolina Clusters needs to consider in making the decision whether to hire two part-time employees or one full-time employee.

Solution

Relevant costs:

- $\$2$ per hour for benefits
- $\$16$ for two t-shirts: Hiring one full-time person will result in a $\$16$ expenditure for t-shirts. Hiring two college students would result in $\$32$ in t-shirt expenditures, thus the relevant t-shirt costs are the $\$16$ difference.
- $\$0.05$ for a hair covering: Hiring one full-time person will result in $\$0.05$ per day in hair covering costs but hiring two college students would result in $\$0.10$ per day in hair covering costs thus the relevant hair covering cost is the $\$0.05$ difference.
- $\$0.04$ for a pair of gloves: Hiring one full-time person will result in $\$0.12(6 \times \$0.02)$ per day in glove costs, but hiring two college students would result in $\$0.16(8 \times \$0.02)$ per day in glove costs.

Thus, the relevant glove cost is the $\$0.04$ difference.

Relevant revenues: None

Sunk costs: $\$27,000$ for the taffy machine

Opportunity costs: None

Footnotes

1. Judith Rehak. “Tylenol Made a Hero of Johnson & Johnson: The Recall That Started Them All.” *New York Times*. Mar. 23, 2002. https://www.nytimes.com/2002/03/23/y...t-started.html

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5.9: Evaluate and Determine Whether to Keep or Discontinue a Segment or Product

Companies tend to divide their organization along product lines, geographic locations, or other management needs for decision-making and reporting. A **segment** is a portion of the business that management believes has sufficient similarities in product lines, geographic locations, or customers to warrant reporting that portion of the company as a distinct part of the entire company. For example, General Electric, Inc., has eight segments and the Walt Disney Company has four segments. Table 5.9.1 shows these segments.

Table 5.9.1: Examples of Company Segments[1]

General Electric Segments	Disney Segments
• Additive • Aviation • Capital • Digital • Healthcare • Lighting • Power • Renewable Energy • Transportation	• Media Networks • Parks, Experiences, and Consumer Products • Studio Entertainment • Direct to Consumer and International

As part of the normal operations of a business, managers make decisions such as whether to keep producing a product, whether to continue operating in certain areas, or whether to close entire segments of their operations. These are historically some of the most difficult decisions that managers make. Examples of these types of decisions include Macy's decision to close 100 stores in 2016 due to increased competition from online retailers such as Amazon.com[2] and Delta Airline's decision to eliminate 16 routes to save costs.[3] What information does management use in making these types of decisions?

As with other decisions, management must consider both the quantitative and qualitative aspects. In choosing between alternatives—that is, in choosing between keeping and eliminating the product, segment, or service—the relevant revenues and costs should be analyzed. Remember that relevant revenues and costs are those that differ between alternatives. Often, the keep-versus-eliminate decision arises because the product or segment appears to be generating less of a profit than in prior periods or is unprofitable. In these situations, the product or segment may produce a positive contribution margin but may appear to have a lower or negative profit because of the allocation of common fixed costs.

Fundamentals of the Decision to Keep or Discontinue a Segment or Product

Two basic approaches can be used to analyze data in this type of decision. One approach is to compare contribution margins and fixed costs. In this method, the contribution margins with and without the segment (or division or product line) are determined. The two contribution margins are compared and the alternative with the greatest contribution margin would be the chosen alternative because it provides the biggest contribution toward meeting fixed costs.

The second approach involves calculating the total net income for retaining the segment and comparing it to the total net income for dropping the segment. The company would then proceed with the alternative that has the highest net income. In order to perform these net income calculations, the company would need more information than they would need in order to follow the contribution margin approach, which does not consider the costs and revenues that are the same between the alternatives.

Think it Through: Allocating Common Fixed Costs

Acme, Co., has three retail divisions: Small, Medium, and Large. Sales, variable costs, and fixed costs for each of the divisions are:

	Sales	Variable Costs	Fixed Costs
Small	$ 5,000,000	$ 2,875,000	$2,450,000
Medium	10,000,000	7,235,000	5,125,000
Large	25,000,000	18,960,000	8,230,000

Figure 5.9.1: Various costs associated with the three divisions

Included in the fixed costs are $\$5,400,000$ in allocated common costs, which are split evenly among the three divisions. Is an even split the best way to allocate those costs? Why or why not? What other ways might Acme consider using to allocate the common fixed costs?

Sample Data

Suppose SnowBucks, Inc., has three product lines: snow boots, snow sporting equipment, and a clothing line for winter sports. It has been brought to senior management's attention that the snow boot product line is unprofitable. Figure 5.9.2 shows the data presented to senior management:

	Snow Boots	Snow Sporting Equipment	Clothing Line	Total
Sales	$1,150,000	$1,540,000	$1,354,000	$4,044,000
Cost of goods sold				
Variable manufacturing expenses	423,000	507,000	378,000	1,308,000
Fixed manufacturing expenses	392,000	413,000	353,000	1,158,000
Gross margin	335,000	620,000	623,000	1,578,000
Selling and administrative expenses				
Variable selling and administrative expenses	195,000	130,000	147,000	472,000
Fixed selling and administrative expenses	216,000	216,000	216,000	648,000
Operating income	$ (76,000)	$ 274,000	$ 260,000	$ 458,000

Figure 5.9.2: Operating Income Report for SnowBucks, by Segment. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Upon initial review, it appears that the snow boot product line is unprofitable. Should this product line be eliminated? To adequately analyze this situation, a proper analysis of the relevant revenues and costs must be made. The functional income statement in Figure 5.9.2 does not separate relevant from non-relevant costs.

In conducting the analysis, the accounting team discovers that each product line is allocated certain costs over which the product line managers have no control. These **allocated costs** are typically associated with areas of the company that do not generate revenue but are necessary for the running of the organization, such as salaries for executives, human resources, and accounting at headquarters.

The cost of these parts of the organization must somehow be shared with the revenue-generating portions of the business. Companies often allocate these costs to other parts of the organization based on some formula, such as dividing the total costs by the number of divisions or segments, as a percentage of total revenue, or as a percentage of total square footage.

SnowBucks currently allocates these costs equally to the three product lines, and all the fixed selling and administrative expenses are considered allocated costs. In addition, the fixed manufacturing expenses represent factory rent, depreciation, and insurance, and all these costs will continue to exist regardless of whether the snow boot division continues. However, included in the fixed manufacturing expenses is the $\$75,000$ salary of a sales supervisor for each division. This is an avoidable fixed cost as this cost would no longer exist if any division ceased operating.

Calculations Using Sample Data

Based on the new information, a new analysis using a product line margin indicates the following:

	Snow Boots	Snow Sporting Equipment	Clothing Line	Total
Sales	$1,150,000	$1,540,000	$1,354,000	$4,044,000
Variable expenses				
Variable manufacturing expenses	423,000	507,000	378,000	1,308,000
Variable selling and administrative expenses	195,000	130,000	147,000	472,000
Contribution margin	532,000	903,000	829,000	2,264,000
Direct fixed manufacturing expenses	75,000	75,000	75,000	225,000
Product margin	457,000	828,000	754,000	2,039,000
Allocated fixed expenses				
Fixed selling and administrative expenses				648,000
Fixed manufacturing expenses				933,000
Operating income				$ 458,000

Figure 5.9.3: A new analysis using a product line margin

Final Analysis of the Decision

This new analysis shows that when the relevant costs and revenues are considered, it is apparent the snow boot product line is contributing toward meeting the fixed costs of the organization and therefore to overall corporate profitability. The reason the snow boot product line was showing an operating loss was due to the allocation of common costs. Consideration should be given to the way allocated costs are assigned to the various products to determine if the allocation is logical or if another allocation method, such as one based on each product line's percentage of the total corporate sales, would provide a better matching of costs and services provided by corporate headquarters. Management should also consider qualitative factors, such as the impact of removing one product line on the overall sales of the other products. If customers commonly buy snow boots and skis together, then discontinuing the snow boot line could impact the sales of snow skis.

Example 5.9.1: Disney's Segments

View Walt Disney Company's 2018 full year earnings report on their website. Scroll to the section on Segment Results and answer these questions:

a. How many segments does Disney have?
b. Which segment had the highest revenue in 2018?
c. Which segment had the highest operating income in 2018?
d. Which segment has shown the most revenue growth between 2017 and 2018?
e. How many segments showed growth in operating income between 2017 and 2018 and how many segments showed a decline in operating income between 2017 and 2018?
f. Which segment has shown the least operating income growth between 2017 and 2018?

Solution

a. Four: Media Networks, Parks & Resorts, Studio Entertainment, and Consumer Products & Interactive Media
b. Media Networks
c. Media Networks
d. Studio Entertainment

e. Two segments (Parks & Resorts and Studio Entertainment) showed operating income growth, while two segments (Media Networks and Consumer Products & Interactive Media) showed a decline in operating income between 2017 and 2018.
f. Consumer Products & Interactive Media

Footnotes

1. GE Businesses. n.d. https://www.ge.com/; Disney. "Our Businesses." n.d. https://www.thewaltdisneycompany.com...our-businesses
2. Hayley Peterson. "Macy's May Shut Down Even More Stores." *Business Insider*. May 12, 2017. http://www.businessinsider.com/macys...-stores-2017-5
3. Jason Williams. "Delta Downsizing Flights to 14 More Cities." Cincinnati.com. Mar. 11, 2015. http://www.cincinnati.com/story/news...ucky/24701445/

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- Template:ContribManagerialAccountingOpenStax

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5.10: Evaluate and Determine How to Make Decisions When Resources Are Constrained

Companies use various resources to be productive. These resources, which include time, labor, space, and machines, are limited, thus constraining the ability of a company to have unlimited productive capacity. For example, a retail store is constrained by the amount of floor space available to display its goods, while a law office may be constrained by the number of hours the paralegal team can feasibly work. These constraints require companies to make decisions on the best ways to allocate their resources in a way that maximizes the benefit to the firm. This situation is especially true when a company is operating at capacity or makes multiple products or provides multiple services.

The question as to which products and how many should be made is a common constraint problem. For example, consider a business that runs at capacity, making four products by running two eight-hour shifts per day, seven days a week for 50 weeks per year. This business is limited to $5,600$ working hours per year $(8 \text{ hr. shifts } \times 2 \text{ shifts } \times 7 \text{ days per week } \times 50$ weeks) unless a third shift is added. Adding a third shift may be prohibitive for any number of reasons, including local ordinances that prevent operating twenty-four hours a day, Environmental Protection Agency constraints, or the down-time of the machines that is required several hours a day for maintenance and calibration. What is the best way for this company to use these work hours? Which products should it produce first and how many of each should it produce?

These types of situations constrain, or limit, management's ability to use their facilities and workforce. Having limited availability of a resource, such as time, labor, or machine hours, means that item becomes a scarce resource. A **constraint** is a scarce resource that limits the output or productive capacity of the organization.

Ordinarily, there are very few actual constraints in any process. Sometimes, there is only one. However, the existence of a constraint can have a major effect on the productivity of an organization. This fact applies to all types of entities, such as production facilities or service providers. One way to view this issue is to consider the old cliché that *a chain is only as strong as its weakest link*. In the example, when trying to measure or estimate an organization's maximum efficiency, its results will often be reduced by the overall negative effects of the constraints. When the constraint slows production, it is called a **bottleneck**. Managers are often faced with the problem of deciding how to best use a scarce resource to prevent bottlenecks. Under the constraint of limited resources, how do managers make decisions when they are working within these conditions?

Fundamentals of How to Make Decisions When Resources are Constrained

As with other short-term decisions, a company must consider the relevant costs and revenues when making decisions when resources are constrained. Whether the organization facing a constraint is a merchandising, manufacturing, or service organization, the initial step in allocating scarce or constrained resources is to determine the **unit contribution margin**, which is the selling price per unit minus the variable cost per unit, for each product or service. The company should produce or provide the products or services that generate the highest contribution margin first, followed by those with the second highest, and so forth. The total contribution margin will be maximized by promoting those products or accepting those orders with the highest contribution margin in relation to the scarce resource. In other words, products or services should be ranked based on their **unit contribution margin per production restraint**, which is the unit contribution margin divided by the production restraint.

If constraints are not managed, a bottleneck usually results, meaning that production slows and a back-up occurs at stages prior to the bottleneck. For example, in producing boxes of cereal, if the cereal is produced at a rate of $1,000$ ounces per minute but the bagging machines can only bag 800 ounces per minute, this will create a bottleneck. Similarly, if on a Saturday morning before a home football game, the local grocery store has ten checkout lines but only opens four of them, long lines will result from the constraint of too few checkout lanes available. Management must decide how many scarce resources (employees, in this example) to pull from stocking the shelves to running cash registers. It may be difficult to see how bottlenecks affect profitability, and they appear to be more of a timing or throughput issue. But bottlenecks can affect profitability in a number of ways. Bottlenecks at the grocery store can result in customers leaving to shop elsewhere or can negatively affect the reputation of the store, which can impact future sales. In the cereal example, bottlenecks in the packaging area can slow the delivery of boxes of cereal to distributors and individual stores. Poor or inconsistent delivery may drive customers to purchase from other cereal manufacturers, which would have a definite impact on profitability.

A common problem relating to constraints occurs in multi-product production environments. Management will need to evaluate the constraints to determine the best mix of products that will minimize the effects of the constraints. In addition to making sure that the best product mix is chosen, managers should seek ways to increase the effective capacity of the constraint. Conceptually, there are two ways a company can do this: increase the rate of output at the bottleneck, or increase the time available at the bottleneck. Increasing the capacity of the constraint or bottleneck is also called *relaxing the constraint* or *elevating the constraint*. Some specific examples of ways to relax the constraint include:

- Keep the production facilities open longer hours. This may allow the workflow through the bottleneck area to be slowed and thus prevent the bottleneck from occurring. However, this may require paying workers overtime pay.
- If working extra hours is not a viable option, then moving additional workers to the bottleneck area may be beneficial as long as the areas from which they were moved are adequately covered and additional problem areas do not result.
- Instead of using current workers, additional staff may be hired to smooth the workflow through the bottleneck area.
- Outsource some or all of the work in the area of the bottleneck. It may be cheaper and more cost effective to buy parts or components than to slow production due to the bottleneck.
- Redesign the production process to prevent the bottleneck by adding more resources to eliminate the bottleneck, reorganizing the process to distribute the bottleneck-causing activities to different parts of the production process, or managing processing times at other stages prior to the bottleneck to help prevent the bottleneck from occurring.
- Insuring a minimal number of defects and rework, since they typically slow the production process and thus add to the bottleneck.

Preventing and minimizing bottlenecks can have significant benefits to the bottom line of the company. The reduction of bottlenecks allows the company to move more products through the production phase and thus be ready to sell.

Ethical Considerations: When to Include a Lifesaving Option - The Case of the Ford Pinto

The case of the fiery Ford Pinto demonstrates that more than cost and revenue should be considered when making an ethical business decision. In the early 1970s, the Ford Motor Company set out to build a Pinto for less than $\$2,000$. Cars were much less expensive then, and Ford had to determine whether or not to include a component part that cost around $\$10$. Given the high cost, Ford decided not to include the component, a rubber bladder for the gas tank. However, in rear-end collisions at over 21 miles per hour, the rubber bladder component functions to prevent the gas tank from flooding the interior of the car with gasoline and gas fumes. Because of the decision not to include the component, a number of Pintos involved in collisions exploded into flames, injuring and sometimes killing the occupants.

Although Ford was aware of the defect, the company's cost/benefit analysis indicated it was less expensive to build Pintos without the rubber bladder, even when including expected reimbursement costs for anyone injured or killed. However, the decision to allow a defective product to be built in order to reduce overall costs caused a significant hit to Ford's reputation. Ultimately, the litigation costs for knowingly constructing a defective car were higher than the original cost of including the rubber bladder component. While Ford's decision seemed profitable in the short-term, their financial analysis could have been improved if it also took into account long-term impacts.

Sample Data

Wood World, Inc., produces wooden desks, chairs, and bookcases. These items are produced using the same machines, and there is a maximum of $80,000$ machine-hours available during the year. The information about the production time and costs for these three items is:

	Desks	Chair	Bookcase
Hours to produce	1	0.50	0.25
Selling price	$350	$200	$175
Direct materials	$ 40	$ 30	$ 35
Direct labor	$ 70	$ 65	$ 50
Variable overhead	$ 55	$ 50	$ 45
Fixed overhead	$ 28	$ 32	$ 24

Figure 5.10.1: Information about the production time and costs for three items

Wood World is limited in producing its products by the number of possible machine-hours. Orders have been received for $60,000$ desks, $48,000$ chairs, and $40,000$ bookcases, which will require $94,000$ machine-hours to produce. Since there are not enough machine-hours available to fill all of the orders, which orders should Wood World fill first?

Calculations Using Sample Data

To address this question, Wood World must find the contribution margin per machine-hour since machine-hours are the constraining factor for production.

	Desks	Chair	Bookcase
Selling price	$ 350	$ 200	$ 175
Direct materials	$ 40	$ 30	$ 35
Direct labor	$ 70	$ 65	$ 50
Variable overhead	$ 55	$ 50	$ 42
Contribution margin	$ 185	$ 55	$ 48
Hours to produce	1	0.50	0.25
Contribution margin per machine-hour	$ 185	$ 110	$ 192

Figure 5.10.2: Contribution margin per machine-hour

Final Analysis of the Decisions

Wood World should fulfill the orders for bookcases first, desks second, and chairs last. The bookcases provide the highest contribution margin per machine-hour, followed by desks and then chairs. Maximizing the contribution margin per constraint, in this case per machine-hour, is the best way for Wood World to manage the constraint. How many of each item will be produced?

Available machine hours	$80,000$
Hours to fill bookcase orders $(40,000 \times 0.25)$	$10,000$
	$70,000$
Remaining hours	
Hours to fill desk orders $(60,000 \times 1)$	$60,000$
	$10,000$
Remaining hours	$60,000$
	$10,000$
Hours needed to produce chairs	$\div 0.50$
	$20,000$

Therefore, based on contribution margin and the constraint of machine hours, Wood World should fill all $40,000$ of the bookcase orders first, then fill the $60,000$ desk orders, and fill $20,000$ of the chair orders last.

Are there any qualitative issues that Wood World should consider? One concern may be that customers who typically buy a desk and chair together may not be able to do so if the chair production is affected by a bottleneck. Another qualitative issue in keeping with the furniture example is that a company might find producing dining room tables to be significantly more profitable than

matching chairs or matching cupboards. However, they will still be required to produce the less profitable chairs and cupboards, because many consumers will want to buy all three items as a set.

The benefits of effectively managing constraints can be enormous. Managers need to understand the positive impact effective management of constrained resources can have on the company's bottom line. The contribution margin per unit of the scarce resource can be used to assess the value of relaxing the constraint. When there is unsatisfied demand for a single product because of a constraint, the value of additional time on the constraint is simply the contribution margin per unit of the scarce resource for that product. When there are two or more products with unsatisfied demand, the value of additional time on the bottleneck would be the largest contribution margin per unit of the scarce resource for any product whose demand is unsatisfied. In many situations, when dealing with conflicting time constraints, an evaluation of multiple bottlenecks might identify a viable solution. While many bottleneck issues and their solutions could be somewhat complex, others might be addressed more simply. For example, in some cases the problem might be solved by the addition of an additional work shift.

Concepts in Practice: Distributing Caseloads at a Law Firm

As a new business school graduate, you landed your first job in the human resources department of a large national law firm in New York City. Your position is providing you with many opportunities to learn about the company and the various tasks for which the human resources department is responsible. Your most recent assignment is to determine the best way to distribute caseloads to the junior level attorneys based on their areas of expertise and to assign paralegal hours to assist the junior level attorneys. What are the constraints with which you are dealing? What information do you need to properly complete this assignment? What type of analysis would be required to effectively allocate caseload hours?

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5.11: Explain the Importance of Performance Measurement

As you learned in Responsibility Accounting and Decentralization, as a company grows, it will often decentralize to better control operations and therefore improve decision-making. Remember, a decentralized organization is one in which the decision-making is spread among various managers throughout the organization and does not solely rest with the chief executive officer (CEO). However, with this dispersion of decision-making comes an even greater need to monitor the results of the decisions made by the many managers at the various levels of the organization to ensure that the overall goals of the organization are still being met.

Ethical Considerations: Ethical Evaluation of Performance Measures

To evaluate whether decisions made by management are both effective and ethical, performance is measured through responsibility accounting. This is a double-layer ethical analysis that requires some thought to establish and implement, as the evaluation system must also operate in an ethical fashion, just as the decision-making process itself does. In most organizations, the overall results of choices made by management, not just the resulting profit, need to be examined to determine whether or not the decisions are ethical.

When an organization's customers and other stakeholders are happy, and the corporate assets are in good condition, these are indicators that the customers, stakeholders, and assets are being treated ethically. Evaluation of customer and stakeholder satisfaction should come directly from the customer, such as through surveys or other direct questionnaires. Proper treatment of organizational assets can be determined by viewing the physical condition of such assets, or the loss rates and productivity of equipment. Customer satisfaction and positive results in the utilization of corporate assets typically indicate ethical decision-making and behavior, while negative results typically indicate the opposite. An organization with a satisfied group of stakeholders and customers, as well as assets that operate efficiently, is often more profitable in the long term.

Managerial accountants therefore must design a framework of **responsibility accounting** in which the evaluation system is based on criteria for which a manager is responsible. The framework should be structured to encourage managers to make decisions that will meet the goals of the company as well as their own professional goals. In your study of managerial accounting, you have learned about company goals such as increasing market share, increasing revenues, decreasing costs, and decreasing defects. Managers and employees have their own goals. These goals can be work related, such as promotions or awards, or they can be more personal, such as receiving raises, receiving bonuses, the privilege of telecommuting, or shares of company stock. This aligning of goals between a corporation's strategy and a manager's personal goals is known as **goal congruence**. Managers should make the best decisions for the benefit of the corporation, and the best way to motivate a manager to make those decisions is to link a reward system to performance results. To accomplish this, a business establishes performance evaluation measures that align the decisions made by management with the goals of the corporation and the professional goals of the manager.

Fundamentals of Performance Measurement

Performance measurement is used to motivate managers to make decisions that benefit the corporation and themselves. Therefore, the key to good performance measurement techniques is to set goals that are realistic and that incorporate decisions over which the manager has control. Then, the company can evaluate the manager based on **controllable factors**, which are the components of the organization for which the manager is responsible and that the manager can control, such as revenues, costs, and procurement of long-term assets, and other possible factors. Recall that in Responsibility Accounting and Decentralization, you learned about responsibility centers, which are a means by which an organization can be divided based on factors that the manager can control. This makes it easier to align the goals of the manager with those of the organization and to design effective performance measures. The four types of responsibility centers are revenue centers, cost centers, profit centers, and investment centers.

In a **revenue center**, the manager has control over the revenues that are generated for the corporation but not over the costs of the organization. For example, the reservations department of an airline is a revenue center because the reservationists can control revenues by selling customers upgrades such as meals or first-class seating, by selling trip insurance, or by trying to keep customers from going to another airline. However, reservationists cannot control the costs of the flights the airline is offering and reserving

because the reservation department cannot control the cost of the planes, airport space rental, or jet fuel. Therefore, the manager of the reservation department should have performance evaluation measures closely related to revenue generation.

In a **cost center**, the manager has control over costs but not over revenues. An example of a cost center would be the accounting department of a grocery store chain. The manager can control the types of people hired, the wages that are paid, and the hours that are worked within that department, and each of these costs contributes to the total cost of the department. However, the manager of the accounting department has no control over the generation of revenues.

In a **profit center**, the manager has control over both revenues and costs. An example would be a single location of Best Buy. The manager at that store has control over both revenues and costs; therefore, one component of evaluation for that manager will be store profits.

An **investment center** is a component of a business for which the manager has control over revenues, costs, and capital assets. This means the manager not only can make decisions regarding generating revenues and controlling costs but also has authority to make decisions regarding assets, such as buying new machines, expanding facilities, or selling old assets. With each of these types of centers, designing the appropriate performance measures begins with evaluating management based on which business areas they oversee.

Using the previous revenue center example, the manager of the reservation department should be evaluated on how well his team generates revenues. The proper incentives will motivate the team to perform better at their jobs. Evaluating a manager on the outcome of decisions over which he or she has no control, or **uncontrollable factors**, will be demotivating and does not promote goal congruence between the organization and the manager. The reservations manager has no control over fuel costs, plane maintenance costs, or pilot salaries. Thus, it would not be logical to evaluate the manager on flight costs.

A good **performance measurement system** is one that utilizes appropriate **performance measures**, which are performance metrics used to evaluate a specific attribute of a manager's role, to evaluate management in a way that will link the goals of the corporation with those of the manager. A **metric** is simply a means to measure something. For example, high school grade point average is a metric used by colleges when considering admission of prospective students, as it is considered a measure of prior academic success. In the business environment, individuals who design the performance measurement system must have extensive knowledge of the corporate strategic plan and the overall goals set by the organization, and a clear understanding of the job descriptions, responsibilities of each manager, and trends in rewards and compensation.

Think it Through: Motivating Dental Industry Employees

As a dentist and owner of your own practice, you are considering ways to both reward and motivate your staff. The obvious choice is to simply give each employee a raise. However, you have heard that many businesses are compensating their employees for meeting various goals that are beneficial to the business. What types of goals might the dental practice have? What are several ideas for ways to motivate the staff, which consists of a receptionist, dental assistants, and dental hygienists? What are possible rewards for meeting goals?

Advantages Derived from Performance Measurement

Every business has a **strategic plan**, or a broad vision of how it will be in the future. This plan leads to goals that must be achieved to fulfill that vision. As shown in Figure 5.11.1, a business will use the strategic plan to determine the goals needed to achieve the strategic vision. Once goals are determined, the business will decide on the appropriate actions necessary to meet the goals. Then, the business will implement, review, and adjust the goals as needed. Properly designed performance measures will help move the company toward meeting the goals of its strategic plan. Advantages of a good performance management system include increased employee retention and loyalty, better communication between the various levels of management, increased productivity, and increased efficiencies. In addition, a well-designed performance plan should lead to improved job satisfaction for the manager and increased personal wealth if the rewards are monetarily based. In summary, a company needs to first identify and create a strategy and then set the necessary goals, which will lead to actions, and finally to an applicable evaluation process.

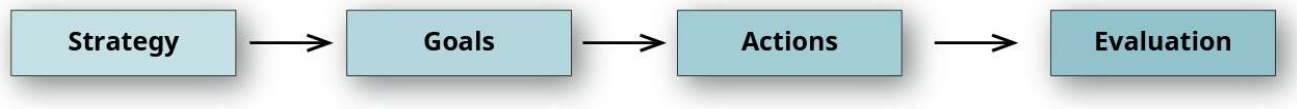

Figure 5.11.1: Strategy-to-Action Sequence. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Example 5.11.1: Measuring Employee Performance

All companies need ways to measure the performance of employees. These measures should be designed in a way that the rewards for performance will motivate the employees to make decisions that are good for the business. If this were your company, what are five goals you would have for your business? What are some measures you could use to see if you are meeting those goals? What types of incentives could you offer to motivate your employees to help meet these goals? Use Table 5.11.1 for your answers.

Table 5.11.1

Motivating Employees toward Business Goals		
Five Business Goals	Measures to Meet Goals	Incentives to Motivate Employees toward Goals

Solution

Answers will vary. Sample answer:

Motivating Employees toward Business Goals		
Five Business Goals	Measures to Meet Goals	Incentives to Motivate Employees toward Goals
Grow customer base	Number of new customers	Give a gift card to employees for each new customer they get
Increase company name recognition	Number of “likes” on Facebook, number of reviews on Google	Host a party or take employees to dinner after certain number of likes or positive reviews occur
Grow revenue each quarter	Percent change in revenue from prior quarter	Have a bonus pool that is shared after a targeted percentage increase in revenue is reached
Lower cost of supplies used per job	Compare the supplies used to a standard for each type of job	Provide a paid day off for suggestions that successfully reduce cost of supplies per job by 5%
Decrease time at each job/increase efficiency	Measure time on job using a call-in system of entering and leaving the job	Pay a flat additional amount for each time the employee performs a job within the allotted time, and that the customer satisfaction is a 5/5

Potential Limitations of Traditional Performance Measurement

What types of measures are used to evaluate management performance? Historically, performance measurement systems have been based on accounting or other quantitative numbers. One reason for this is that most accounting-based measures are easy to use due to their availability, since many accounting measures can be found in or generated from a company’s financial statements. Although this type of information is readily available, it does not mean the use of accounting numbers as performance measures is the best or only way to measure performance. One issue is that some accounting numbers can be affected by the actions of managers, and this may result in distorted performance results.

For example, as shown in Figure $5.11.2$, if a retail company uses a last-in, first-out (LIFO) inventory system and the manager of the retail store is evaluated based on either cost containment or profit, the manager can postpone a decision to purchase inventory at the end of the year until the beginning of the next fiscal year if prices of the inventory have risen. This decision will postpone the effect of that purchase and, in turn, the higher costs associated with that inventory, until the next accounting cycle. As you can see, in either scenario, the company ordered $500,000$ units of inventory but the timing of those orders, given the changing prices of the inventory, has a significant effect on income from operations. This scenario is an example of the possibility of an unintended conflict of interests between procurement and production decisions by an individual manager or department and the overall best interests of the company. A well-designed performance measurement system should eliminate these potential conflicts, as much as possible.

	Number of Units		(A) Decision to Avoid Purchase of Inventory at End of Accounting Period	(B) Decision to Purchase Inventory at End of Accounting Period	*Difference*
Sales ($20.00 per unit)	(A) 500,000	(B) 500,000	$10,000,000	$10,000,000	$ 0
Orders Placed for Inventory					
Aug. 1 ($ 9.00 per unit)	100,000				
Sep. 1 ($10.00 per unit)	100,000	100,000	$ 900,000	$ 0	
Oct. 1 ($12.00 per unit)	200,000	200,000	$ 1,000,000	$ 1,000,000	
Nov. 1 ($11.00 per unit)	50,000	50,000	$ 2,400,000	$ 2,400,000	
Dec. 1 ($12.00 per unit)	50,000	50,000	$ 550,000	$ 550,000	
Dec. 31 ($14.00 per unit)		100,000	$ 600,000	$ 600,000	
Total units ordered	**500,000**	**500,000**	$ 0	$ 1,400,000	
Cost of goods sold (LIFO)			$ (5,450,000)	$ (5,950,000)	$ 500,000 *increase*
Gross profit			$ 4,550,000	$ 4,050,000	$(500,000) *decrease*
Selling and administrative expenses			$ (2,000,000)	$ (2,000,000)	$ 0
Income from operations			$ 2,550,000	$ 2,050.000	$(500,000) *decrease*

Figure 5.11.2: Effects on Income of Delaying Inventory Order. If LIFO is being used and inventory prices are rising, when inventory is ordered has an impact on income. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Accounting numbers are often affected by economic conditions, but these economic effects are beyond the control of the manager. For example, if the parts used in a manufacturing process are ordered from another country, the manager cannot control the exchange rate that occurs between the two currencies, yet this can impact the cost of the components to the manager and thus affect the cost of the product the company is producing.

Some management decisions affect multiple periods, or the decision being made will have the greatest impact in a future period. For example, capital budgeting decisions affect not only the current but future periods as well. This may compel a manager to have a short-term focus, because increasing his immediate remuneration, or compensation, is often his goal. Many long-term decisions, such as capital budgeting decisions, maintenance on equipment, or advertising campaigns, may most significantly affect future accounting numbers and, in turn, the compensation of the manager in future periods. If a manager cannot see himself reaping the rewards of that decision in future years, the decision becomes less attractive. If a performance measurement system is not designed properly, it can lead to managers having a short-term focus or making decisions that have the greatest impact on their individual goals (such as reaching a bonus goal), even if these decisions are not in the best long-term interest of the corporation. Last, a manager focused solely on accounting numbers may miss opportunities for future benefits because making the decision will have a negative impact on accounting measures in the current period. For example, spending money to build a potential customer database may decrease income in the current year. If the manager's performance is measured based on the profitability of his division, he may avoid spending the money to create the customer database. However, that database may result in a significant increase in profitability in future years if the potential customers become actual customers.

Is there a way to prevent these issues associated with using accounting measures as performance measures? The use of non-accounting measures in conjunction with accounting-based measures can help mitigate the problems of using accounting-based measures alone. Therefore, most performance measurement systems today use a combination of accounting-based measures and non-accounting-based measures, short-term or long-term indicators, or quantitative and qualitative components. Let's first look at the use of accounting-based measures, and then we'll consider a methodology that also incorporates non-accounting-based measures.

Think it Through: Balancing Customer Needs with Company Needs

Noah Barnes just graduated from college and took a position as production supervisor for Morgensen Machines, which manufactures sewing machine and vacuum cleaner parts. On his first day at work, one of Morgensen's sales managers asked Noah if it would be OK to rearrange his manufacturing job schedule so that a special order from a new customer could be pushed to the front of the line. This new customer requires fast turnarounds; unfortunately, this also means running the production equipment for all three shifts at maximum output for at least one week, possibly more. This would completely prohibit the schedule that management told Noah to implement. Noah does not want to make the sales manager angry at him, but he also does not want to lose his job in the first month out of college. He knows that the manager is focused on landing this new customer, who could reward the company with a needed increase in overall sales and plant output. The problems, as Noah sees them, are that (1) current jobs will be delayed; (2) there will be greater demand on the machines during all three shifts, increasing the possibility that they will fail; (3) there will not be time for needed maintenance; and (4) eventually all of these factors will snowball into significant delays for the new customer, as well as extensive delays for the previously scheduled orders.

How should Noah handle this problem? What managerial principles would you advise him to use from his college studies to help him develop better policies for future events like this?

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5.12: Identify the Characteristics of an Effective Performance Measure

It is important to identify the characteristics that make a performance measure a good assessment of goal congruence. A good performance measurement system will align the goals of management with the goals of the corporation, and both parties will benefit. A lack of goal congruence in a performance measurement system can be detrimental to a business in many ways. Without proper performance measures, goal congruence is almost impossible to achieve and will likely lead to lost profits and dissatisfied employees,

A good performance measurement system should have the following characteristics:

- It should be based on activities over which managers have control or influence.
- It should be measurable.
- It should be timely.
- It should be consistent in its application.
- When appropriate, the actual results should be compared with the budgeted results, standards, or past performance.
- The measurements must not favor the manager over the goals of the entire organization. Often, managers have the ability to make decisions that favor their individual units but that may be detrimental to the overall performance of the organization.

As you've learned, it is important that the activities on which managers are evaluated are within that manager's control. In addition, it is very important for the information that is used in the performance measurement system to be gathered, evaluated, and presented in a timely manner. Performance measurement systems provide an indication of how well the evaluated managers are doing their jobs. Remember, the organization wants managers to make decisions that are in the best interest of the organization as a whole, and hence the need for the performance management system. If managers do not receive appropriate feedback in a timely manner, they will not know which decisions they should continue to make in the same manner and which are less effective. The same is true from the corporation's perspective. Timely information allows the evaluation team to determine the effects of individual management decisions on the corporation as a whole.

In addition to being timely, performance measures need to be applied or measured consistently. The accounting variables or other measures that are used to evaluate a manager should be measured the same way from period to period. For example, if a performance measure includes some form of income, such as operating income, then that measure should be used each time and not replaced with another income measure for the current measurement cycle (usually one year). If, upon further analysis, it seems that net income is a better measure to use in the evaluation of a manager, then the new measure can be implemented during the next measurement cycle. When measures are changed, it is imperative that the manager being evaluated is aware of the measurement change, as this may affect his or her decision-making. The idea is to keep the targets stable for a period. Otherwise, the measurements might be inconsistent, and thus misleading. A good performance measurement plan would include the manager's input in the design discussion. Not only does this help to ensure that the plan is clear to all parties involved in the process, it also helps to motivate managers. Rather than being told what goals are to be met, managers will be more motivated to achieve the goals if they have input into the process, the goals to be reached, and the measurements or metrics being used.

Performance measures are only useful if there is a baseline against which to compare the measured results. For example, students often evaluate how well they performed on a test by comparing their grade to the average for the test. If a student scored 65 out of 100 on a test, the initial response may be that this is a less than stellar grade unless that score is compared to the average. Suppose the average on that particular test was a 50. Obviously, in this example, the student performed above average on this test, but this could not be interpreted correctly until the score was compared to a baseline. In evaluating performance measures, a standard, baseline, or threshold is typically used as a basis against which to compare the actual results of the manager.

A company has both short- and long-term goals. Short-term goals include reducing costs of production by a certain percentage for the current year or increasing year-over-year sales by a certain percentage. Long-term goals may include expanding into new territories or adding new products. Employees also have short- and long-term goals. Short-term goals can include a beach vacation, and long-term goals can include saving for retirement or college. A good performance measurement system will include both short- and long-term measures in order to motivate managers to make decisions that will fulfill both the corporation and their own short- and long-term goals.

You've learned about the human factor that causes managers to make what is typically the best decision for themselves rather than the best decision for the overall good of the corporation, especially if the decision that benefits the corporation is not beneficial to the manager. Again, this means the performance measurement system must attempt to prevent the manager from benefiting without the corporation also benefiting. This is one of the trickiest parts of performance measurement system design.

For example, suppose the manager of the used car department at an automobile dealership is responsible for the profit he makes selling used cars that were taken as trade-ins on new car sales. Some of these used cars need a few repairs to prepare them for sale. The manager has the option of getting the cars fixed using the service department at the dealership or outsourcing the repairs to another company. If the manager can get the repairs completed at a lower cost at another repair shop, and if he is evaluated and receives a bonus based on his profit, then he is likely to use the outside repair shop. Is this a good thing to do? Obviously, it is good for the manager of the used car department who will have fewer costs getting the used car ready to sell and therefore will make more of a profit from the sale of that car. Higher profits for the used car department mean a higher bonus for the manager. But what about for the dealership? Was outsourcing the repairs the right decision?

It depends on several factors, but here are points to ponder. What if the dealership's service department is more expensive because it provides higher-quality parts and the mechanics are certified? Does the reputation of the quality of the used cars sold by the dealership affect more than just the used car department? What if the service department could have completed the work at cost? As you can tell by these questions, without further information, we do not know whether or not the used car manager should outsource the repairs. But we do know that his decision was based on his bonus being tied to his profitability and not linked to other factors such as dealership profitability or dealership reputation (customer satisfaction). Therefore, it is important that the performance management system not promote decisions that only benefit the manager to the detriment of the corporation.

NASA

Nearly twenty years ago, the National Aeronautics and Space Administration (NASA) along with five NASA contractors undertook a project to derive performance measures. As a result, they developed a series of five models for measures. These measures included effectiveness, quantity, quality, value, and change, and are as follows:

- Effectiveness was measured as projected/actual. An example was the number of tests completed/number of tests planned.
- Quantity was measured as process or product unit/sources of cost. An example was the total number of wind tunnel tests run/facilities management cost.
- Quality was measured as indicators of error, loss/process, or product unit. An example of quality measures is mistakes in work packages issued/work packages issued in total.
- Value was measured as desirability/source of cost. An example of value measures is savings from the suggestion program/man hours to review suggestions.
- Change was measured as the information provided by the indexes that are developed by tracking the same performance measures over time. An example would be the improvement measures, like
  - Reduction by X percent in downtime of facilities/tests accomplished or attempted or
  - Increase by X percent of documents prepared by/procurement clerk

These measures have some distinct advantages but also may be met with some resistance from employees and contractors. Advantages likely included a better understanding of their processes as well as an understanding of the amount of time wasted and value derived from these processes. Development and implementation become an opportunity to discover what may be wrong with processes, to start a dialogue concerning ongoing change and improvement, and to communicate and brainstorm about organizational inefficiencies. Networking involved in development of the performance measures can become an equalizer among processes that break down silos and complexity.

Resistance would likely come from the measurements being too time-consuming and the processes too complex to be charted for these measurement objectives. How can upper management judge the complex progress on projects if they have little to no involvement? If these measures were so important, then NASA would have already developed them in an organization that was started around 1960. Resistance like this develops as one where the prior absence of these measures becomes the primary resistance toward developing them.

Link to Learning

General Electric is changing their performance measurement practices to more closely align with the goals of millennials. Read the Impraise blog on GE Performance Reviews for more details.

Footnotes

1. D. Kinlaw. “Developing Performance Measures with Aerospace Managers.” *National Productivity Review*. December 1, 1986.

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5.13: Evaluate an Operating Segment or a Project Using Return on Investment, Residual Income, and Economic Value Added

There are three performance measures commonly used when a manager has control over investments, such as the buying and selling of inventory and equipment: return on investment, residual income, and economic value added. These measures use financial accounting data to evaluate how well a manager is meeting certain goals.

Introduction to Return on Investment, Residual Income, and Economic Value Added as Evaluative Tools

One of the primary goals of a company is to be profitable. There are many ways a company can use profits. For example, companies can retain profits for future use, they can distribute them to shareholders in the form of dividends, or they can use the profits to pay off debts. However, none of these options actually contributes to the growth of the company. In order to stay profitable, a company must continuously evolve. A fourth option for the use of company profits is to reinvest the profits into the company in order to help it grow. For example, a company can buy new assets such as equipment, buildings, or patents; finance research and development; acquire other companies; or implement a vigorous advertising campaign. There are many options that will help the company to grow and to continue to be profitable.

One way to measure how effective a company is at using its invested profits to be profitable is by measuring its **return on investment (ROI)**, which shows the percentage of income generated by profits that were invested in capital assets. It is calculated using the following formula:

$$\text{ROI} = \frac{\text{Income}}{\text{Average Capital Assets}} \tag{5.13.1}$$

Capital assets are those tangible and intangible assets that have lives longer than one year; they are also called *fixed assets*. ROI in its basic form is useful; however, there are really two components of ROI: sales margin and asset turnover. This is known as the *DuPont Model*. It originated in the 1920s when the DuPont company implemented it for internal measurement purposes. The DuPont model can be expressed using this formula:

$$\text{ROI} = \text{Sales Margin} \times \text{Asset Turnover} \tag{5.13.2}$$

Sales margin indicates how much profit is generated by each dollar of sales and is computed as shown:

$$\text{Sales Margin} = \frac{\text{Income}}{\text{Sales Revenue}} \tag{5.13.3}$$

Asset turnover indicates the number of sales dollars produced by every dollar invested in capital assets—in other words, how efficiently the company is using its capital assets to generate sales. It is computed as:

$$\text{Asset Turnover} = \frac{\text{Sales Revenue}}{\text{Average Capital Assets}} \tag{5.13.4}$$

Using ROI represented as $\text{Sales Margin} \times \text{Asset Turnover}$, we can get another formula for ROI. Substituting the formulas for each of these individual ratios, ROI can be expressed as:

$$\text{RoI} = \left(\frac{\text{Operating Income}}{\text{Sales Revenue}}\right) \times \left(\frac{\text{Sales Revenue}}{\text{Average Capital Assets}}\right) \tag{5.13.5}$$

To visualize this ROI formula in another way, we can deconstruct it into its components, as in Figure 5.13.1.

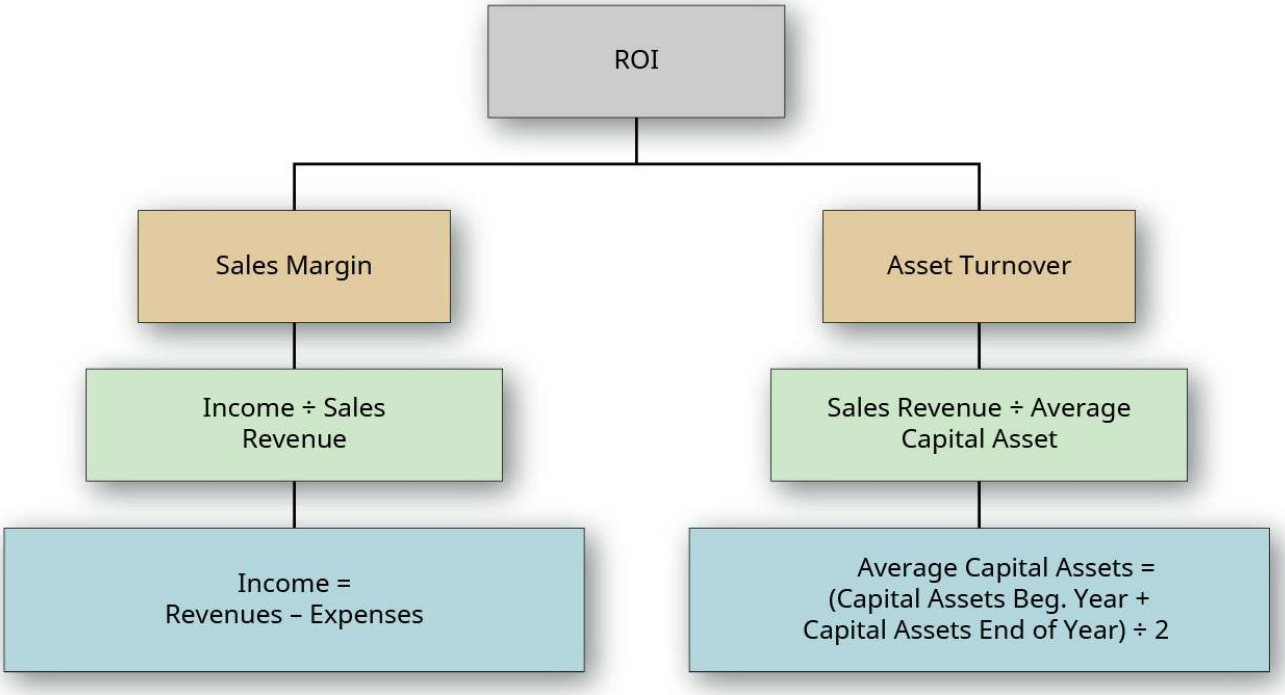

Figure 5.13.1: Decomposition of ROI into the Components Sales Margin and Asset Turnover. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

When sales margin and asset turnover are multiplied by each other, the sales components of each measure will cancel out, leaving

$$\text{ROI} = \frac{\text{Income}}{\text{Average Capital Assets}} \tag{5.13.6}$$

ROI captures the nuances of both elements. A good sales margin and a proper asset turnover are both needed for a successful operation. As an example, a jewelry store typically has a very low turnover but is profitable because of its high sales margin. A grocery store has a much lower sales margin but is successful because of high turnover. You can see it is important to understand each of these individual components of ROI.

Calculation and Interpretation of the Return on Investment

To put these concepts in context, consider a bakery called Scrumptious Sweets, Inc., that has three divisions and evaluates the managers of each of these decisions based on ROI. The following information is available for these divisions:

	Donut Division	Bagel Division	Brownie Division
Income	$1,000,000	$2,500,000	$1,300,000
Sales Revenue	5,000,000	8,500,000	5,500,000
Assets Jan. 1	2,800,000	5,950,000	4,850,000
Assets Dec. 31	2,900,000	5,950,000	4,820,000

Figure 5.13.2: Scrumptious Sweets, Inc. information available on it's 3 divisions

This information can be used to find the sales margin, asset turnover, and ROI for each division:

	Donut Division	Bagel Division	Brownie Division
Sales Margin	$\frac{\$1,000,000}{\$5,000,000} = 20\%$	$\frac{\$2,500,000}{\$8,500,000} = 29\%$	$\frac{\$1,300,000}{\$5,500,000} = 24\%$
Asset Turnover	$\frac{\$5,000,000}{\$2,850,000^*} = 1.75$ times	$\frac{\$8,500,000}{\$5,950,000^{**}} = 1.43$ times	$\frac{\$5,500,000}{\$4,835,000^{***}} = 1.14$ times
ROI	$\frac{\$1,000,000}{\$2,850,000^*} = 35\%$	$\frac{\$2,500,000}{\$5,950,000^{**}} = 42\%$	$\frac{\$1,300,000}{\$4,835,000^{***}} = 27\%$

*The average capital assets for donuts are $\frac{(2,800,000 + 2,900,000)}{2} = 2,850,000.$

**The average capital assets for bagels are $\frac{(5,950,000 + 5,950,000)}{2} = 5,950,000.$

***The average capital assets for brownies are $\frac{(4,850,000 + 4,820,000)}{2} = 4,835,000.$

Figure 5.13.3: Scrumptious Sweets, Inc. information available on its 3 divisions used to find the sales margin, asset turnover, and ROI for each division

Alternatively, ROI could have been calculated by multiplying $\text{Sales Margin} \times \text{Asset Turnover}$:

	Donut Division	Bagel Division	Brownie Division
ROI	20% × 1.75 times = 35%	29% × 1.43 times = 42%	24% × 1.14 times = 27%

Figure 5.13.4: Scrumptious Sweets, Inc. sample calculations

ROI measures the return in a percentage form rather than in absolute dollars, which is helpful when comparing projects, divisions, or departments of different sizes. How do we interpret the ROIs for Scrumptious Sweets? Suppose Scrumptious has set a target ROI for each division at 30% in order to share in the bonus pool. In this case, both the donut division and the bagel division would participate in the company bonus pool. What does the analysis regarding the brownie division show? By looking at the breakdown of ROI into its component parts of sales margin and asset turnover, it is apparent that the brownie division has a higher sales margin than the donut division, but it has a lower asset turnover than the other divisions, and this is affecting the brownie division's ROI. This would provide direction for management of the brownie division to investigate why their asset turnover is significantly lower than the other two divisions. Again, ROI is useful if there is a benchmark against which to compare, but it cannot be judged as a stand-alone measure without that comparison.

Managers want a high ROI, so they strive to increase it. Looking at its components, there are certain decisions managers can make to increase their ROI. For example, the sales margin component can be increased by increasing income, which can be done by either increasing sales revenue or decreasing expenses. Sales revenue can be increased by increasing sales price per unit without losing volume, or by maintaining current sales price but increasing the volume of sales. Asset turnover can be increased by increasing sales revenue or decreasing the amount of capital assets. Capital assets can be decreased by selling off assets such as equipment.

For example, suppose the manager of the brownie division has been running a new advertising campaign and is estimating that his sales volume will increase by 5% over the next year due to this ad campaign. This increase in sales volume will lead to an increase in income of $\$140,000$. What does this do to his ROI? Division income will increase from $\$1,300,000$ to $\$1,440,000$, and the division average assets will stay the same, at $\$4,835,000$. This will lead to an ROI of 30%, which is the ROI that must be achieved to participate in the bonus pool.

Another factor to consider is the effect of depreciation on ROI. Assets are depreciated over time, and this will reduce the value of the capital assets. A reduction in the capital assets results in an increase in ROI. Looking at the bagel division, suppose the assets in that division depreciated $\$500,000$ from the beginning of the year to the end of the year and that no capital assets were sold and none were purchased. Look at the effect on ROI:

Bagel Division	Original ROI	ROI with Increased Depreciation
	$\frac{\$2,500,000}{\$5,950,000*} = 42\%$	$\frac{\$2,500,000}{\$5,700,000**} = 44\%$

*The original average capital assets for bagels are $\frac{(5,950,000 + 5,950,000)}{2} = 5,950,000.$

**The new average capital assets for bagels are $\frac{(5,950,000 + 5,450,000)}{2} = 5,700,000.$

Figure 5.13.5: Scrumptious Sweets, Inc. sample calculations

Notice that depreciation helped to improve the division's ROI even though management made no new decisions. Some companies will calculate ROI based on historical cost, while others keep the calculation based on depreciated assets with the idea that the manager is efficiently using the assets as they age. However, if depreciated values are used in the calculation of ROI, as assets are replaced, the ROI will drop from the prior period.

One drawback to using ROI is the potential of decreased goal congruence. For example, assume that one of the goals of a corporation is to have ROI of at least 15% (the cost of capital) on all new projects. Suppose one of the divisions within this corporation currently has a ROI of 20%, and the manager is evaluating the production of a new product in his division. If analysis shows that the new project is predicted to have a ROI of 18%, would the manager move forward with the project? Top management would opt to accept the production of the new product. However, since the project would decrease the division's current ROI, the division manager may reject the project to avoid decreasing his overall performance and possibly his overall compensation. The division manager is making an intentional choice based on his division's ROI relative to corporate ROI.

In other situations, the use of ROI can unintentionally lead to improper decision-making. For example, look at the ROI for the following investment opportunities faced by a manager:

	Income	Average Capital Assets	ROI
Investment Opportunity 1	$ 500	$ 1,000	50%
Investment Opportunity 2	20,000	75,000	27%

Figure 5.13.5: ROI for an investment opportunity

In this example, though investment opportunity 1 has a higher ROI, it does not generate any significant income. Therefore, it is important to look at ROI among other factors in order to make an informed decision.

Calculation and Interpretation of the Residual Income

Another performance measure is **residual income (RI)**, which shows the amount of income a given division (or project) is expected to earn in excess of a firm's minimum return goal. Every company sets a **minimum required rate of return** on projects and investments, representing the minimum return, usually in percentage form, that a project or investment must produce in order for the company to be willing to undertake it. This return is used as a basis for evaluating investments so that the firm may meet its targets and goals, and ensures that only profitable projects will be accepted. (You will learn the theory and mechanics behind establishing a minimum required rate of return in advanced accounting courses.)

Think about this concept in your own life. If you plan to invest in stocks, bonds, a work of art, precious stones, a graduate degree, or a business, you would want to know what your expected return would be before you made that investment. Most people shy away from investing time or money in things that do not provide a certain return, whether that return is money, happiness, or satisfaction. A company has to make similar decisions and decide where to spend its money, and does not want to spend it in areas that will not return a minimum profit to the company and its shareholders. Companies will determine a minimum required rate of return as a basis against which to compare investment opportunities to aid in the decision of whether or not to accept a project. This minimum required rate of return is used to calculate residual income, which uses this formula:

$$\text{RI} = \text{ Project Profit - (Project Invested Capital} \times \text{ Minimum Required Rate of Return)} \tag{5.13.7}$$

Suppose the donut division of Scrumptious Sweets is considering acquiring new machinery to speed up the production of donuts and make the donuts more uniform in shape and size. The cost of the machine is $\$1,500,000$, and it is expected to generate a profit of $\$250,000$. Scrumptious has a corporate policy of a required minimum rate of return on projects of 18%. Based on residual income, should the donut division move forward on this project?

$$\text{RI} = \$250,000 - (\$1,500,000 \times 0.18)$$
$$\text{RI} = -\$20,000$$

A project will be accepted as long as the RI is a positive number, because that implies the project is earning more than the minimum required by the company. Therefore, the manager of the donut division would not accept this project based on RI alone. Note that RI is measured in absolute dollars. This makes it almost impossible to compare firms of different sizes or projects of different sizes to one another. Both ROI and RI are useful, but as shown, both tools have drawbacks. Therefore, many companies will use a combination of ROI and RI (as well as other measures) to evaluate performance.

Calculation and Interpretation of Economic Value Added

Economic value added (EVA) is similar to RI but is a measure of shareholder wealth that is being created by a project, segment, or division. Companies want to maximize shareholder wealth, and to do that, they have to generate enough income to cover their cost of debt and their cost of equity, but also to have income available to shareholders. Just as in residual income, the goal is a positive EVA. A positive EVA indicates management has effectively used its capital assets to increase the value of the firm and thus the wealth of shareholders. EVA is computed as shown:

$$\text{EVA} = \text{ After-Tax Income - (Invested Capital} \times \text{ Weighted Average cost of Capital)} \tag{5.13.8}$$

After-tax income is the income reduced by tax expenses. The **weighted average cost of capital (WACC)** is the cost that the company expects to pay on average to finance assets and growth using either debt or equity. WACC is based on the proportion of debt and equity held by a company and the costs of each of those. For example, if a company has a total of $\$1,000,000$ in debt and equity, consisting of $\$400,000$ in debt and $\$600,000$ in stock, then the proportion of the company's capital structure that is debt is 40% ($\$400,000/\$1,000,000$), and the proportion that is equity is 60% ($\$600,000/\$1,000,000$).

What about the cost component for each? A company raises capital (money) in three primary ways: borrowing (debt), issuing stock (equity), or earning it (income). The cost of debt is the after-tax interest rate associated with borrowing money. The cost of equity is the rate associated with what the shareholders expect the corporation to earn in order for that shareholder to maintain ownership in the company. For example, shareholders of Apple stock may on average expect the company to earn a return of 10% per year; otherwise, they will sell their stock.

Sometimes the weighted average cost of capital and the required rate of return are the same for some companies, but often they will differ. Suppose Scrumptious Sweets, for example, has both debt capital and equity capital. Table $5.13.1$ lists the cost of each type of capital as well as what proportion of the capital is made up of each of the two types. Notice that debt makes up 45% of the capital of Scrumptious Sweets and that the cost of debt is 8%. Equity makes up the other 55% of the capital structure of Scrumptious and the cost of equity is 9.8%. The weighted average cost of capital is the sum of each of the weighted costs of each type of capital. Thus, the weighted cost of debt is $0.08 \times 0.45 = 0.036$ or 3.6% and the weighted cost of equity is $0.098 \times 0.55 = 0.054$ or 5.4%. This results in a weighted average cost of capital of 3.6% plus 5.4%, or 9%.

Table $5.13.1$: Scrumptious Sweets' Weighted Average Cost of Capital

Type of Capital	A Cost of Capital	B Proportion of Total Capital	A × B Weighted Cost
Debt	8%	45%	3.6%
Equity	9.8%	55%	5.4%
Weighted Average Cost of Capital			9%

Reconsidering the new machine the donut division wants to buy, and using EVA to evaluate the project decision, would the decision change? Remember, the cost of the machine is $\$1,500,000$, and it is expected to generate a profit of $\$250,000$. Assume the tax rate for Scrumptious is 40%. To calculate EVA for the project, we need the following:

1. After-Tax income	
Project income	$ 250,000
Less taxes at 40% ($250,000 × 0.40)	($ 100,000)
After-Tax income	$ 150,000
2. Invested capital	$1,500,000
3. Weighted average cost of capital	9%

EVA = After-Tax Income – (Invested Capital × Weighted Average Cost of Capital)
EVA = $150,000 – ($1,500,000 × 9%)
EVA = $150,000 – $135,000
EVA = $15,000

Figure $5.13.6$: EVA calculation for Scrumptious Sweets

The positive EVA of $\$15,000$ indicates that the project is generating income for the shareholders and should be accepted.

As you can see, though RI and EVA look similar, they can lead to different decisions. This difference stems from two sources. First, RI is calculated based on management's choice for the required rate of return, which can be determined from many different variables, whereas the weighted average cost of capital is based on the actual cost of debt and the estimated cost of equity, weighted by the actual percentages of both components. Second, when used to evaluate unit managers, RI often is based on pretax income, whereas EVA is based on after-tax income to the company itself. EVA and RI do not always lead to different decisions, but it is important that managers understand the components of both measures to ensure they make the best decision for the company.

Considerations in Using the Three Evaluative Tools

One of the most challenging aspects of using ROI, RI, and EVA lies in the determination of the variables used to calculate these measures. Income and invested capital are factors in the ROI, RI, and EVA performance models, and each can be defined in several ways. **Invested capital** can be defined as fixed assets, productive assets, or operating assets. **Fixed assets** typically include only tangible long-term assets. **Productive assets** typically include inventory plus the fixed assets. **Operating assets** include productive assets plus intangible assets, and current assets. One problem is determining which assets the manager can control with his or her decision-making authority. Each definition of invested capital will have a different impact on the performance measure, whether that measure is ROI, RI, or EVA. Deciding how to define invested capital is further complicated when combined with the additional decision of whether to use net book value (depreciated value) or gross book value (non-depreciated value) of long-lived assets. Net book value is the historical cost of an asset minus any accumulated depreciation, whereas gross book value is merely the historical cost of the asset. Obviously at the time of acquisition of an asset, these two numbers are the same, but over time, net book value will decrease for any given asset, while gross book value will stay the same for that asset. Using gross book value will result in a higher value for invested capital than using net book value. Remember, net book value will vary based on the depreciation method employed—straight line versus double declining balance, for example. Thus, gross book value removes the effect of choosing different depreciation methods. Despite this, most companies use net book value in the computation of ROI since net

book value aligns with their financial reporting of capital assets on the balance sheet at their net value. Assets can also be measured at fair value, also known as market value. This is the value at which the assets could be sold. Fair value is only used in special cases of computing ROI, such as in computing ROI for a real estate investment. The reason fair value is not typically used for ROI is that the fair or market value is rarely known or determinable with certainty and is often very subjective, whereas both gross and book value are readily known and determinable.

The second major component of these performance measures involves which income measure to use. First and foremost, no matter how a company measures income, the most important point is that the income the company uses as a measure should be controllable income if the performance model is to be a motivator and if the company uses responsibility accounting. Income, sometimes referred to as earnings, can be measured in many ways, and there are often common acronyms given for some of these measures. Common ways to measure income are **operating income** (income before taxes); earnings before interest and taxes (EBIT); earnings before interest, taxes, and depreciation (EBITDA); net income (income after taxes); or return on funds employed (ROFE), which adds working capital to any of the other income measures. Companies must decide which income measure they want to use in their determination of these various performance metrics. They must consider how the metric is being used, who they are evaluating by that metric, and whether the income and capital asset chosen capture the decision-making authority of the individual or division whose performance is being evaluated.

Example 5.13.1: SkyHigh Superball Decisions

The manager of the SkyHigh division of Superball Corp. is faced with a decision on whether or not to buy a new machine that will mix the ingredients used in the SkyHigh superball produced by the SkyHigh division. This ball bounces as high as a two-story building upon first bounce and is so popular that the SkyHigh division barely keeps up with demand. The manager is hoping the new machine will allow the balls to be produced more quickly and therefore increase the volume of production within the same time currently being used in production. The manager wants to evaluate the effect of the purchase of the machine on his compensation. He receives a base salary plus a 25% bonus of his salary if he meets certain income goals. The information he has available for the analysis is shown here:

Cost of the machine	$2,000,000
Income to be generated by the machine	$1,000,000
Income without the new machine	$7,000,000
Beginning of the year capital assets (without the machine)	$8,000,000
End of the year capital assets (without the machine)	$8,400,000
Tax rate	30%
Minimum required rate of return	15%
Weighted average cost of capital	9%
Sales revenue without the machine	$18,000,000
Sales revenue with the machine	$19,400,000

The manager is looking at several different measures to evaluate this decision. Answer the following questions:

a. What is the sales margin without the new machine?
b. What is the asset turnover without the new machine?
c. What is ROI without the new machine?
d. What is RI without the new machine?
e. What is EVA without the new machine?
f. What is the sales margin with the new machine?
g. What is the asset turnover with the new machine?
h. What is ROI with the new machine?

i. What is RI with the new machine?
j. What is EVA with the new machine?
k. Should the manager buy the new machine? Why or why not?
l. How would ROI be affected if the invested capital were measured at gross book value, and the gross book values of the beginning and end of the year assets without the new machine were $\$11,000,000$ and $\$11,800,000$, respectively?

Solution

a. Income/Sales: $\$7,000,000/\$18,000,000 = 39\%$
b. Sales/Average Assets: $\$18,000,000/[(\$12,000,000 + \$12,400,000)/2] = 1.48$ times
c. Income/Average Assets: $\$7,000,000/[(\$12,000,000 + \$12,400,000)/2] = 58\%$
Or $\#1 \times \#2 : 39\% \times 1.48 = 58\%$
d. Income – (Invested Capital × Minimum Required Rate of Return)
$\$7,000,000–(\$12,200,000 \times 0.15) = \$5,170,000$
e. After-Tax Income – (Invested Capital × Weighted Average Cost of Capital)
$[\$7,000,000 \times (1 - 0.30)] \times (\$12,200,000 \times 0.09) = \$3,802,000$
f. Income/Sales: $\$8,000,000/\$19,400,000 = 41\%$
g. Sales/Average Assets: $\$19,400,000/[(\$12,000,000 + \$12,400,000)/2] = 1.59$ times
h. Income/Average Assets: $\$8,000,000/[(\$12,000,000 + \$12,400,000)/2] = 66\%$
Or $\#7 \times \#8 : 41\% \times 1.59 = 66\%$
i. Income – (Invested Capital × Minimum Required Rate of Return)
$\$8,000,000–(12,200,000 \times 0.15) = \$6,170,000$
j. After-Tax Income – (Invested Capital × Weighted Average Cost of Capital)
$[\$8,000,000 \times (1–0.30)]–(\$12,200,000 \times 0.09) = \$4,502,000$
k. The manager of the SkyHigh division of Superball Corp. should accept the project, as the project improves all of his performance measures.
l. Income/Average Assets: $\$8,000,000/[(\$13,000,000 + \$13,800,000)/2] = 60\%$ This shows that the choice used as the measure of assets can affect the analysis.

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5.14: Describe the Balanced Scorecard and Explain How It Is Used

The performance measures considered up to this point have relied only on financial accounting measures as the means to evaluate performance. Over time, the trend has become to incorporate both quantitative and qualitative measures and short- and long-term goals when evaluating the performance of managers as well as the company as a whole. One approach to evaluating both financial and non-financial measures is to use a balanced scorecard.

History and Function of the Balanced Scorecard

Suppose you work in retail and your compensation consists of an hourly wage plus a bonus based on your sales. You have excellent interpersonal skills, and customers appreciate your help and often seek you out when they come to the store. Some of your customers will return on a different day, even making an extra trip to the store to make sure you are the employee who helps them. Sometimes these customers buy items and other times they do not, but they always come back. Your compensation does not include any acknowledgment of your attention to customers and your ability to keep them returning to the store, but consider how much more you could earn if this were the case. However, in order for compensation to include non-financial, or qualitative, factors, the store would need to track non-financial information, in addition to the financial, or quantitative, information already tracked in the accounting system. One way to track both qualitative and quantitative measures is to use a **balanced scorecard**.

The idea for using a balanced scorecard to evaluate employees was first suggested by Art Schneiderman of Analog Devices in 1987 as a means to improve corporate performance by using metrics to measure improvements in areas in which Analog Devices was struggling, such as in a high number of defects. Schneiderman went through different iterations of a balanced scorecard design over several years, but the final design chosen measured three different categories: financial, customer, and internal. The financial category included measures such as return on assets and revenue growth, the customer category included measures such as customer satisfaction and on-time delivery, and the internal category included measures such as reduced defects and improved throughput time. Eventually, Robert Kaplan and David Norton, both Harvard University faculty, expanded upon Schneiderman's ideas to create the current concept of the balanced scorecard and four general categories for evaluation: financial perspective, customer perspective, internal perspective, and learning and growth. These categories are sometimes modified for particular industries.

Therefore, a balanced scorecard evaluates employees on an assortment of **quantitative factors**, or metrics based on financial information, and **qualitative factors**, or those based on non-financial information, in several significant areas. The quantitative or financial measurements tend to emphasize past results, often based on their financial statements, while the qualitative or non-financial measurements center on current results or activities, with the intent to evaluate activities that will influence future financial performance.

Ethical Considerations: Use of a Balanced Scorecard Leads to Ethical Decision-Making

Managers and employees generally strive to create and work in an ethical environment. In order to develop such an environment, employees need to be informed of the organization's ethical standards and values and have an understanding of the laws and regulations under which the organization operates. If employees do not know the standards by which they will be measured, they might not be aware if their behavior is ethical. A balanced scorecard allows employees to understand their organization's obligations, and to evaluate their own obligations in the workplace.

To evaluate their ethical environment, organizations can hold meetings that use ethical analysis metrics. Kaplan and Norton, leaders in balanced scorecard use, explain the use of the balanced scorecard in the context of strategy review meetings: Companies conduct strategy review meetings to discuss the indicators and initiatives from the unit's Balanced Scorecard and assess the progress of and barriers to strategy execution.[2] In such meetings, the metrics analyzed should include, but not be limited to, the availability of a hotline; employee participation in ethics training; satisfaction of customers, employees, and other stakeholders; employee turnover rate; regulation compliance; community involvement; environmental awareness; diversity; legal expenses; efficient asset usage; condition of assets; and social responsibility.[1] Metrics should be tailored to an organization's values and desired operational results. The use of a balanced scorecard helps lead to an ethical environment for employees and managers.

Four Components of a Balanced Scorecard

To create a balanced scorecard2, a company will start with its strategic goals and organize them into key areas. The four key areas used by Kaplan and Norton were financial perspective, internal operations perspective, customer perspective, and learning and growth (Figure 5.14.1).

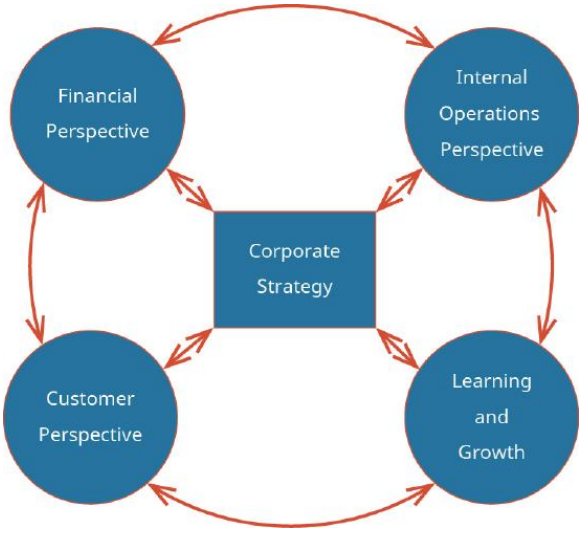

Figure 5.14.1: Four Key Areas of a Balanced Scorecard. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

These areas were chosen by Kaplan and Norton because the success of a company is dependent on how it performs financially, which is directly related to the company's internal operations, how the customer perceives and interacts with the company, and the direction in which the company is headed. The use of the balanced scorecard allows the company to take a stakeholder perspective as compared to a stockholder perspective. **Stockholders** are the owners of the company stock and often are most concerned with the profitability of the company and thus focus primarily on financial results. **Stakeholders** are people who are affected by the decisions made by a company, such as investors, creditors, managers, regulators, employees, customers, suppliers, and even lay people who are concerned about whether or not the company is a good world citizen. This is why social responsibility factors are sometimes included in balanced scorecards. To understand where these types of factors might fit in a balanced scorecard framework, let's look at the four sections or categories of a balanced scorecard.

Financial Perspective

The financial performance section of a balanced scorecard retains the types of metrics that have historically been set by companies to evaluate performance. The particular metric used in the scorecard will vary depending on the type of company involved, who is being evaluated, and what is being measured. You've learned that ROI, RI, and EVA can be used to evaluate performance. There are other financial measures that can be used as well, for example, earnings per share (EPS), revenue growth, sales growth, inventory turnover, and many others. The type of financial measures used should capture the components of the decision-making tasks of the person being evaluated. Financial measures can be very broad and general, such as sales growth, or they can be more specific, such as seat revenue. Looking back at the Scrumptious Sweets example, financial measures could include baked goods revenue growth, drink revenue growth, and product cost containment.

Internal Business Perspective

A successful company should operate like a well-tuned machine. This requires that the company monitor its internal operations and evaluate them to ensure they are meeting the strategic goals of the corporation. There are many variables that could be used as internal business measures, including number of defects produced, machine downtime, transaction efficiency, and number of products completed per day per employee, or more refined measures, such as percent of time planes are on the ground, or ensuring

air tanks are well stocked for a scuba diving business. For Scrumptious Sweets, internal measures could include time between production and sale of the baked goods or amount of waste.

Customer Perspectives

All businesses have customers or clients—a business will cease to operate without them—thus, it is important for a company to measure how well it is doing with respect to customers. Examples of common variables that could be measured include customer satisfaction, number of repeat customers, number of new customers, number of new customers from customer referrals, and market share. Variables that are more specific to a particular business include factors such as being ranked first in the industry by customers and providing a safe diving environment for scuba diving. Customer measures for Scrumptious Sweets might include customer loyalty, customer satisfaction, and number of new customers.

Learning and Growth

The business environment is a very dynamic one and requires a company to constantly evolve in order to survive, let alone grow. To reach strategic targets such as increased market share, management must focus on ways to grow the company. The learning and growth measures are a means to assess how the employees and management are working together to grow the company and to help the employees grow within the company. Examples of measures in this category include the number of employee suggestions that are adopted, turnover rates, hours of employee training, scope of process improvements, and number of new products. Scrumptious Sweets may use learning and growth measures such as hours of customer service training and hours on workforce relationship training.

Combining the Four Components of a Balanced Scorecard

Balanced scorecards can be created for any type of business and can be used at any level of the organization. An effective and successful balanced scorecard will start with the strategic plan or goals of the organization. Those goals are then restated based on the level of the organization to which the balanced scorecard pertains. A balanced scorecard for an entire organization will be broader and more general in terms of goals and measures than a balanced scorecard designed for a division manager. Balanced scorecards can even be created at the individual employee level either as an evaluation mechanism or as a means for the employee to set and monitor individual goals. Once the strategic goals of the organization are stated for the appropriate level for which the balanced scorecard is being created, then the measures for each of the categories of the balanced scorecard should be defined, being sure to consider the areas over which the division or individual does or does not have control. In addition, the variables have to be obtainable and measurable. Last, the measures must be useful, meaning that what is actually being measured must be informative, and there must be a basis of comparison—either company standards or individual targets. Using both quantitative and non-quantitative performance measures, along with long- and short-term measurements, can be very beneficial, as they can serve to motivate an employee while providing a clear framework of how that employee fits into the company's strategic plan.

As an example, let's examine several balanced scorecards for Scrumptious Sweets. First, Figure 5.14.2 shows an overall organizational balanced scorecard, the broadest and most general balanced scorecard.

SCRUMPTIOUS SWEETS, INC. Corporate Balanced Scorecard			
Mission: Provide customers with superior-quality traditional and innovative baked goods			
	Business Objectives	**Measures**	**Target**
Financial	Increase Revenue	Sales Revenues	Increase revenue 5%
	Lower Costs	Operating Costs	Decrease costs 3%
	Increase Profits	Net Income	Increase income 6%
Customer	Increase Customer Satisfaction	Customer satisfaction surveys	95% customer satisfaction rating
	Improve Customer Loyalty	Number of repeat customers	90% retentions of existing customers
	Grow Market Share	Number of new customers	10% increase in market share
Internal	Improve Production Processes	Reduce time from production to customer	10% decrease in production-to-customer time
	Reduce Waste on Products Produced	Units of waste per production process	10% decrease in waste generated per production process
	Reduce Carbon Footprint	Factory effluents and exhaust measured in PPM (parts per million)	5% decrease in both effluents and exhaust pollutants (PPM)
Learning & Growth	Improve Product & Service Innovation	Implemented employee suggestions	40% increase in number of employee suggestions made
	Increase Motivation and Empowerment	Management training course certificates awarded	20% incerase in number of employees completing management training courses
	Improve Employee Retention	Employee satisfaction surveys	90% rating on overall employee satisfaction

Figure 5.14.2: Scrumptious Sweets, Inc. Corporate Balanced Scorecard. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Notice that this scorecard starts with the overall corporate mission. It then contains very broad goals and measures in each of the four categories: financial, customer, internal, and learning and growth. In this scorecard, there are three general goals for each of these four categories. For example, the goals related to customers are to improve customer satisfaction, improve customer loyalty, and increase market share. For each of the goals, there is a general measure that will be used to assess if the goal has been met. In this example, the goal to improve customer satisfaction will be assessed using customer satisfaction surveys. But remember, measures are only useful as a management tool if there is a target to work toward. In this case, the goal is to achieve an overall 95% customer satisfaction rating. Obviously, the goals on this scorecard and the associated measures seem almost vague due to their general nature. However, these goals match with the overall corporate strategy and provide guidance for management at lower levels to begin dissecting these goals to more specific ones that pertain to their particular area or division. This allows them to create more detailed, balanced scorecards that will allow them to help meet the overall corporate goals laid out in the corporate scorecard. Figure 5.14.3 shows how the corporate balanced scorecard previously presented could be further detailed for the manager of the brownie division.

SCRUMPTIOUS SWEETS, INC. Brownie Division Balanced Scorecard			
Corporate Mission: Provide customers with superior-quality traditional and innovative baked goods			
	Business Objectives	**Measures**	**Target**
Financial	Increase revenues through improved sales mix	Sales mix revenues	Increase revenues 10% through better sales mix utilization
	Lower production costs	Production costs	Decrease production costs by 4% through order and production efficiencies
	Increase divisional profits	Divisional profit	Increase divisional profit by 12%
Customer	Meet customer unique needs	Number of customer suggestions or special requests	Meet 95% of customer special requests and track customer suggestions implemented
	Brand recognition	Number of repeat customers and number and variety of best selling-products	95% retention of existing customers; 10% increase in sales of best sellers
	Customer referrals	Number of customer referrals	15% increase in referral cards received
Internal	Reduce time from production to customer/storefront	Time from packaging to delivery or display	10% decrease in time from production to customer access
	Reduce product waste through improved uniformity of product and better timing of orders and production	Units of waste per production process, uniformity of product and inventory control	10% decrease in production waste; 5% improvement in inventory turnover
	Increase environmental protection efforts	Number of energy-efficient bulbs replaced; paperless efforts measure	75% use of energy-efficient bulbs; 5% decrease in water usage; 80% paperless work environment
Learning & Growth	New or improved product or process ideas	Number of new products introduced; number of improved products	10% increase in new products produced; improvements to 5% of products or processes
	Increase employee motivation and empowerment	Management training course certificates awarded	20% increase in number of employees completing management training courses
	Improve employee retention	Employee satisfaction surveys	90% rating on overall employee satisfaction; 50% increase in employees using open-door policy

Figure 5.14.3: Scrumptious Sweets, Inc. Brownie Division Balanced Scorecard. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

As you can see from the balanced scorecard for the brownie division, the same corporate mission is included, as are the same four categories; however, the divisional goals are more specific, as are the measures and the targets. For example, related to the overall corporate goal to increase customer satisfaction, the divisional goal is to meet customers' unique needs. The division will assess how well they are accomplishing this goal by tracking the number of customer suggestions and customer special requests, such as when a customer requests a special flavor of brownie not normally produced by the brownie division. The target set by the management of the brownie division is to meet 95% of customer special requests and to track the number of customer suggestions that are implemented by the division. The idea is that if the division is meeting customer needs and requests, this will result in high customer satisfaction, which is an overriding corporate goal. The success of the division will be based on each employee doing his or her best at his or her specific job. Therefore, it is useful to see how the balanced scorecard can be used at an individual employee

level. Figure 5.14.4 shows a balanced scorecard for the brownie division's employees who work in the front end or store portion of the division.

SCRUMPTIOUS SWEETS, INC. Brownie Division Storefront Employees Balanced Scorecard			
Corporate Mission: Provide customers with superior-quality traditional and innovative baked goods			
	Objectives	**Measures**	**Target**
Financial Initiatives	Increase Sales • Offer additional products to each customer • Promote mobile ordering	Same store sales	10% increase
		Mobile sales	20% increase in mobile orders
	Lower Costs • Follow safety rules • Reduce waste • Follow drink recipes exactly	Safety reports/claims	5% reduction in number of reports filed
		Inventory turnover	5% improvements in inventory turnover
Customer Initiatives	Improve Customer Experience • Clean and well-stocked store • Polite, friendly interaction • Offering to carry/load products	Customer satisfaction surverys	95% customer satisfaction rating
		Mystery customer reports	Average rating of A on all 10 dimensions measured
	Customer Retention and Growth • Promote frequent buyer awards • Promote referral incentives	Frequent buyer rewards redeemed	5% increase in rewards redeemed
		Customer referral cards redeemed	20% increase in rewards redeemed
Internal Initiatives	Improve Product Delivery Efficiency • Follow order queuing/filling • Order taking accuracy • Correct errors quickly	Order queuing reports	100% accuracy in order queuing
		Customer surveys and mystery customer reports	100% accuracy in order taking
	Reduce Carbon Footprint • Avoid order errors • Minimize waste • Turn off lights in unused rooms	Pounds of trash	10% reduction in trash generated
		Utility charges	5% reduction in utility costs
Learning and Growth Initiatives	Expand Employee Mentoring Program and Expand Business Improvements • Meet with mentor regularly • Take advantage of open-door policy • Making suggestions	Mentor meeting log	100% quarterly employee/mentor meetings
		Employee suggestions implemented	20% increase in number of viable suggestions by employees
	Actively Participate in Corporate Training opportunities • Management training courses • College tuition program	Training certifications	100% of employees completing quarterly training

Figure 5.14.4: Scrumptious Sweets, Inc. Brownie Division Store Front Employees Balanced Scorecard. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

In this balanced scorecard, the same categories are used, but there is more detail about each of the business objectives, and each objective has more refined measures than the prior two scorecards. Again in the customer category, one of the objectives of the storefront employees is to improve the customer experience. Notice that there are three initiatives listed to help drive this goal. The measures that would be used to evaluate the success of these initiatives as well as their specific targets are detailed. Again, the idea is that if the employees who work in the store portion of the brownie division make the customer experience great, this will translate into high scores on the customer satisfaction surveys and help the company meet its overriding goal to increase customer satisfaction. In order to ensure that this occurs, the specific goals and metrics are created. As previously expressed, it is best if these objectives, measures, and targets are determined by a process that includes management and the employees. Without employee input, employees may feel resentful of targets over which they had no input. But, the employees alone cannot set their own goals and targets, as there could be a tendency to set easy targets, or the employee may not be aware of how his or her efforts affect the division and overall corporation. Thus, a collaborative approach is best in creating balanced scorecards.

The three scorecards presented show that the process of creating appropriate and viable scorecards can be quite complicated and challenging. Determining the appropriate qualitative and quantitative measures can be a daunting process, but the results can be

extremely beneficial. The scorecards can be useful tools at all levels of the organization if they are adequately thought out and if there is buy-in at all levels being evaluated by a scorecard. Next, we'll consider how the use of the balanced scorecard and performance measures are not mutually exclusive and can work well together.

Continuing Application: Balanced Scorecard

Let's revisit Gearhead Outfitters in the context of their operating results, internal processes, growth, and customer satisfaction. Recall that the company was founded as a single store in 1997 and grew to multiple locations mainly in the southern United States. How did Gearhead get there? How did the company gather information to make expansion decisions? Now that Gearhead has expanded, should it keep all current locations open? Is the company meeting the desires of its customers?

Questions such as these are addressed through performance measures detailed in a balanced scorecard. Financial metrics such as return on investment and residual income give Gearhead information on whether or not dollars invested have translated into additional income, and if current income can support needed cash flow for current and future operations. While financial measures are important, they are only one aspect of evaluating the effectiveness of a company's strategy. Value provided to customers should also be considered, as well as the success of internal processes, and whether or not the company adequately provides growth opportunities for employees. Sales from new products, employee turnover, and customer satisfaction surveys can also provide valuable data for measuring success. The idea of a balanced scorecard is to give a business both financial and non-financial information to use in its strategic decisions.

The Our Story page of Gearhead's website reads: "Gearhead Outfitters exists to create a positive shopping experience for our guests. Gearhead is known for its relaxed environment, specialized inventory and customer service for those pursuing an active lifestyle. True to our local roots, we employ local residents of each city we operate in, support local organizations, and strive to build relationships within our communities."[3]

Given how Gearhead describes itself, and the performance measures discussed previously, what other information might the company want to gather for its balanced scorecard?

Final Summary of Quantitative and Qualitative Performance Measurement Tools

As the business environment changes, one thing stays the same: businesses want to be successful, to be profitable, and to meet their strategic goals. With these changes in the business environment come more varied responsibilities placed on managers. These changes occur due to an increased use of technology along with ever-increasing globalization. It is very important that an organization can appropriately measure whether employees are meeting these various responsibilities and reward them accordingly.

You've learned about some common performance measures such as ROI, RI, EVA, and the balanced scorecard. The more accurately and efficiently a company can monitor and measure its decision-making processes at all levels, the more quickly it can respond to change or problems, and the more likely the company will be able to meet its strategic goals. Most companies will use some combination of the quantitative and non-quantitative measures described. ROI, RI, and EVA are typically used to evaluate specific projects, but ROI is sometimes used as a divisional measure. These measures are all quantitative measures. The balanced scorecard not only has quantitative measures but adds qualitative measures to address more of the goals of the organization. The combination of these different types of quantitative and qualitative measures—project-specific measures, employee-level measures, divisional measures, and corporate measures—enables an organization to more adequately assess how it is progressing toward meeting short- and long-term goals. Remember, the best performance measurement system will contain multiple measures and consist of both quantitative and qualitative factors, which allows for better assessment of managers and better results for the corporation.

Think it Through: Non-Financial Measurements of Success

For each of the following businesses, what are four non-financial measures that might be useful for helping management evaluate the success of its strategies?

- Grocery store
- Hospital

- Auto manufacturer
- Law office
- Coffee shop
- Movie theater

Footnotes

1. Alistair Craven. *An Interview with Robert Kaplan & David Norton* (Emerald Publishing, 2008). http://www.emeraldgrouppublishing.co...lan_norton.htm
2. Paul Arveson. *The Ethics Perspective* (Balanced Scorecard Institute, Strategy Management Group, 2002). www.balancedscorecard.org/Th...cs-Perspective
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5.15: Why It Matters

Let's Talk Simulation

Reports to assist with Decision Making

Proformas

Proformas use decisions made in the current year to project company performance for the next year. Analyzing them is critical for a company's success. Because they are projections, they do not take into consideration how your competition performs or where your product is positioned or if you are forecasting too high or low. If you know you have a realistic forecast, you can rely on these decision to give you an indication if you are on track or not.

The following proformas are available to you each round:

- Balance sheet
- Income Statement
- Cash Flow Statement
- Financial Ratios (The following chapter sections will reduce ratios in more detail)

Success Measures

- In the real world, companies have different goals. Using the same success measures, YOU get to choose the parameters on which your company is measured.
- Some of the Criteria that are used:
  - Cumulative Profits
  - Average Market Share
  - Average ROS (Return on Sales)
  - Average Asset Turnover
  - Average ROA (Return on Assets)
  - Average ROE (Return on Equity)
  - Ending Stock Price
  - Ending Market Cap
- Students or Professors choose the percentage weighting for each selection.

Foundation FastTrack Summary

The Foundation FastTrack is a comprehensive report in Capsim's Foundation simulation that provides critical market and company performance data. Here's a summary of its key sections and how to use them for decision-making:

1. **Market Segment Analysis**:
   - **Customer Buying Criteria**: Understand what customers in each segment value most (e.g., price, age, MTBF, positioning). This helps tailor your product development and marketing strategies[1].
   - **Market Share**: Review the market share of each company in different segments to gauge competitive positioning[1].
2. **Production Analysis**:
   - **Capacity and Automation**: Check the production capacity and automation levels of each company. This helps in planning your own capacity investments and understanding competitors' production capabilities[1].
   - **Inventory Levels**: Monitor inventory levels to avoid stockouts or excess inventory, which can impact your financial performance[1].
3. **Financial Summary**:

- **Profit and Loss**: Analyze your company's profitability, including revenue, costs, and net profit. This helps in making informed financial decisions[1].
- **Cash Flow**: Review cash flow statements to ensure your company has enough liquidity to meet its obligations and invest in growth[1].

4. **Customer Survey Scores**:
   - **Customer Satisfaction**: Evaluate customer satisfaction scores to understand how well your products are meeting market needs. High scores indicate strong market acceptance[1].

Using FastTrack for Decision-Making

1. **Strategic Planning**: Use the market segment analysis to align your product development and marketing strategies with customer preferences and competitive dynamics[1].
2. **Operational Efficiency**: Leverage production analysis to optimize your capacity and automation investments, ensuring you can meet demand efficiently without incurring unnecessary costs[1].
3. **Financial Management**: Utilize the financial summary to make informed decisions about pricing, cost control, and investment. This helps maintain profitability and financial health[1].
4. **Customer Focus**: Pay attention to customer survey scores to continuously improve your products and services, enhancing customer satisfaction and loyalty[1].

Foundation Balanced Scorecard Explanation

The balanced scorecard evaluates company performance by analyzing four pillars: financial, internal business process, customer, and learning and growth. Within each pillar, there are goals that a company much reach to get points. These goals change over time; as company performance should increase to keep up with market growth. As you near the end of the simulation, it is important to reference the Recap, which evaluates the company's long-term goals. The recap analyzes the company's overall performance across all 8 rounds by using ending, cumulative, and average methods.

Financial

- Stock Price – 8 points
- Profits – 9 points
- Leverage – 8 points

Internal Business Process

- Contribution Margin – 5 points
- Plant Utilization – 5 points
- Days of Working Capital – 5 points
- Stock-out Costs – 5 points
- Inventory Carrying Costs – 5 points

Customer

- Customer Buying Criteria – 5 points
- Customer Awareness – 5 points
- Customer Accessibility – 5 points
- Product Count – 5 points
- SG&A Expense – 5 points

Learning and Growth

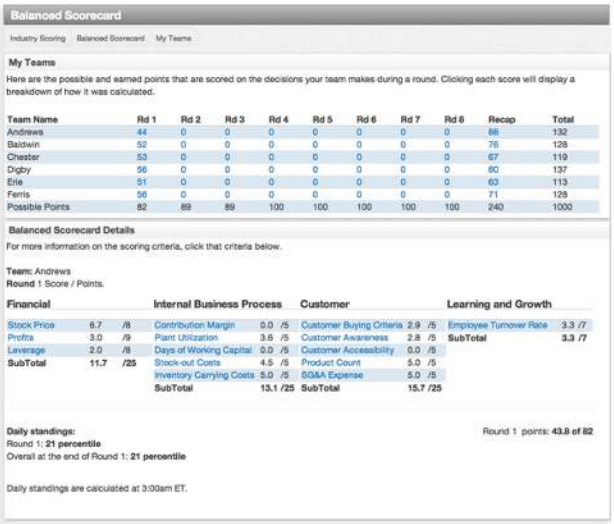
(Points Vary Each Round)

- Employee Turnover Rate – 6 points
- Employee Productivity - 7 points
- TQM Material Reduction – 3 points

- TQM R&D Reduction – 3 points
- TQM Admin Cost Reduction – 3 points
- TQM Demand Increase – 3 points

Balanced Scorecard

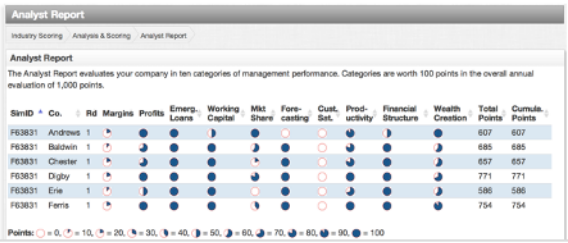
- Improving company financial picture in preparation for final debrief
- Point System
- Gauges company performance based on four perspectives:
  - The Customer
  - Internal Business Process
  - Learning and Growth
  - Financials
- In the simulation, a Proforma Balanced Scorecard is available to project results for the upcoming year.



Analyst Report

Evaluates your company in ten categories:

1. Margins
2. Profits
3. Emergency Loans
4. Working Capital
5. Market Share
6. Customer Satisfaction
7. Financial Structure
8. Wealth Creation
9. Forecasting
10. Productivity



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5.16: Ratios- Condensing Information into Smaller Pieces

Learning Objectives

By the end of this section, you will be able to:

- Explain the importance of financial statement analysis in making informed decisions about business opportunities.
- Outline the limitations of financial statement analysis in making investment decisions.

When considering the outcomes from analysis, it is important for a company to understand that the data generated needs to be compared to similar data within the industry at large as well as that of close competitors. The company should also consider its past experience and how it corresponds to current and future performance expectations.

Importance of Ratios and Analysis

Financial ratios help internal and external stakeholders make informed decisions about actions like investing, becoming a supplier, making a loan, or altering internal operations, among other things. The information resulting from ratio analysis can be used to examine trends in performance, establish benchmarks for success, set budget expectations, and compare industry competitors. There are four main types of ratios: liquidity, solvency, efficiency, and profitability. While outcomes for some ratios may seem more ideal, the industry in which the business operates can change the influence of these outcomes on stakeholder decisions.

There are several benefits to analyzing financial statements. The information can show trends over time, which can help in making future business decisions. Converting information to percentages or ratios eliminates some of the disparities between competitors' sizes and operating abilities, making it easier for stakeholders to make informed decisions. It can assist with understanding the makeup of current operations within the business and which shifts need to occur internally to increase productivity.

Limitation of Financial Statement Analysis

Though useful, it's important to note that there are limitations to financial statement analysis as well. Stakeholders need to remember that past performance does not always predict future performance. Economic influences, such as inflation or a recession, could skew the data being analyzed. Additionally, the way a company reports information may change over time. For example, there could be changes in where and when certain transactions are recorded, and this may not be immediately evident to financial statement users. It is also key to note that though all publicly traded companies in the United States are required to follow Generally Accepted Accounting Principles (GAAP), there are many estimates and flexibility in how some standards are applied. This means that firms can still follow accounting standards appropriately but present some information differently from other firms.

It makes good sense for a company to use financial statement analysis to guide future operations so it can budget properly, control costs, increase revenues, and make long-term expenditure decisions. As long as stakeholders understand the limitations of financial statement analysis, it is a useful way to predict growth and financial strength.

Despite limitations, ratios are still a valuable tool if used appropriately. The next section discusses several operating efficiency ratios including accounts receivable turnover, total asset turnover, inventory turnover, and days' sales in inventory. Operating efficiency ratios help users see how well management is using the financial assets of the firm.

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5.17: Operating Efficiency Ratios

Learning Objectives

By the end of this section, you will be able to:

- Calculate accounts receivable turnover to assess a firm's performance in managing customer receivables.
- Evaluate management's use of assets using total asset turnover and inventory turnover.
- Assess organizational performance using days' sales in inventory calculations.

Efficiency ratios show how well a company uses and manages its assets, one key element of financial health. Important areas of efficiency are the management of sales, accounts receivable, and inventory. A company that is efficient will usually be able to generate revenues quickly using the assets it has acquired. Let's examine four efficiency ratios: accounts receivable turnover, total asset turnover, inventory turnover, and days' sales in inventory.

Accounts Receivable Turnover

For our discussion of financial statement analysis, we will look at Clear Lake Sporting Goods. Clear Lake Sporting Goods is a small merchandising company (a company that buys finished goods and sells them to consumers) that sells hunting and fishing gear. Figure 5.17.1 shows the comparative income statements and balance sheets for the past two years.

Clear Lake Sporting Goods
Comparative Year-End Income Statements

	Prior Year	Current Year
Net Sales	$100,000	$120,000
Cost of Goods Sold	50,000	60,000
Gross Profit	50,000	60,000
Rent Expense	5,000	5,500
Depreciation Expense	2,500	3,600
Salaries Expense	3,000	5,400
Utility Expense	1,500	2,500
Operating Income	38,000	43,000
Interest Expense	3,000	2,000
Income Tax Expense	5,000	6,000
Net Income	$ 30,000	$ 35,000

Clear Lake Sporting Goods
Comparative Year-End Balance Sheets

	Prior Year	Current Year
Assets:		
Cash	$ 90,000	$110,000
Accounts Receivable	20,000	30,000
Inventory	35,000	40,000
Short-Term Investments	15,000	20,000
Total Current Assets	160,000	200,000
Equipment	40,000	50,000
Total Assets	$200,000	$250,000
Liabilities:		
Accounts Payable	$ 60,000	$ 75,000
Unearned Revenue	10,000	25,000
Total Current Liabilities	70,000	100,000
Notes Payable	40,000	50,000
Total Liabilities	$110,000	$150,000
Stockholder Equity		
Common Stock	75,000	80,000
Ending Retained Earnings	15,000	20,000
Total Stockholders' Equity	90,000	100,000
Total Liabilities and Stockholder Equity	$200,000	$250,000

Figure 5.17.1: Comparative Income Statements and Year-End Balance Sheets Note that the comparative income statements and balance sheets have been simplified here and do not fully reflect all possible company accounts.

To begin an analysis of receivables, it's important to first understand the cycles and periods used in the calculations.

Operating Cycle

A period is one operating cycle of a business. The operating cycle includes the cash conversion cycle plus the accounts receivable cycle (discussed below). Essentially, it is the time it takes a business to purchase or make inventory and then sell it. For example, assume Clear Lake Sporting Goods orders and receives a shipment of fishing lures on June 1. It stocks the shelves with lures and tracks its inventory and sales. By July 15, all the lures from that shipment are gone. In this example, Clear Lake's operating cycle is 45 days.

Cash Conversion Cycle

Cash, however, doesn't necessarily flow linearly with accounting periods or operating cycles. The cash conversion cycle is the time it takes to spend cash to purchase inventory, produce the product, sell it, and then collect cash from the customer. Accounts receivable is one section of that cycle. Referring to Clear Lake's June 1 shipment of lures that sold by July 15, assume that some of the customers were fishing guides that keep an open account with Clear Lake. This company did not pay for its lures until August 15 when it settled its account. In this example, Clear Lake's cash cycle is 75 days.

Let's take a look at the accounts receivable turnover ratio, which helps assess that element of the cash conversion cycle.

Accounts Receivable Turnover Ratio

Receivables ratios show company performance in relation to current receivables (what is due from customers), as well as credit policy effect on sales growth. One receivables ratio is called the accounts receivable turnover ratio. This ratio determines how many times (i.e., how often) accounts receivable are collected during a year and converted to cash. A higher number of times indicates that receivables are collected quickly. This quick cash collection may be viewed as a positive occurrence because liquidity improves, and the company may reinvest in its business sooner when the value of the dollar has more buying power (time value of money). The higher number of times may also be a negative occurrence, signaling that credit extension terms are too tight, and it may exclude qualified consumers from purchasing. Excluding these customers means that they may take their business to a competitor, thus reducing potential sales.

In contrast, a lower number of times indicates that receivables are collected at a slower rate. A slower collection rate could signal that lending terms are too lenient; management might consider tightening lending opportunities and more aggressively pursuing payment from its customers. The lower turnover also shows that the company has cash tied up in receivables longer, thus hindering its ability to reinvest this cash in other current projects. The lower turnover rate may signal a high level of bad debt accounts. The determination of a high or low turnover rate really depends on the standards of the company's industry. It's key to note the tradeoff in adjusting credit terms. Loose credit terms may attract more customers but may also increase bad debt expense. Tighter credit terms may attract fewer customers but may also reduce bad debt expense.

The formula for accounts receivable turnover is

$$\text{Accounts Receivable Turnover} = \text{mfrac}$$

5.17.1

$$\text{Average Accounts Receivable} = \text{mfrac}$$

5.17.2

Net credit sales are sales made on credit only; cash sales are not included because they do not produce receivables. However, many companies do not report credit sales separately from cash sales, so "net sales" may be substituted for "net credit sales" in this case. Beginning and ending accounts receivable refer to the beginning and ending balances in accounts receivable for the period. The beginning accounts receivable balance is the same figure as the ending accounts receivable balance from the prior period.

When computing the accounts receivable turnover for Clear Lake Sporting Goods, let's assume net credit sales make up $100,000 of the $120,000 of the net sales found on the income statement in the current year.

$$\text{Average Accounts Receivable} = \frac{\$20{,}000 + \$30{,}000}{2} = \$25,$$

5.17.3

$$\text{Accounts Receivable Turnover} = \frac{\$100{,}000}{\$25{,}000} = 4$$

5.17.4

To gain a better understanding of its ratio performance, Clear Lake Sporting Goods can compare its turnover to industry averages, key competitors, and its own historical ratios. Given this outcome, the managers may want to consider stricter credit lending practices to make sure credit customers are of a higher quality. They may also need to be more aggressive with collecting any outstanding accounts.

Think It Through

Accounts Receivable Turnover

You are a consultant assessing cash management practices for two firms, Company A and Company B (see Figure 5.17.2).

	Company A	Company B
Beginning Accounts Receivable	$ 50,000	$ 60,000
Ending Accounts Receivable	80,000	90,000
Net Credit Sales	$550,000	$460,000

Figure 5.17.2: Financial Information for Company A and Company B

Based on the information provided, do the following:

- Compute the accounts receivable turnover ratio.
- Interpret the outcomes, indicating how each company is performing

▼

Solution

Company A: $\text{ART} = 8.46$ times, Company B: $\text{ART} = 6.13$ times. Upon initial review of this limited information, Company A seems to be performing better since its turnover ratio is higher. Accounts receivable turnover has a significant impact on cash flows. One might want more information on trends for each company with these ratios and a comparison to others in the same industry. More information is helpful in assessing performance.

Link to Learning

American Superconductor Corporation

American Superconductor Corporation specializes in the production and service of energy-efficient wind turbine systems, as well as energy grid construction solutions. On the company's 2019 financial statement, the accounts receivable turnover ratio is approximately 6.32 times.

Total Asset Turnover

Total asset turnover measures the ability of a company to use its assets to generate revenues. A company would like to use as few assets as possible to generate the most net sales. Therefore, a higher total asset turnover means the company is using their assets very efficiently to produce net sales. The formula for total asset turnover is

$$\text{Total Asset Turnover} = \text{mfrac}$$

5.17.5

$$\text{Average Total Assets} = \text{mfrac}$$

5.17.6

Average total assets are found by dividing the sum of beginning and ending total assets balances found on the balance sheet. The beginning total assets balance in the current year is taken from the ending total assets balance in the prior year.

Clear Lake Sporting Goods' total asset turnover is

$$\text{Average Total Assets} = \frac{\$200{,}000 + \$250{,}000}{2} = \$225,$$

5.17.7

$$\text{Total Asset Turnover} = \frac{\$120{,}000}{\$225{,}000} = 0.53\text{times (rounded)}$$

5.17.8

The outcome of 0.53 means that for every $1 of assets, $0.53 of net sales are generated. Over time, Clear Lake Sporting Goods would like to see this turnover ratio increase.

Inventory Turnover

Inventory turnover measures how many times during the year a company has sold and replaced inventory. This can tell a company how well inventory is managed. A higher ratio is preferable; however, an extremely high turnover may mean that the company does not have enough inventory available to meet demand. A low turnover may mean the company has too much supply of inventory on hand. The formula for inventory turnover is

$$\text{Inventory Turnover} = \text{mfrac}$$

5.17.9

$$\text{Average Inventory} = \text{mfrac}$$

5.17.10

Cost of goods sold for the current year is found on the income statement. Average inventory is found by dividing the sum of beginning and ending inventory balances found on the balance sheet. The beginning inventory balance in the current year is taken from the ending inventory balance in the prior year.

Clear Lake Sporting Goods' inventory turnover is

$$\text{Average Inventory} = \frac{\$35{,}000 + \$40{,}000}{2} = \$37,$$

5.17.11

$$\text{Inventory Turnover} = \frac{\$60{,}000}{\$37{,}500} = 1.6$$

5.17.12

A ratio of 1.6 times seems to be a very low turnover rate for Clear Lake Sporting Goods. This may mean the company is maintaining too high an inventory supply to meet a low demand from customers. Managers may want to decrease their on-hand inventory to free up more liquid assets to use in other ways. Keep in mind, ratios should not be taken out of context. One ratio alone can't tell the whole story. Ratios should be used with caution and in conjunction with other ratios and additional financial and contextual information.

As with accounts receivable, there is a trade-off to consider in managing inventory. Low turnover will usually mean a low risk of stockouts and the ability to carry more of what customers are looking for. But high inventory levels will mean that more cash is tied up in inventory. High turnover will mean carrying less inventory and the higher risk of stockouts, causing customers to go elsewhere to find what they need.

Figure 5.17.3 Inventory turnover can help determine how well a company manages its inventory. (credit: "Untitled" by Marcin Wichary/flickr, CC BY 2.0)

Link to Learning

Target Corporation

As we have learned, the inventory turnover ratio shows how well a company manages its inventory. Look through the financial statements in the 2019 Annual Report for Target and calculate the inventory turnover ratio. What does the outcome mean for Target?

Days' Sales in Inventory

Days' sales in inventory expresses the number of days it takes a company to turn inventory into sales. The fewer the number of days, the more quickly the company can sell its inventory. The greater the number of days, the longer it takes to sell its inventory. The formula for days' sales in inventory is

$$\text{Days' Sales in Inventory} = \text{mfrac}\times$$

5.17.13

Clear Lake Sporting Goods' days' sales in inventory is

$$\text{Days' Sales in Inventory} = \frac{\$40{,}000}{\$60{,}000} \times 365 = 243\text{days (rounded)}$$

5.17.14

Depending on the industry, 243 days may be a long time to sell inventory. While industry dictates what is an acceptable number of days to sell inventory, 243 days is likely to be unsustainable long-term. Remember, it's important to not take one ratio out of context. Review the ratio in conjunction with other ratios and other financial data. For example, we might review the days' sales in inventory along with accounts receivable turnover for Clear Lake Sporting Goods relative to the industry average to get a better picture of Clear Lake's performance in this area.

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5.18: Liquidity Ratios

Learning Objectives

By the end of this section, you will be able to:

- Calculate current, quick, and cash ratios to assess a firm's liquidity and make informed business decisions.
- Assess organizational performance using liquidity ratios.

Liquidity refers to the business's ability to manage current assets or convert assets into cash in order to meet short-term cash needs, another aspect of a firm's financial health. Examples of the most liquid assets include cash, accounts receivable, and inventory for merchandising or manufacturing businesses. The reason these are among the most liquid assets is that these assets will be turned into cash more quickly than land or buildings, for example. Accounts receivable represents goods or services that have already been sold and will typically be paid/collected within 30 to 45 days.

Inventory is less liquid than accounts receivable because the product must first be sold before it generates cash (either through a cash sale or sale on account). Inventory is, however, more liquid than land or buildings because, under most circumstances, it is easier and quicker for a business to find someone to purchase its goods than it is to find a buyer for land or buildings.

Current Ratio

The current ratio is closely related to working capital; it represents the current assets divided by current liabilities. The current ratio utilizes the same amounts as working capital (current assets and current liabilities) but presents the amount in ratio, rather than dollar, form. That is, the current ratio is defined as current assets/current liabilities. The interpretation of the current ratio is similar to working capital. A ratio of greater than one indicates that the firm has the ability to meet short-term obligations with a buffer, while a ratio of less than one indicates that the firm should pay close attention to the composition of its current assets as well as the timing of the current liabilities.

$$\text{Current Ratio} = \text{mfrac}$$

5.18.1

The current ratio in the current year for Clear Lake Sporting Goods is

$$\text{Current Ratio} = \frac{\$200{,}000}{\$100{,}000} = 2\text{or}2:$$

5.18.2

A 2:1 ratio means the company has twice as many current assets as current liabilities; typically, this would be plenty to cover obligations. A 2:1 ratio is actually quite high for most companies and most industries. Again, it's recommended that ratios be used in conjunction with one another. An analyst would likely look at the high current ratio and low accounts receivable turnover to begin asking questions about management performance, as this might indicate a trouble area (high inventory and slow collections).

Link to Learning

Target Corporation

As we have learned, the current ratio shows how well a company can cover short-term liabilities with short-term assets. Look through the balance sheet in the 2019 Annual Report for Target and calculate the current ratio. What does the outcome mean for Target?

Quick Ratio

The quick ratio, also known as the *acid-test ratio*, is similar to the current ratio except current assets are more narrowly defined as the most liquid assets, which exclude inventory and prepaid expenses. The conversion of inventory and prepaid expenses to cash can sometimes take more time than the liquidation of other current assets. A company will want to know what it has on hand and can use quickly if an immediate obligation is due. The formula for the quick ratio is

$$\text{Quick Ratio} = \text{mfrac}$$

5.18.3

The quick ratio for Clear Lake Sporting Goods in the current year is

$$\text{Quick Ratio} = \frac{\$110{,}000 + \$20{,}000 + \$30{,}000}{\$100{,}000} = 1.6\text{or}1.6:$$

5.18.4

A 1.6:1 ratio means the company has enough quick assets to cover current liabilities. It's again key to note that a single ratio shouldn't be used out of context. A 1.6 ratio is difficult to interpret on its own. Industry averages and trend analysis for Clear Lake Sporting Goods would also be helpful in giving the ratio more meaning.

Link to Learning

Target Corporation

As we have learned, the quick ratio shows how quickly a company can liquidate current assets to cover current liabilities. Look through the financial statements in the 2019 Annual Report for Target and calculate the quick ratio. What does the outcome mean for Target?

Cash Ratio

Cash is the most liquid asset a company has, and cash ratio is often used by investors and lenders to asses an organization's liquidity. It represents the firm's cash and cash equivalents divided by current liabilities and is a more conservative look at a firm's liquidity than the current or quick ratios. The ratio is reflected as a number, not a percentage. A cash ratio of 1.0 means the firm has enough cash to cover all current liabilities if something happened and it was required to pay all current debts immediately. A ratio of less than 1.0 means the firm has more current liabilities than it has cash on hand. A ratio of more than 1.0 means it has enough cash on hand to pay all current liabilities and still have cash left over. While a ratio greater than 1.0 may sound ideal, it's important to consider the specifics of the company. Sitting on idle cash is not ideal, as the cash could be used to earn a return. And having a ratio less than 1.0 isn't always bad, as many firms operate quite successfully with a ratio of less than 1.0. Comparing the company ratio with trend analysis and with industry averages will help provide more insight.

$$\text{Cash Ratio} = \text{mfrac}$$

5.18.5

The cash ratio for Clear Lake Sporting Goods in the current year is:

$$\text{Cash Ratio} = \frac{\$110{,}000}{\$100{,}000} = 1.1$$

5.18.6

A 1.1 ratio means the company has enough cash to cover current liabilities.

Figure 5.18.1: Cash is the most liquid asset a company has and is often used by investors and lenders to assess an organization's liquidity. (credit: "20 US Dollar" by Jack Sem/flickr CC BY 2.0)

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5.19: Solvency Ratios

Learning Objectives

By the end of this section, you will be able to:

- Evaluate organizational solvency using the debt-to-assets and debt-to-equity ratios.
- Calculate the times interest earned ratio to assess a firm's ability to cover interest expense on debt as it comes due.

Solvency implies that a company can meet its long-term obligations and will likely stay in business in the future. Meeting long-term obligations includes the ability to pay any interest incurred on long-term debt. Two main solvency ratios are the debt-to-equity ratio and the times interest earned ratio.

Debt-to-Assets Ratio

The debt-to-assets ratio shows the relationship between debt and assets. It reflects how much of the assets of the business were financed through debt. It reflects the company's leverage and is helpful to analysts in comparing how leveraged one company is compared to another.

Debts normally carry interest expense and must be repaid. The debt-to-assets ratio includes all debt—both long-term debt and current liabilities. The formula for the debt-to-assets ratio is

$$\text{Debt-to-Assets Ratio} = \text{mfrac}$$

5.19.1

The information needed to compute the debt-to-assets ratio for Clear Lake Sporting Goods in the current year can be found on the balance sheet. The debt-to-assets ratio for Clear Lake Sporting Goods in the current year is

$$\text{Debt-to-Assets Ratio} = \frac{\$100{,}000 + \$50{,}000}{\$250{,}000} = 0.6\text{or}60\%$$

5.19.2

This means that 60 percent of Clear Lake's assets are financed by debt. We can also then infer that the other 40 percent is financed by equity. A ratio higher than 1.0 means the company has more debts than assets, which means it has negative equity. In Clear Lake's case, a 60 percent debt-to-assets ratio indicates some risk, but perhaps not a high risk. Comparing Clear Lake's ratio to industry averages would provide better insight.

Link to Learning

Target Corporation

As we have learned, the debt-to-assets ratio shows the relationship between a firm's debt and assets. Look through the financial statements in the 2019 Annual Report for Target and calculate the debt-to-assets ratio. What does the outcome mean for Target?

Debt-to-Equity Ratio

The debt-to-equity ratio shows the relationship between debt and equity as it relates to business financing. A company can take out loans, issue stock, and retain earnings to be used in future periods to keep operations running. A key difference in debt and equity is the interest expense repayment that a loan carries as opposed to equity, which does not have this requirement. Therefore, a company wants to know how much debt and equity contribute to its financing. The formula for the debt-to-equity ratio is

$$\text{Debt-to-Equity Ratio} = \text{mfrac}$$

5.19.3

The information needed to compute the debt-to-equity ratio for Clear Lake Sporting Goods in the current year can be found on the balance sheet.

$$\text{Debt-to-Equity Ratio} = \frac{\$150{,}000 + \$50{,}000}{\$100{,}000} = 1.5 \text{or} 1.5:$$

5.19.4

This means that for every one dollar of equity contributed toward financing, $1.50 is contributed from lenders. Recall that total assets equal total liabilities plus total equity. Both the debt-to-assets and debt-to-equity ratio have total liabilities in the numerator. The difference in the two ratios is the denominator. The denominator for the debt-to-equity ratio is total stockholder equity. The denominator for the debt-to-assets ratio is total assets, or total liabilities plus total equity. Thus, the two ratios contain the same information, making calculating both ratios redundant. A financial analyst may prefer to calculate one ratio over the other because of the format of readily available industry data to use for comparison purposes or for consistency with other calculations the analyst is performing.

Think It Through

Financing a Business Expansion

You are the CFO of a small corporation. The president, who is one of five shareholders, has created an innovative new product that is testing well with substantial demand. To begin manufacturing, $400,000 is needed to acquire the equipment. The corporation's balance sheet shows total assets of $2,400,000 and total liabilities of $600,000. Most of the liabilities relate to debt that carries a covenant requiring that the company maintain a debt-to-equity ratio not exceeding 0.50. Determine the effect that each of the two options of obtaining additional capital will have on the debt covenant.

▼

Solution

We know the total liabilities for the firm to be $600,000. Using the accounting equation, we can find that the firm has $1,800,000 in equity. $\$600{,}000/\$1{,}800{,}000 =$ current debt-to-equity ratio of 0.33, which is well below the requirement for the debt covenant. If the firm issues debt, the ratio changes to $\$1{,}000{,}000/\$1{,}800{,}000$, which is 0.55 and would violate the debt covenant. If the firm chooses to issue additional stock, the new debt-to-equity ratio would be $\$600{,}000/\$2{,}200{,}000$, which is 0.27. This is well below the requirements in the debt covenant.

Times Interest Earned (TIE) Ratio

The times interest earned (TIE) ratio measures the company's ability to pay interest expense on all debt incurred. This ability to pay is determined by the available earnings before interest and taxes (EBIT) are deducted. These earnings are considered the operating income. Lenders will pay attention to this ratio before extending credit. The more times a company can cover interest, the more likely a lender will extend long-term credit. The formula for times interest earned is

$$\text{Times Interest Earned} = \frac{\text{Earnings Before Interest and Taxes (EBIT)}}{\text{Interest}}$$

5.19.5

The information needed to compute times interest earned for Clear Lake Sporting Goods in the current year can be found on the income statement.

$$\text{Times Interest Earned} = \frac{\$43{,}000}{\$2{,}000} = 21.5$$

5.19.6

The $43,000 is the operating income, representing earnings before interest and taxes. The 21.5 times outcome suggests that Clear Lake Sporting Goods can easily repay interest on an outstanding loan and creditors would have little risk that Clear Lake Sporting Goods would be unable to pay.

Link to Learning

Times Interest Earned

This video about times interest earned explains how to calculate it and why the ratio is useful, and it provides an example.

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5.20: Market Value Ratios

Learning Objectives

By the end of this section, you will be able to:

- Calculate earnings per share to determine the portion of profit allocated to each outstanding share of common stock.
- Evaluate firm value using the price/earnings ratio and book value per share.

In this section we will turn our attention to market value ratios, measures used to assess a firm's overall market price. Common ratios used include earnings per share, the price/earnings ratio, and book value per share.

Earnings per Share (EPS)

Earnings per share (EPS) measures the portion of a corporation's profit allocated to each outstanding share of common stock. An increasing earnings per share can drive up a stock price. Conversely, falling earnings per share can lower a stock's market price. Earnings per share is also a component in calculating the price-to-earnings ratio (the market price of the stock divided by its earnings per share), which many investors find to be a key indicator of the value of a company's stock.

It's key to note, however, that EPS, like any ratio, should be used with caution and in tandem with other ratios and contextual data. Many financial professionals choose not to rely on income statement data and, similarly, EPS because they feel the cash flow statement provides more reliable and insightful information.

Concepts In Practice

Alibaba Group Earnings Announcements Continue to Exceed Market Expectations

Alibaba, a Chinese-based company traded in the United States, exceeded market expectations in 2020 quarterly earnings releases. In the November 2020 earnings release, Alibaba reported earnings per share of 17.97 yuan versus market estimates of 14.33. Despite many companies struggling due to the pandemic, Alibaba reported strong earnings as a result of the surge in online shopping and remote work.

(sources: "Alibaba Beats Estimates as Pandemic Fuels Online, Cloud Computing Demand." *CNBC*. August 20, 2020. https://www.cnbc.com/2020/08/20/alib...estimates.html; Emily Bary. "Alibaba Earnings Top Expectations as Pandemic Drives Increased Digital Purchases. *Market Watch*. August 20, 2020. www.marketwatch.com/story/al...ses-2020-08-20; Matthew Johnston. "Alibaba Earnings: What Happened." *Investopedia*. November 5, 2020. https://www.investopedia.com/alibaba...rnings-5085444; Chris Versace. "Why S&P 500 EPS Expectations Showcase the Need for Thematic Investing." *Tematica Research*. June 3, 2020. https://www.tematicaresearch.com/why...atic-investing)

Calculating Earnings per Share

Earnings per share is the profit a company earns for each of its outstanding common shares. Both the balance sheet and income statement are needed to calculate earnings per share. The balance sheet provides details on the preferred dividend rate, the total par value of the preferred stock, and the number of common shares outstanding. The income statement indicates the net income for the period. The formula to calculate basic earnings per share is

$$\text{Earnings per Share} = \text{mfrac}$$

DividendsWeighted Average Common Shares OutstandingEarnings per Share=Net Income - Preferred DividendsWeighted Average Common Shares Outstanding
5.20.1

By removing the preferred dividends from net income, the numerator represents the profit available to common shareholders. Because preferred dividends represent the amount of net income to be distributed to preferred shareholders, this portion of the income is obviously not available for common shareholders. While a number of variations of measuring a company's profit, such as NOPAT (net operating profit after taxes) and EBITDA (earnings before interest, taxes, depreciation, and amortization), are used

in the financial world, GAAP requires companies to calculate earnings per share based on a corporation's net income, as this amount appears directly on a company's income statement, which for public companies must be audited.

In the denominator, only common shares are used to determine earnings per share because earnings per share is a measure of earnings for each common share of stock. The denominator can fluctuate throughout the year as a company issues and buys back shares of its own stock. The weighted average number of shares is used on the denominator because of this fluctuation. To illustrate, assume that a corporation began the year with 600 shares of common stock outstanding and then on April 1 issued 1,000 more shares. During the period January 1 to March 31, the company had the original 600 shares outstanding. Once the new shares were issued, the company had the original 600 plus the new 1,000 shares, for a total of 1,600 shares for each of the next nine months—from April 1 to December 31. To determine the weighted average shares, apply these fractional weights to both of the stock amounts (see Figure 5.20.1).

Number of Shares	×	Portion of Year	=	Weighted Shares
600	×	3/12	=	150
1,600	×	9/12	=	1,200
Weighted Average Shares				1,350

Figure 5.20.1: Weighted Shares

If the shares were not weighted, the calculation would not consider the time period during which the shares were outstanding.

To illustrate how earnings per share is calculated, assume Clear Lake Sporting Goods earns $35,000 in net income during the current year. During the year, the company also declared a $5,000 dividend on preferred stock and a $6,000 dividend on common stock. The company had 8,000 common shares outstanding the entire year. Clear Lake Sporting Goods has generated $3.75 of earnings ($35,000 less the $5,000 of preferred dividends) for each of the 8,000 common shares of stock it has outstanding.

$$\text{Earnings per Share} = \frac{\$35{,}000 - \$5{,}000}{8{,}000} = \$3.75$$

5.20.2

Measuring Performance with Earnings per Share

Earnings per share is a key profitability measure that both current and potential common stockholders monitor. Its importance is accentuated by the fact that GAAP requires public companies to report earnings per share on the face of a company's income statement. This is the only ratio that requires such prominent reporting. If fact, public companies are required to report two different earnings per share amounts on their income statements—basic and diluted. We've illustrated the calculation of basic earnings per share. Diluted earnings per share, which is not demonstrated here, involves the consideration of all securities, such as stocks and bonds, that could potentially dilute, or reduce, the basic earnings per share.

Link to Learning

Finding Earning per Share for Public Companies

Where can you find earnings per share information on public companies? Use the Yahoo! Finance website to look up stock and earnings per share data for Tellurian Inc. (TELL), Amazon (AMZN), or CVS Pharmacy (CVS). Or use the search function to search for earnings per share data for your favorite corporation. Enter the ticker for the company you are looking up, and a basic chart and graph will display with stock price data along with several commonly used ratios (including earnings per share).

As you review data, keep in mind that a company can manipulate or impact its earnings per share by issuing new shares or buying back issued shares. What are the ethical implications of earnings per share calculations?

Common stock shares are normally purchased by investors to generate income through dividends or to sell at a profit in the future. Investors realize that inadequate earnings per share can result in poor or inconsistent dividend payments and fluctuating stock prices. As such, companies seek to produce earnings per share amounts that rise each period. However, an increase in earnings per

share may not always reflect favorable performance, as there are multiple reasons that earnings per share may increase. One way earnings per share can increase is through increased net income. On the other hand, it can also increase when a company buys back its own shares of stock.

For example, assume that Clear Lake Sporting Goods generated net income of $30,000 and paid out $3,000 in preferred shareholder dividends last year. In addition, 10,550 shares of common stock were outstanding throughout the entire year. In January of the current year, the company buys back shares of its common stock and holds them as treasury shares, making its current weighted average shares outstanding for this year 8,000. Net income for the current year is $35,000, $5,000 of which was paid to preferred shareholders in dividends. In the prior year, the company's earnings per share were

$$\text{Earnings per Share} = \frac{\$30{,}000 - \$3{,}000}{10{,}550} = \$2.56$$

5.20.3

Clear Lake Sporting Goods' current year earnings per share is

$$\text{Earnings per Share} = \frac{\$35{,}000 - \$5{,}000}{8{,}000} = \$3.75$$

5.20.4

The purchase of treasury stock in the current year reduces the common shares outstanding to 8,000 because treasury shares are considered issued but not outstanding. Earnings per share for the current year is now $3.75 per share even though earnings only increased by $5,000. It's key to note the impact of purchasing treasury stock and the intentions in doing so. Treasury stock is commonly purchased for a variety of reasons, but doing so to intentionally manipulate earnings per share should not be a primary reason.

This increase in earnings per share occurred because the net income is now spread over fewer shares of stock. Similarly, earnings per share can decline even when a company's net income increases if the number of shares increases at a higher degree than net income.

Concepts In Practice

Stock Buybacks Can Drive Up Earnings per Share: Ethical?

As many companies struggled to make ends meet or meet their cash flow needs amid the COVID-19 pandemic, some companies continued to thrive. Apple continued to have a healthy financial position with ample cash supply. It repurchased $18.5 billion of its own stock in the second quarter of 2020.[1] The total stock buyback over the preceding five years was $282.87 billion, which is 3.5 times higher than any other company. Since the earnings per share calculation is earnings divided by average outstanding shares, the fewer shares there are outstanding, the higher the earnings per share goes without the firm having to actually raise earnings.

What do you think? Did Apple act ethically in repurchasing large quantities of its own shares? Is it ethical for any company to do so? If you were an investor or analyst, what questions would you ask or what cautions would you take in assessing and comparing earnings per share data?

(sources: Wayne Duggan. "7 S&P 500 Companies with Stock Buybacks." *US News & World Report*. December 14, 2020. money.usnews.com/investing/s...ybacks?slide=2; "Apple's $460 Billion Stock Buyback." *Above Avalon*. April 23, 2020. https://www.aboveavalon.com/notes/20...-stock-buyback; "Apple Stock Buybacks (Quarterly)." *Ycharts*. n.d. ycharts.com/companies/AAPL/stock_buyback)

Link to Learning

Stock Buybacks

This *Wall Street Journal* video about stock buybacks explains the various perspectives on the subject. It walks through the basic concepts of how buybacks work and explores some viewpoints on whether buybacks are good, bad, or otherwise.

To put a firm's earnings per share into perspective and allow for a more meaningful analysis, earnings per share is often tracked over a number of years, such as when presented in the comparative income statements for Clear Lake Sporting Goods (see Figure 5.20.2).

Clear Lake Sporting Goods Comparative Year-End Income Statements			
	Current Year	Prior Year	2 Years Prior
Net Sales	$120,000	$100,000	$90,000
Cost of Goods Sold	60,000	50,000	45,000
Gross Profit	60,000	50,000	45,000
Rent Expense	5,500	5,000	5,000
Depreciation Expense	3,600	2,500	2,000
Salaries Expense	5,400	3,000	2,750
Utility Expense	2,500	1,500	1,250
Operating Income	43,000	38,000	34,000
Interest Expense	2,000	3,000	2,000
Income Tax Expense	6,000	5,000	5,000
Net Income	$ 35,000	$ 30,000	$27,000
Basic Weighted Shares Outstanding	8,000	10,550	11,100
Basic Net Income per Share (EPS)	$ 3.75	$ 2.56	$ 2.21
Common Dividends	$ 6,000	$ 4,000	$ 3,500
Preferred Dividends	$ 5,000	$ 3,000	$ 2,500

Figure 5.20.2: Comparative Year-End Income Statements Earnings per share year after year can be a good indication of a company's financial health.

Most analysts believe that a consistent improvement in earnings per share year after year is an indication of continuous improvement in the earning power of a company. This is what is seen in Clear Lake Sporting Goods' earnings per share amounts over each of the three years reported, moving from $2.21 to $2.56 to $3.75. However, it is important to remember that earnings per share is calculated on historical data, which is not always predictive of the future.

Think It Through

Would You Have Invested?

What if, in 1997, you invested $5,000 in Amazon? Today, your investment would be worth nearly $6 million. Potential investors viewing Amazon's income statement in 1997 would have seen earnings per share of negative $1.27. In other words, Amazon lost $1.27 for each share of common stock outstanding. Would you have invested?

Price/Earnings (P/E) Ratio

The price/earnings (P/E) ratio measures the current market share price of a company's stock relative to its earnings per share (EPS). The ratio is helpful in comparing performance and stock price of a company to other companies. It's also helpful in evaluating how much investors are willing to pay for earnings performance. Investors, in particular, use this ratio and rely on two key characteristics: past performance (trailing) and future estimates (forward). Trailing data can be calculated but is also easily found online, as it's a common measure reported on financial sites. Investors will often look for P/E TTM, which is the price/earnings ratio for the trailing 12 months (last year worth of earnings data). This helps investors assess one day's stock price relative to the

earnings per share over the past 12 months. P/E ratio is widely used by investors to determine if a stock is over- or undervalued. It also helps them compare one firm to that of the industry average or index, such as the S&P 500.

$$\text{Price/Earnings Ratio} = \text{mfrac}$$

ShareEarnings per SharePrice/Earnings Ratio=Market Value per ShareEarnings per Share
5.20.5

In the prior section we saw earnings per share data for Clear Lake Sporting Goods. Using its current year earnings per share of $3.75 and the current stock price of $69.41, we can calculate price/earnings ratio for Clear Lake Sporting Goods:

$$\text{Price Earnings Ratio} = \frac{\$69.41}{\$3.75} = 18.51$$

5.20.6

An 18.51 ratio means an investor would expect to invest $18.51 to gain $1 of earnings.

Book Value per Share

Book value per share is often used hand in hand with market value per share. Investors compare the two in order to see if the stock is possibly over- or undervalued. Book value is derived from accounting practices and shows the value of the firm on paper. Market value, on the other hand, is determined by supply and demand, based on what investors are willing to pay for the stock. If the market value per share is higher than the book value, the stock is considered overvalued. If the market value is lower than the book value, it's considered undervalued.

In theory, book value per share represents the total value common shareholders would receive if the firm were liquidated. It is total equity less preferred equity, spread across the total shares outstanding. The formula to calculate book value per share is

$$\text{Book Value per Share} = \text{mfrac}$$

EquityTotal Shares OutstandingBook Value per Share=Total Equity – Preferred EquityTotal Shares Outstanding
5.20.7

The book value per share for Clear Lake Sporting Goods is

$$\text{Book Value per Share} = \frac{\$100{,}000 - \$20{,}000}{8{,}000} = \$$$

10Book Value per Share=$100,000-$20,0008,000=$10
5.20.8

If investors compared the book value per share of $10.00 for Clear Lake Sporting Goods to the P/E ratio of $18.51, they would likely conclude that the stock was undervalued in the year of analysis.

Link to Learning

Book Value versus Market Value of Shares

This video about book value and market value explains the basic concepts and discusses how the two differ. Samples of the concept are then explored using Apple Inc. as an example.

Footnotes

- 1Bill Maurer. "Apple: New Highs Seem Likely." Seeking Alpha. May 11, 2020. seekingalpha.com/article/434...hs-seem-likely

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CHAPTER OVERVIEW

6: Competition

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6.1: Introduction to Strategic Analysis

Exploring Managerial Careers: Lauri Goodman Lampson (Planning Design Research Corporation)

Lauri Goodman Lampson is president and CEO of Planning Design Research Corporation,[1] a firm that analyzes work environments to understand how employees work and what kind of spaces and facilities they need to do their best, most productive work. Lampson was hired by Accenture, a consulting firm, to evaluate and improve its location in Houston. Accenture's Houston office was a three-story, 66,000-square-foot building that served 800 employees.[2] Accenture employees are consultants themselves, and they typically spend up to two-thirds of their working time away from the office serving clients.

Lampson worked with Accenture director of workplaces Dan Johnson and Steelcase, an office furniture manufacturer, to study how Accenture was using its Houston space. Lampson's "focus is on gaining a deep understanding of the business and its strategy for success and then developing strategic workplace solutions that enable those goals."[3] To achieve this outcome, Lampson and Steelcase analyzed employee demographics and expectations and studied how employees actually interacted with each other and performed tasks in the workplace. Accenture wanted to have a workspace that fostered its corporate goals of: worker innovation, collaboration, and flexibility.[4]

Figure 6.1.1: American General Center The American General Center is a complex of several office buildings in Houston, Texas, and home offices for Accenture. (Credit: Ken Luncd/ flickr/ Attribution-ShareAlike 2.0 Generic (CC BY-SA 2.0))

Understanding a firm's strengths is an important step in strategic analysis, and Lampson's focus on supporting those strengths in the workplace environment led to Workplace 2.0, Accenture's reimagined facility. Not only does the new workspace provide better physical and technological support for collaboration among Accenture employees, but Lampson and Steelcase were able to identify opportunities for Accenture to significantly reduce the size of its offices. Accenture saves money by using less space (it was able to downsize to a single floor of 25,000 square feet to serve the same number of workers) and supports worker interaction and engagement by providing a more effective workspace. You can watch a video of this transformation here: https://www.youtube.com/watch?v=y4oIlY3HJfo

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3. PDR (2016). Lauri Goodman Lampson President + CEO. www.pdrcorp.com/lauri-goodman-lampson/ Accessed July 28, 2017.
4. Steelcase (2011). Accenture Case Study. https://www.youtube.com/watch?v=y4oIlY3HJfo&t=219s Accessed July 28, 2017.

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6.2: Gaining Advantages by Understanding the Competitive Environment

Learning Objectives

- What is strategic analysis, and why do firms need to analyze their competitive environment?

Strategic analysis is the process that firms use to study and understand the many different layers and aspects of their competitive environment. Why do firms spend time and money trying to understand what is going on around them? Firms do not operate in a vacuum. They are impacted by forces and factors from inside their organizations and outside in the world at large. Understanding these forces and factors is crucial to achieving success as a business. For example, the growth in the Spanish-speaking population in the United States has led many firms to change the signage in their stores and labels on their products to include Spanish, in order to make their stores easier to shop in and their products easier to identify for this growing market. The external environment is continually changing, and the most successful firms are able to prepare for and adapt to environmental changes because they have done their homework and understand how external forces impact their operations.

To react to change more easily and develop products consumers want, managers and consultants engage in **environmental scanning**—the systematic and intentional analysis of both a firm's internal state and its external, competitive environment. From a local coffee shop to an international corporation, firms of all sizes benefit from strategic analysis. Let's examine some important strategic factors in more detail.

The Competitive Environment

A firm's **competitive environment** includes components inside the firm and outside the firm. **External factors** are things in the global environment that may impact a firm's operations or success, examples are a rise in interest rates, or a natural disaster. External factors cannot be controlled, but they must be managed effectively, and to understand them so that the firm can be as successful. For example, the unemployment rate will affect a firm's ability to hire qualified employees at a reasonable rate of pay. If unemployment is high, meaning that a lot of people are looking for jobs, then a firm will probably have a lot of applicants for any positions it needs to fill. It will be able to choose more highly qualified applicants to hire and may be able to hire them at a lower pay rate because the employee would rather work for a lower pay rate than not have a job at all. On the other hand, when unemployment is low, meaning that not many people are looking for jobs, firms may have to offer higher pay or settle for lower qualifications to find someone to fill a position.

Internal factors are characteristics of the firm itself. To plan to compete against other firms, a firm needs to understand what physical, financial, and human resources it has, what it is good at, and how it is organized. For example, Walmart has a sophisticated IT system that tracks inventory and automatically orders products before they run out, by calculating how long it will take for the new product to arrive and comparing that to the rate at which the product is selling off the shelves. The system orders new product so that it will arrive just as the product on the shelves is running out, so that Walmart stores do not need to have storage space for inventory. All Walmart inventory is on the store shelves, ready to be sold to customers. How does this system benefit Walmart? It does not have to spend money on storing or keeping track of inventory, all products in the store can generate revenue because they are available for customers to buy, and when the system is working optimally, the store never runs out of items customers want.

Concept Check

1. Why do managers use strategic analysis?
2. How are internal factors different from external factors in a firm's competitive environment?

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6.3: Using SWOT for Strategic Analysis

Learning Objectives

- What is a SWOT analysis, and what can it reveal about a firm?

You may already have heard of one very common tool firms use to analyze their strategic and competitive situations: SWOT, which is an acronym for strengths, weaknesses, opportunities, and threats. Firms use SWOT analysis to get a general understanding of what they are good or bad at and what factors outside their doors might present chances for success or difficulty. Let's take a look at SWOT analysis piece by piece (Figure 6.3.1).

Figure 6.3.1: The Components of SWOT (Attribution: Copyright Rice University, OpenStax, under CC-BY 4.0 license)

Strengths

A firm's **strengths** are, to put it simply, what it is good at. Nike is good at marketing sports products, McDonald's is good at making food quickly and inexpensively, and Ferrari is good at making beautiful fast cars. When a firm analyzes its strengths, it compiles a list of its capabilities and assets. Does the firm have a lot of cash available? That is a strength. Does the firm have highly skilled employees? Another strength. Knowing exactly what it is good at allows a firm to make plans that exploit those strengths. Nike can plan to expand its business by making products for a sport it doesn't currently serve. Its sports marketing expertise will help it successfully launch that new product line.

Weaknesses

A firm's **weaknesses** are what it is not good at—things that it does not have the capabilities to perform well. Weaknesses are not necessarily faults—remember that not all firms can be great at all things. When a firm understands its weaknesses, it will avoid trying to do things it does not have the skills or assets to succeed in, or it will find ways to improve its weaknesses before undertaking something new. A firm's weaknesses are simply gaps in capabilities, and those gaps do not always have to be filled within the firm.

SWOT analysis alerts firms to the gaps in their capabilities so they can work around them, find help in those areas, or develop capabilities to fill the gaps. For example, Paychex is a firm that handles payroll for over 600,000 firms.[1] Paychex processes hours, pay rates, tax and benefits deductions, and direct deposit for firms that would rather not have to perform those tasks themselves. A large firm would need to have a team of employees dedicated to fulfilling that task and equip that team with software systems to do the job efficiently and accurately. For Paychex, these capabilities are a company strength—that's what it does. Other companies that do not have the resources to develop this capability or may not be interested in doing so can hire Paychex to do the job for them.

Opportunities

While strengths and weaknesses are internal to an organization, opportunities and threats are always external. An **opportunity** is a potential situation that a firm is equipped to take advantage of. Think of opportunities in terms of things that happen in the market. Opportunities offer positive potential, however, sometimes a firm is not equipped to take advantage of an opportunity, which is why considering the entire SWOT is important before deciding what to do. For example, as cities are becoming more populated, parking is becoming scarcer. Younger consumers who live in cities are starting to question whether it makes sense to own a car at all, when public transportation is available and parking is not. Sometimes, however, a person might need a car to travel outside the city or transport a special purchase. Daimler, the manufacturer of Mercedes-Benz and Smart cars, started a car-sharing service in Europe, North America, and China called Car2Go to offer cars to this new market of part-time drivers. By establishing Car2Go, Daimler has found a way to sell the use of its products to people who would not buy them outright.

Threats

When a manager assesses the external competitive environment, she labels anything that would make it harder for her firm to be successful as a **threat**. A wide variety of situations and scenarios can threaten a firm's chances of success, from a downturn in the economy to a competitor launching a better version of a product the firm also offers. A good threat assessment looks thoroughly at the external environment and identifies threats to the firm's business so it can be prepared to meet them. Opportunities and threats can also be a matter of perspective or interpretation: the Car2Go service that Daimler developed to serve young urban customers who don't own cars could also be cast as a defensive response to the trend away from car ownership in this customer group. Daimler could have identified decreasing sales among young urban professionals as a threat and developed Car2Go as an alternative way to gain revenue from these otherwise lost customers.

The Limitations of SWOT Analysis

Although a SWOT analysis can identify important factors and situations that affect a firm, it only works as well as the person doing the analysis. SWOT can generate a good evaluation of the firm's internal and external environments, but it is more likely to overlook key issues because it is difficult to identify or imagine everything that could, for example, be a threat to the firm. That's why the remainder of this chapter will present tools for developing a strategic analysis that is more thorough and systematic in examining both the internal and external environments that firms operate in.

? Concept Check

1. Explain the elements of a SWOT analysis.
2. What information does a SWOT analysis provide managers? What information might it miss?

References

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6.4: A Firm's External Macro Environment - PESTEL

Learning Objectives

- What makes up a firm's external macro environment, and what tools do strategists use to understand it?

The world at large forms the **external environment** for businesses. A firm must confront, adapt to, take advantage of, and defend itself against what is happening in the world around it to succeed. To make gathering and interpreting information about the external environment easier, strategic analysts have defined several general categories of activities and groups that managers should examine and understand. Figure 6.4.1 illustrates layers and categories found in a firm's environment.

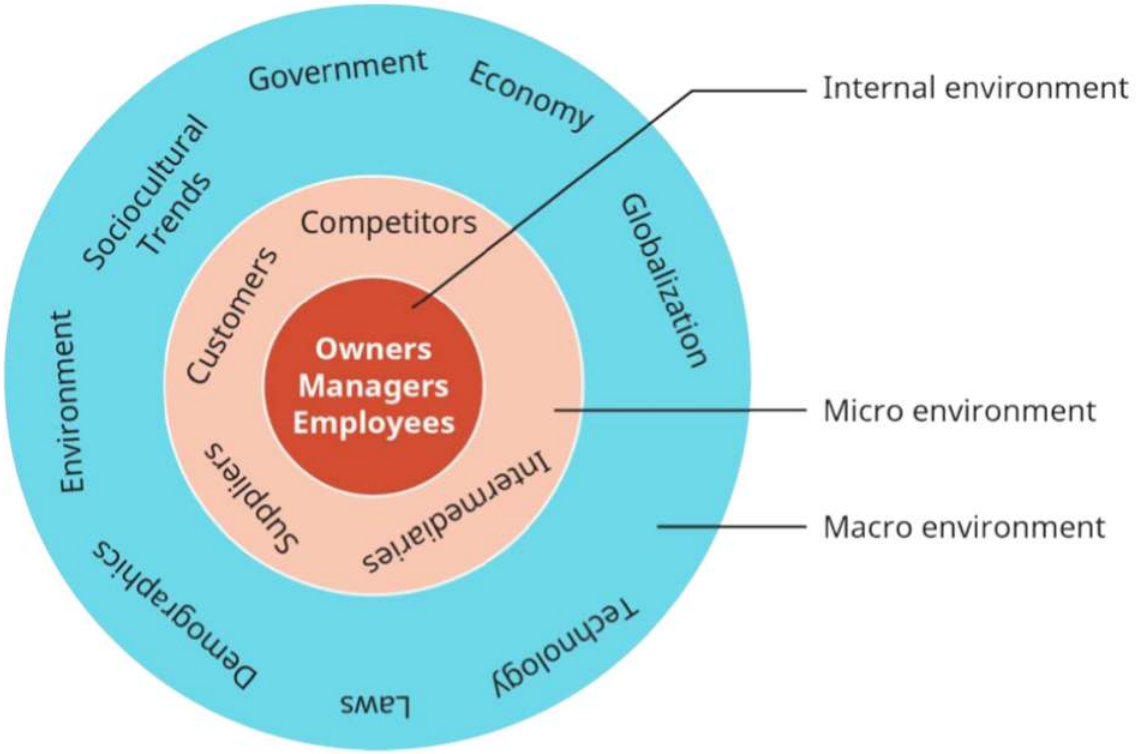

Figure 6.4.1: Components of a Firm's Environment (Attribution: Copyright Rice University, OpenStax, under CC-BY 4.0 license)

A firm's **macro environment** contains elements that can impact the firm but are generally beyond its direct control. These elements are characteristics of the world at large and are factors that all businesses must contend with, regardless of the industry they are in or type of business they are. In the Figure 6.4.1, the macro environment is indicated in blue. Note that the terms contained in the blue ring are all "big-picture" items that exist independently of business activities. That is not to say that they do not affect firms or that firm activities cannot affect macro environmental elements; both can and do happen, but firms are largely unable to directly change things in the macro environment.

Strategists study the macro environment to learn about facts and trends that may present opportunities or threats to their firms. However, they do not usually just think in terms of SWOT. Strategists have developed more discerning tools to examine the external environment.

PESTEL

PESTEL is a tool that reminds managers to look at several distinct categories in the macro environment. Like SWOT, PESTEL is an acronym. In this case, the letters represent the categories to examine: political factors, economic factors, sociocultural factors, technological factors, environmental factors, and legal factors. When using PESTEL to analyze a specific firm's situation, overlap between different categories of PESTEL factors can sometimes happen just as it can with SWOT.

Remember our earlier example: When urban millennials decide that car ownership is no longer attractive, car manufacturers' sales are threatened. However, those same manufacturers might be able to adapt their sales methods to offer millennials car-sharing services, taking advantage of the opportunity to earn revenue from millennials who want access to cars for vacations or big shopping trips. PESTEL can also reveal multiple impacts from a single element in the external environment. For example, decreasing interest in car ownership among urban millennials would be a sociocultural trend. However, the technological connectedness of those same urban millennials is exactly what makes it possible for ride-sharing services such as Uber and Lyft to thrive: their services are app-based and provide convenience both by connecting drivers and passengers quickly and by making transactions cashless.

Figure 6.4.2 illustrates the components of PESTEL, which will be discussed individually below.

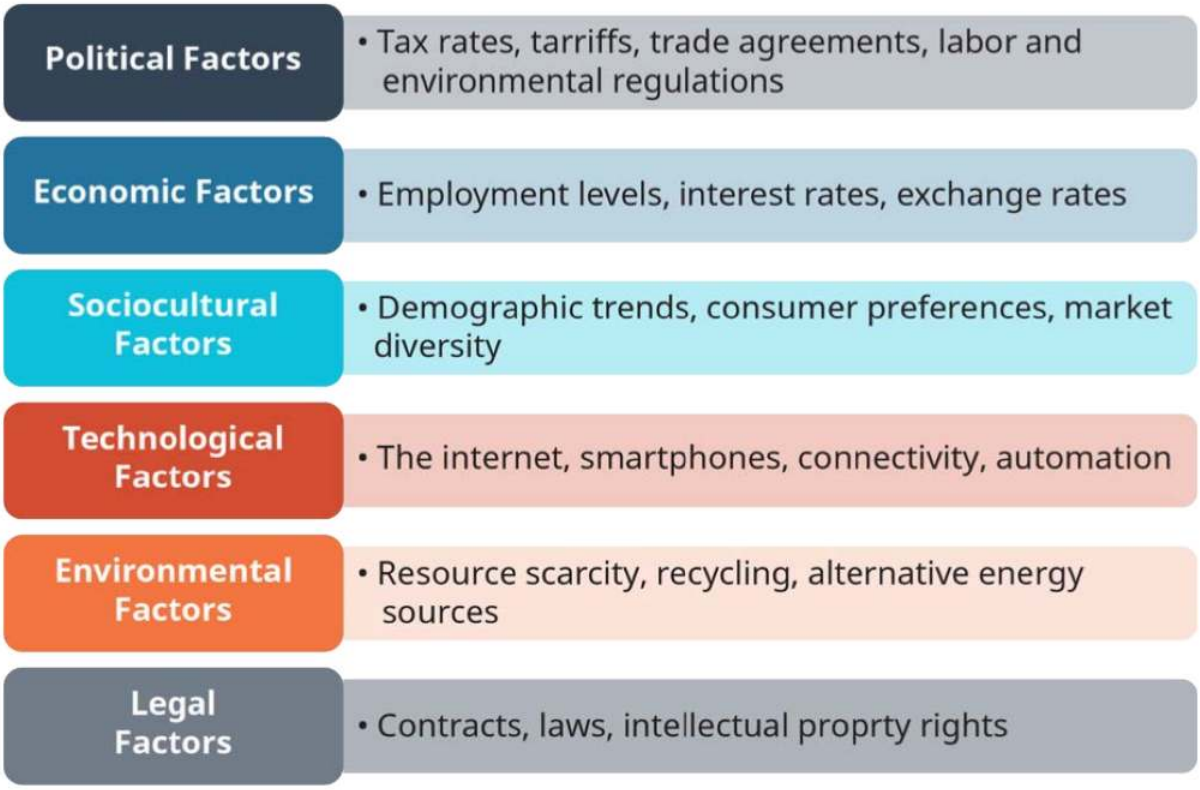

Figure 6.4.2: The PESTEL Model for External Environmental Analysis (Attribution: Copyright Rice University, OpenStax, under CC-BY 4.0 license)

Political Factors

Political factors in the macro environment include taxation, tariffs, trade agreements, labor regulations, and environmental regulations. Note that in PESTEL, factors are not characterized as opportunities or threats. They are simply things that a firm can take advantage of or treat as problems, depending on its own interpretation or abilities. American Electric Power, a large company that generates and distributes electricity, may be negatively impacted by environmental regulations that restrict its ability to use coal to generate electricity because of pollution caused by burning coal. However, another energy firm has taken advantage of the government's interest in reducing coal emissions by developing a way to capture the emissions while producing power. The Petra Nova plant, near Houston, was developed by NRG and JX Nippon, who received Energy Department grants to help fund the project.[1] Although firms do not directly make government policy decisions, many industries and firms invest in lobbying efforts to try to influence government policy development to create opportunities or reduce threats.

Economic Factors

All firms are impacted by the state of the national and global economies. The increased interdependence of individual country economies has made evaluating the **economic factors** in a firm's macro environment more complex. Firms analyze economic indicators to make decisions about entering or exiting geographic markets, investing in expansion, and hiring or laying off

employees. As discussed earlier in this chapter, employment rates impact the quantity, quality, and cost of employees available to firms. Interest rates impact sales of big ticket items that consumers normally finance, such as appliances, cars, and homes. Interest rates also impact the cost of capital for firms that want to invest in expansion. Exchange rates present risks and opportunities to all firms that operate across national borders, and the price of oil impacts many industries, from airlines and transportation companies to solar panel producers and plastic recycling companies. Once again, any scenario can be a threat to one firm and an opportunity to another, so economic forces should not be assumed to be intrinsically good or bad.

Sociocultural Factors

Quite possibly the largest category of macro environmental factors an analyst might examine are **sociocultural factors**. This broad category encompasses everything from changing national demographics to fashion trends and many things in between. **Demographics**, a subset of this category, includes facts about income, education levels, age groups, and the ethnic and racial composition of a population. All of these facts present market challenges and possibilities. Firms can target products to specific market segments by studying the needs and preferences of demographic groups, such as working women (they might need daycare services but not watch daytime television), college students (who would be interested in affordable textbooks but couldn't afford to buy new cars), or the elderly (who would be willing to pay for lawn-mowing services but might not be interested in adventure tourism).

Changes in people's values and interests are also included in this category. Environmental awareness has spurred demand for solar panels and electric and hybrid cars. A general interest in health and fitness has created industries in gyms, home gym equipment, and organic food. The popularity of social media has created an enormous demand for instant access to information and services, not to mention smartphones. Values and interests are constantly changing and vary from country to country, creating new market opportunities as well as communication challenges for companies trying to enter unfamiliar new markets.

Technological Factors

The rise of the Internet may be the most disruptive technological change of the last century. The globe has become more interconnected and interdependent because of the fast, low-cost communications the Internet provides. Customer service agents in India can serve customers in Kansas because technology has advanced to the point that the customer's account information can be instantly accessed by the service provider in India. Entrepreneurs around the world can reach customers anywhere through companies such as eBay, Alibaba, and Etsy, and they can get paid, regardless of their customers' currency, through PayPal. The Internet has enabled Jeff Bezos, who started an online bookselling company called Amazon in 1994, to transform how consumers shop for goods.

How else have **technological factors** impacted business? The Internet is not the only technological advance that has transformed how businesses operate. Automation has increased efficiency for manufacturers. MRP (materials requirement planning) systems have changed how companies and their suppliers work together, and global-positioning technology has helped construction engineers manage large projects more accurately. Consumers and firms have nearly unlimited access to information, and this access has empowered consumers to make more-informed buying decisions and challenged firms to develop ways to analyze the large amounts of data their businesses generate.

Environmental Factors

The physical environment, which provides natural resources for manufacturing and energy production, has always been a key part of human business activity. As resources become scarcer and more expensive, **environmental factors** impact businesses more every day. Firms are developing technology to operate more cleanly and using fewer resources. Political pressure on businesses to reduce their impact on the natural environment has increased globally and dramatically in the 21st century. In 2017, London, Barcelona, and Paris announced their plans to ban cars with internal combustion engines over the next few decades, in order to combat air-quality issues.[2]

This external environment category often overlaps with others in PESTEL because concern for the environment is also a sociocultural trend, as more consumers look for recycled products and buy electric and hybrid cars. On the political front, firms are facing increased regulation around the world on their carbon emissions and natural resource use. Although SWOT would

characterize these factors as either opportunities or threats, PESTEL simply identifies them as aspects of the external environment that firms must consider when planning for their futures.

Legal Factors

Legal factors in the external environment often coincide with political factors because laws are enacted by government entities. This does not mean that the categories identify the same issues, however. Although labor laws and environmental regulations have deep political connections, other legal factors can impact business success. For example, in the streaming video industry, licensing fees are a significant cost for firms. Netflix pays billions of dollars every year to movie and television studios for the right to broadcast their content. In addition to the legal requirement to pay the studios, Netflix must consider that consumers may find illegal ways to view the movies they want to see, making them less willing to pay to subscribe to Netflix. Intellectual property rights and patents are major issues in the legal realm.

Note that some external factors are difficult to categorize in PESTEL. For instance, tariffs can be viewed as either a political or economic factor, while the influence of the internet could be viewed as either a technological or social factor. While some issues can overlap two or more PESTEL areas, it does not diminish the value of PESTEL as an analytical tool.

Concept Check

1. Describe a firm's macro environment.
2. What does PESTEL stand for? How do managers use PESTEL to understand their firm's macro environment?

Ethics in Practice

Sustainability and Responsible Management: Can LEGO Give up Plastic?

"In 2012, the LEGO Group first shared its ambition to find and implement sustainable alternatives to the current raw materials used to manufacture LEGO products by 2030. The ambition is part of the LEGO Group's work to reduce its environmental footprint and leave a positive impact on the planet our children will inherit."[3]

Danish toy company LEGO announced in 2015 that it would invest almost $160 million dollars into its efforts to meet the goal it announced in 2012. You know LEGO—they are the colored plastic bricks that snap together to make toys ranging from Harry Potter castles to Star Wars fighter craft. The family-owned company was founded in 1932 by Ole Kirk Christiansen and has since grown to be the world's number one toy brand.[4]

Given that LEGO and plastic seem to go hand in hand, why would the company want to give up on the material that makes their toys so successful? LEGO's manufacturing process relies on plastic to make highly precise plastic bricks that always fit together securely and easily. Replacing the plastic with another material that is durable, can be brightly colored, and can be molded as precisely is a difficult task. LEGO's leadership has decided that a strategic position based on fossil fuels is not sustainable and is making plans now to transition to a more environmentally friendly material to manufacture its products.

Switching from oil-based plastic might make economic sense as well. Manufacturers who rely on petroleum-based products must weather volatile oil prices. LEGO's raw materials costs could skyrocket overnight if the price of oil climbs again as it did in 2011. That price spike was due to conflict in Libya and other parts of the Arab world,[5] something entirely beyond the control of any business.

Technological innovations in bio-based plastics may be the answer for LEGO,6 which is working with university researchers around the globe to find a solution to its carbon-footprint problem.

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Critical Thinking Questions

1. How would you approach this issue if you were the manager in charge of sourcing raw materials for LEGO? How would PESTEL analysis inform your actions?
2. What PESTEL challenges is LEGO trying to address by changing the raw materials used in its products?
3. Explain what favorable PESTEL factors support LEGO's efforts.

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6.5: A Firm's Micro Environment- Porter's Five Forces

Learning Objectives

- What makes up a firm's external micro environment, and what tools do strategists use to understand it?

A firm's **micro environment** is illustrated in the green circle in Figure 6.5.1. These entities are all directly connected to the firm in some way, and firms must understand the micro environment in order to successfully compete in an industry. All firms are part of an **industry**—a group of firms all making similar products or offering similar services, for example automobile manufacturers or airlines. Firms in an industry may or may not compete directly against one another, as we'll discuss shortly, but they all face similar situations in terms of customer interests, supplier relations, and industry growth or decline.

Harvard strategy professor Michael Porter developed an analysis tool to evaluate a firm's micro environment. **Porter's Five Forces** is a tool used to examine different micro-environmental groups in order to understand the impact each group has on a firm in an industry (Figure 6.5.1). Each of the forces represents an aspect of competition that affects a firm's potential to be successful in its industry. It is important to note that this tool is different than Porter's generic strategy typology that we will discuss later.

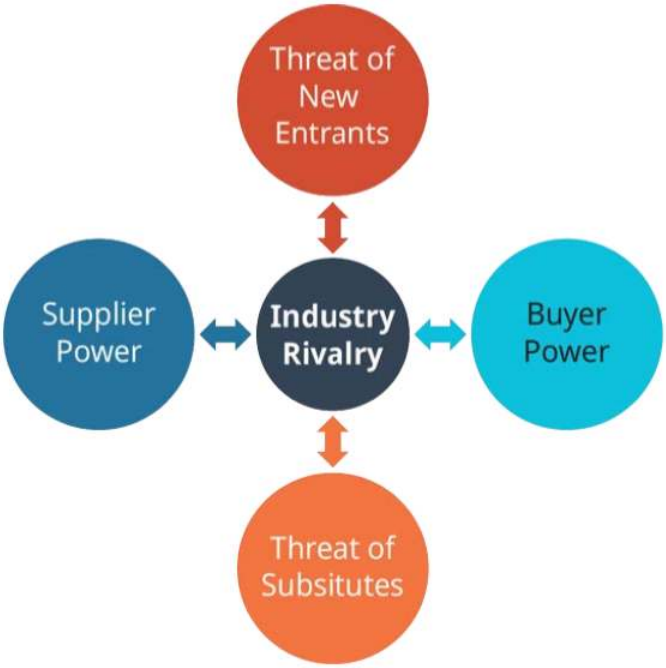

Figure 6.5.1: Porter's Five Forces Model of Industry Competition (Attribution: Copyright Rice University, OpenStax, under CC-BY 4.0 license)

Industry Rivalry

Industry rivalry, the first of Porter's forces, is in the center of the diagram. Note that the arrows in the diagram show two-way relationships between rivalry and all of the other forces. This is because each force can affect how hard firms in an industry must compete against each other to gain customers, establish favorable supplier relationships, and defend themselves against new firms entering the industry.

When using Porter's model, an analyst will determine if each force has a strong or weak impact on industry firms. In the case of rivalry, the question of strength focuses on how hard firms must fight against industry rivals (competitors) to gain customers and market share. Strong rivalry in an industry reduces the profit potential for all firms because consumers have many firms from which to purchase products or services and can make at least part of their purchasing decisions based on prices. An industry with weak rivalry will have few firms, meaning that there are enough customers for everyone, or will have firms that have each staked out a unique position in the industry, meaning that customers will be more loyal to the firm that best meets their particular needs.

The Threat of New Entrants

In an industry, there are incumbent (existing) firms that compete against each other as rivals. If an industry has a growing market or is very profitable, however, it may attract **new entrants**. These either are firms that start up in the industry as new companies or are firms from another industry that expand their capabilities or target markets to compete in an industry that is new to them.

Different industries may be easier or harder to enter depending on **barriers to entry**, factors that prevent new firms from successfully competing in the industry. Common barriers to entry include cost, brand loyalty, and industry growth. For example, the firms in the airline industry rarely face threats from new entrants because it is very expensive to obtain the equipment, airport landing rights, and expertise to start up a new airline.

Brand loyalty can also keep new firms from entering an industry, because customers who are familiar with a strong brand name may be unwilling to try a new, unknown brand. Industry growth can increase or decrease the chances a new entrant will succeed. In an industry with low growth, new customers are scarce, and a firm can only gain market share by attracting customers of other firms. Think of all the ads you see and hear from competing cell phone providers. Cell phone companies are facing lower industry growth and must offer consumers incentives to switch from another provider. On the other hand, high-growth industries have an increasing number of customers, and new firms can successfully appeal to new customers by offering them something existing firms do not offer. It is important to note that barriers to entry are not always external, firms often lobby politicians for regulations that can be a barrier to entry. These types of barriers will be covered in greater depth in more upper-level courses.

Threat of Substitutes

In the context of Porter's model, a **substitute** is any other product or service that can satisfy the same need for a customer as an industry's offerings. Be careful not to confuse substitutes with rivals. Rivals offer similar products or services and directly compete with one another. Substitutes are completely different products or services that consumers would be willing to use instead of the product they currently use. For example, the fast food industry offers quickly prepared, convenient, low-cost meals. Customers can go to McDonald's, Wendy's, Burger King, or Taco Bell—all of these firms compete against each other for business. However, their customers are really just hungry people. What else could you do if you were hungry? You could go to the grocery store and buy food to prepare at home. McDonald's does not directly compete against Kroger for customers, because they are in different industries, but McDonald's does face a threat from grocery stores because they both sell food. How does McDonald's defend itself from the threat of Kroger as a substitute? By making sure their food is already prepared and convenient to purchase—your burger or salad is ready to eat and available without even getting out of your car.

Figure 6.5.2: McDonalds A drive-through menu at this McDonald's is designed to help customers choose their meal quickly and have it ready for pickup at the drive-through window. (Credit: Caribb/ flickr/ Public Domain)

Supplier Power

Virtually all firms have suppliers who sell parts, materials, labor, or products. **Supplier power** refers to the balance of power in the relationship between firms and their suppliers in an industry. Suppliers can have the upper hand in a relationship if they offer specialized products or control rare resources. For example, when Sony develops a new PlayStation model, it often works with a single supplier to develop the most advanced processor chip it can for their game console. That means its supplier will be able to command a fairly high price for the processors, an indication that the supplier has power. On the other hand, a firm that needs commodity resources such as oil, wheat, or aluminum in its operations will have many suppliers to choose from and can easily switch suppliers if price or quality is better from a new partner. Commodity suppliers usually have low power.

Buyer Power

The last of Porter's forces is **buyer power**, which refers to the balance of power in the relationship between a firm and its customers. If a firm provides a unique good or service, it will have the power to charge its customers premium prices, because those customers have no choice but to buy from the firm if they need that product. In contrast, when customers have many potential sources for a product, firms will need to attract customers by offering better prices or better value for the money if they want to sell their products. One protection firms have against buyer power is **switching costs**, the penalty consumers face when they choose to use a particular product made by a different company. Switching costs can be financial (the extra price paid to choose a different product) or practical (the time or hassle required to switch to a different product). For example, think about your smartphone. If you have an iPhone now, what would be the penalty for you to switch to a non-Apple smartphone? Would it just be the cost of the new phone? Smartphones are not inexpensive, but even when cell phone service providers offer free phones to new customers, many people still don't switch. The loss of compatibility with other Apple products, the need to transfer apps and phone settings to another system, and the loss of favorite iPhone features, such as iMessage, are enough to keep many people loyal to their iPhones.

Concept Check

1. Describe each of Porter's Five Forces. What information does each provide a manager trying to understand her firm's micro environment?

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6.6: The Internal Environment

Learning Objectives

- How and why do managers conduct an internal analysis of their firms?

A firm's **internal environment** consists of members of the firm itself, investors in the firm, and the assets a firm has. Employees and managers are good examples; they are firm members who have skills and knowledge that are valuable assets to their firms. Evaluating a firm's internal environment is not just a matter of counting heads, however. Successful firms have a wide range of resources and capabilities that they can use to maintain their success and grow into new ventures. A thorough analysis of a firm's internal situation provides a manager with an understanding of the resources available to pursue new initiatives, innovate, and plan for future success.

Resources and Capabilities

A firm's resources and capacities are the unique skills and assets it possesses. **Resources** are things a firm has to work with, such as equipment, facilities, raw materials, employees, and cash. **Capabilities** are things a firm can do, such as deliver good customer service or develop innovative products to create value. Both are the building blocks of a firm's plans and activities, and both are required if a firm is going to compete successfully against its rivals. Firms use their resources and leverage their capabilities to create products and services that have some advantage over competitors' products. For example, a firm might offer its customers a product with higher quality, better features, or lower prices. Not all resources and capabilities are equally helpful in creating success, though. Internal analysis identifies exactly which assets bring the most value to the firm.

The Value Chain

Before examining the role of resources and capabilities in firm success, let's take a look at the importance of how a firm uses those factors in its operations. A firm's **value chain** is the progression of activities it undertakes to create a product or service that consumers will pay for. A firm should be adding value at each of the chain of steps it follows to create its product. The goal is for the firm to add enough value so that its customers will believe that the product is worth buying for a price that is higher than the costs the firm incurs in making it. As an example, Figure 6.6.1 illustrates a hypothetical value chain for some of Walmart's activities.

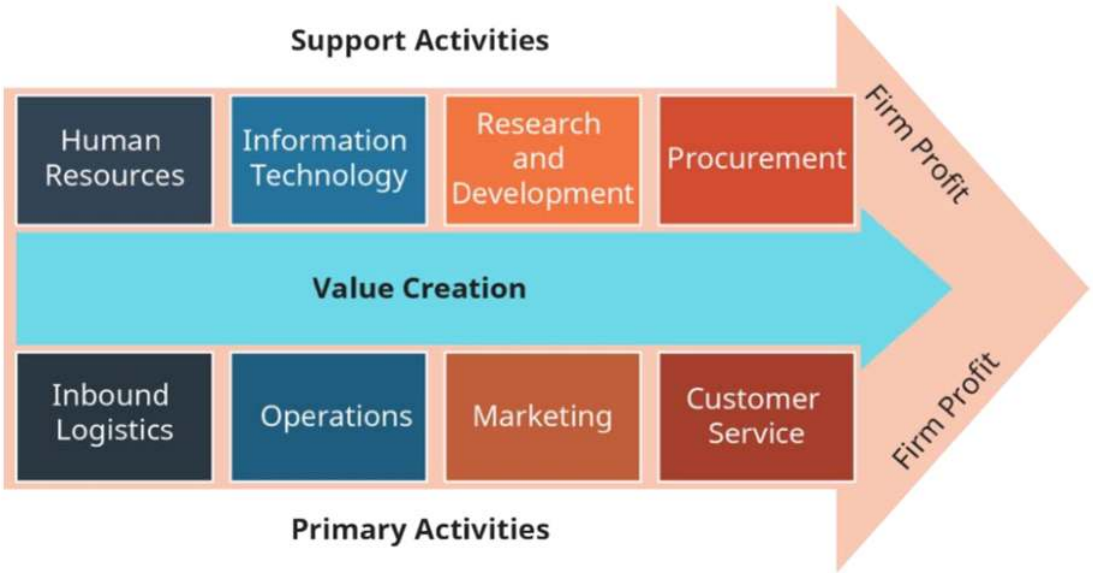

Figure 6.6.1: A Value Chain Example (Attribution: Copyright Rice University, OpenStax, under CC-BY 4.0 license)

In this example, note that value increases from left to right as Walmart performs more activities. If it adds enough value through its efforts, it will profit when it finally sells its services to customers. By working with product suppliers (procurement), getting those products to store locations efficiently (inbound logistics), and automatically keeping track of sales and inventory (information

technology), Walmart is able to offer its customers a wide variety of products in one store at low prices, a service customers value. **Primary activities**, the ones across the bottom half of the diagram, are the actions a firm takes to directly provide a product or service to customers. **Support activities**, the ones across the top of the diagram, are actions required to sustain the firm that are not directly part of product or service creation.

Using Resources and Capabilities to Build an Advantage over Rivals

A firm's resources and capabilities are not just a list of equipment and things it can do. Instead, resources and capabilities are the distinctive assets and activities that separate firms from each other. Firms that can amass critical resources and develop superior capabilities will succeed in competition over rivals in their industry. Strategists evaluate firm resources and capabilities to determine if they are sufficiently special to help the firm succeed in a competitive industry.

Using VRIO

The analytical tool used to assess resources and capabilities is called **VRIO**. As usual, this is an acronym developed to remind managers of the questions to ask when evaluating their firms' resources and capabilities. The four questions of VRIO, which focus on value, rarity, imitation, and organization, are illustrated in Figure 6.6.2.

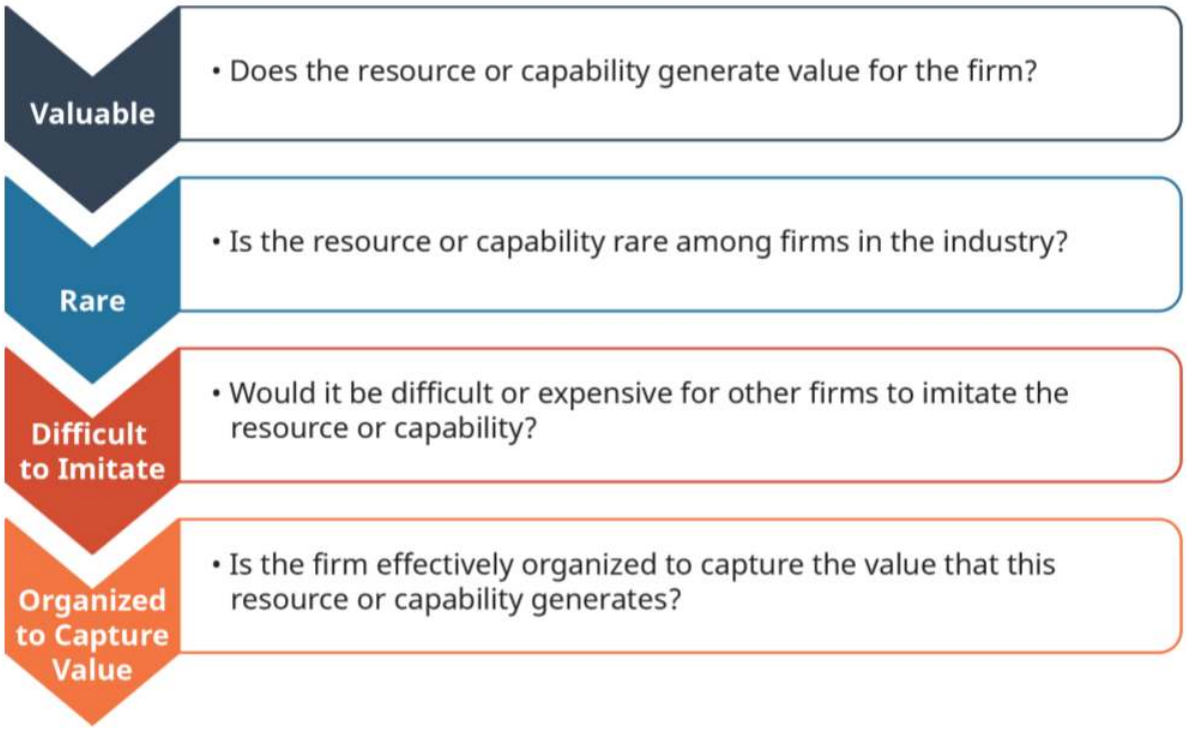

Figure 6.6.2: VRIO, a Tool for Evaluating Firm Resources and Capabilities (Attribution: Copyright Rice University, OpenStax, under CC-BY 4.0 license)

If each question can be answered with a "yes," then the resource or capability being evaluated can be the source of a competitive advantage for the firm. An example will help you better understand the VRIO process.

Imagine that you are a top manager for Starbucks and you want to understand why you are able to be successful against rivals in the coffee industry. You make a list of some of Starbucks' resources and capabilities and use VRIO to determine which ones are key to your success. These are shown in Table 6.6.1.

Starbucks' Resources and Capabilities

Resources	Capabilities
Brand name	Making quality coffee drinks
Thousands of locations worldwide	Delivering excellent customer service
Cash	Training excellent staff
Loyal customers	Paying above-average wages
Well-trained employees	Retaining quality employees

Table 6.6.1 (Attribution: Copyright Rice University, OpenStax, under CC-BY 4.0 license)

You look at your list and decide to pick a few of the entries to evaluate with VRIO (Table 6.6.2):

Evaluating Starbucks' VRIO

Resource/ Capability	Is it valuable?	Is it rare?	Is it difficult to imitate?	Is Starbucks organized to capture its value?	Can it be a basis for competitive advantage?
Brand Name	Yes	Yes	Yes	Yes	Yes
Delivering excellent customer service	Yes	Yes	Yes	Yes	Yes
Thousands of locations worldwide	Yes	No	No	Yes	Yes

Table 6.6.2: (Attribution: Copyright Rice University, OpenStax, under CC-BY 4.0 license)

According to the evaluation above, Starbucks' brand helps it compete and succeed against rivals, as does its excellent customer service. However, simply having a lot of locations globally isn't enough to beat rivals—McDonald's and Subway also have thousands of worldwide locations, and both serve coffee. Starbucks succeeds against them because of their brand and customer service.

? Concept Check

1. What are firm resources and capabilities?
2. Describe a value chain and what the activities in the chain represent.
3. What is VRIO? What questions do the letters stand for, and how does using VRIO help a manager make decisions?

✔ Managing Change

Technology and Innovation: Uber, Lyft, and the Self-Driving Car: The Transportation of the Future Is Coming Soon

Although the ride-sharing industry is still relatively new, it has seen explosive growth, and its two main rivals, Uber and Lyft, are looking for ways to increase their capacity to serve riders. Both firms, and rivals like them, operate in basically the same way. A person needing a ride uses a smartphone app to alert a nearby person with a car of their location. The driver, usually an independent contractor for the service (meaning they are just a person with a car that has signed up to provide rides in exchange for a portion of the fare the customer pays), picks up the customer and drives them to their destination. Paying for the ride is also handled through the app, and the driver receives about 75–80% of the fare, with Uber or Lyft keeping the balance.[1]

Figure 6.6.3: Rideshare pickup area The ride-share pickup area at Pierre Elliott Trudeau Airport in Montreal. Due to the popularity of ride sharing with companies such as Uber and Lyft, municipalities and airports have had to accommodate the changing demands of customers. (Credit: Quinn Dombroski/ flickr/ Attribution-ShareAlike2.0 Generic (CC BY-NC 2.0))

The popularity of ride-sharing services has soared, and both companies are constantly recruiting more drivers. However, both companies have also explored alternatives to independent drivers: self-driving cars. Uber and Lyft have taken different paths to develop this capability. Uber has worked to internally develop its own software technology and self-driving car technology, while Lyft has focused on software interfaces that can accommodate other companies' self-driving cars.[2] Lyft's partnerships with firms such as Google and GM that are already developing self-driving cars has put it ahead of Uber in the race to get driverless vehicles into its ride-sharing network, and it was able to test self-driving cars in Boston by partnering with NuTonomy in 2017.[3] Lyft offered a demonstration to journalists at the Consumer Electronics Show in Las Vegas in 2018, offering rides in self-driving cars developed by Aptiv.[4] Uber had been testing similar technology in Pittsburgh but suspended its self-driving car program after a fatal pedestrian accident in Arizona.[5]

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Critical Thinking Questions

1. What resource or capability challenges have Uber and Lyft faced because of their fast company growth?
2. What PESTEL factors do you think are contributing to the popularity of ride-sharing services?
3. What industry challenges (think of Porter's Five Forces) does the use of self-driving cars address?

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6.7: Competition, Strategy, and Competitive Advantage

Learning Objectives

- What does it mean to compete with other firms in a business environment, what does it mean when a firm has a competitive advantage over its rivals, and what generic strategies can a firm implement to gain advantage over its rivals?

Now that you understand more about the environment that businesses operate in, let's take a deeper look at exactly how they operate. Businesses exist to make profits by offering goods and services in the marketplace at prices that are higher than the costs they incurred creating those goods and services. Businesses rarely exist alone in an industry; **competition** is usually a key part of any marketplace. This means that businesses must find ways to attract customers to their products and away from competitors' products. **Strategy** is the process of planning and implementing actions that will lead to success in competition.

The analytical tools we discuss here are part of the strategic planning process. Managers cannot successfully plan to compete in an industry if they don't understand its competitive landscape. It is also unlikely that a firm planning to launch a new product that they are not equipped to make will be successful.

Competition

Porter's Five Forces model is centered around rivalry, a synonym for competition. In any industry, multiple firms compete against each other for customers by offering better or cheaper products than their rivals. Firms use PESTEL to understand what consumers are interested in and use VRIO to evaluate their own resources and capabilities so that they can figure out how to offer products and services that match those consumer interests and that are better in quality and price than the products offered by their competitors.

A firm is described as having a **competitive advantage** when it successfully attracts more customers, earns more profit, or returns more value to its shareholders than rival firms do. A firm achieves a competitive advantage by adding value to its products and services or reducing its own costs more effectively than its rivals in the industry.

Generic Business-Level Competitive Strategies

When discussing business strategy, a business is a firm or a unit of a firm that centers its activities around one primary type of product or service line. Business-level strategy is the general way that a business organizes its activities to compete against rivals in its product's industry. Michael Porter (the same Harvard professor who developed the Five Forces Model) defined three **generic business-level strategies** that outline the basic methods of organizing to compete in a product market. He called the strategies "generic" because these ways of organizing can be used by any firm in any industry.

Cost Leadership

When pursuing a **cost-leadership strategy**, a firm offers customers its product or service at a lower price than its rivals can. To achieve a competitive advantage over rivals in the industry, the successful cost leader tightly controls costs throughout its value chain activities. Supplier relationships are managed to guarantee the lowest prices for parts, manufacturing is conducted in the least expensive labor markets, and operations may be automated for maximum efficiency. A cost leader must spend as little as possible producing a product or providing a service so that it will still be profitable when selling that product or service at the lowest price. Walmart is the master of cost leadership, offering a wide variety of products at lower prices than competitors because it does not spend money on fancy stores, it extracts low prices from its suppliers, and it pays its employees relatively low wages.

Differentiation

Not all products or services in the marketplace are offered at low prices, of course. A **differentiation strategy** is exactly the opposite of a cost-leadership strategy. While firms do not look to spend as much as possible to produce their output, firms that differentiate try to add value to their products and services so they can attract customers who are willing to pay a higher price. At each step in the value chain, the differentiator increases the quality, features, and overall attractiveness of its products or services. Research and development efforts focus on innovation, customer service is excellent, and marketing bolsters the value of the firm brand. These efforts guarantee that the successful differentiator can still profit even though its production costs are higher than a

cost leader's. Starbucks is a good example of a differentiator: it makes coffee, but its customers are willing to pay premium prices for a cup of Starbucks coffee because they value the restaurant atmosphere, customer service, product quality, and brand.

Porter's typology assumes that firms can succeed through either cost leadership or differentiation. Trying to combine these two, Porter suggests, can lead to a firm being stuck in the middle.

Focus

Porter's third generic competitive strategy, **focus**, is a little different from the other two. A firm that focuses still must choose one of the other strategies to organize its activities. It will still strive to lower costs or add value. The difference here is that a firm choosing to implement a focused strategy will concentrate its marketing and selling efforts on a smaller market than a broad cost leader or differentiator. A firm following a focus-differentiation strategy, for example, will add value to its product or service that a few customers will value highly, either because the product is specifically suited to a particular use or because it is a luxury product that few can afford. For example, Flux is a company that offers custom-made bindings for your snowboard. Flux is a focus differentiator because it makes a specialized product that is valued by a small market of customers who are willing to pay premium prices for high-quality, customized snowboarding equipment.

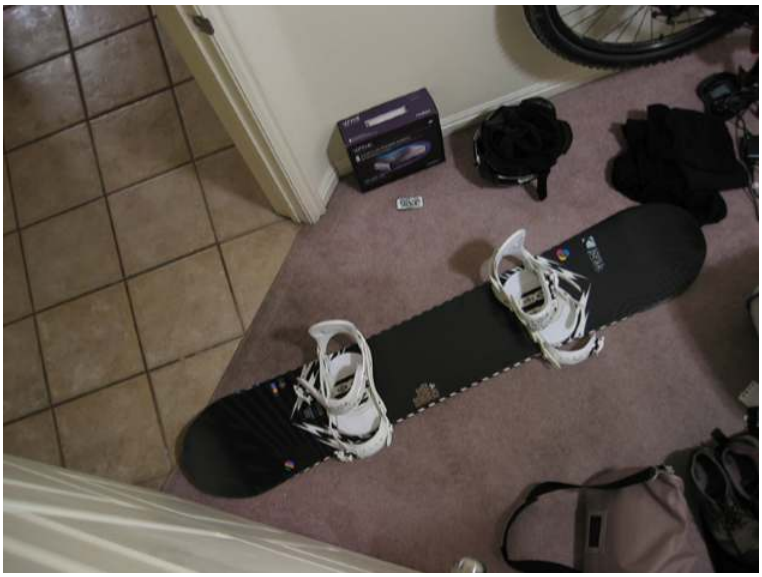

Figure 6.7.1: Snowboard bindings The Flux premium bindings on this snowboard are an example of a product on a focus-driven company. Snowboard bindings are the only products Flux markets. (Credit: Ted and dani Percival/ flickr/ Attribution 2.0 Generic (CC BY 2.0))

Strategic Groups

When managers analyze their competitive environment and examine rivalry within their industry, they are not confronted by an infinite variety of competitors. Although there are millions of businesses of all sizes around the globe, a single business usually competes mainly against other businesses offering similar products or services and following the same generic competitive strategy. Groups of businesses that follow similar strategies in the same industry are called **strategic groups**, and it is important that a manager know the other firms in their strategic group. Rivalry is fiercest within a strategic group, and the actions of one firm in a group will elicit responses from other group members, who don't want to lose market share in the industry. Take a look at Figure 6.7.2. Although all of the firms shown are in the retail industry, they don't all compete directly against one another.

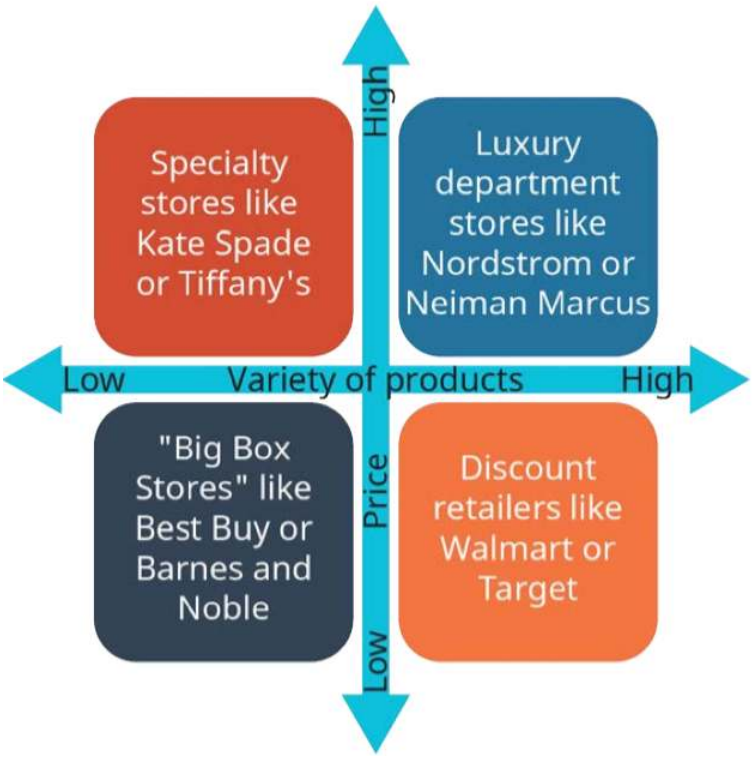

Figure 6.7.2: Strategic Groups in the Retail Industry (Attribution: Copyright Rice University, OpenStax, under CC-BY 4.0 license)

Although some cross competition can occur (for example, you could buy a Kate Spade wallet at Nordstrom), firms in different strategic groups tend to compete more with each other than against firms outside their group. Although Walmart and Neiman Marcus both offer a wide variety of products, the two firms do not cater to the same customers, and their managers do not lose sleep at night wondering what each might do next. On the other hand, a Walmart manager would be concerned with the products or prices offered at Target; if laundry detergent is on sale at Target, the Walmart manager might lose sales from customers who buy it at Target instead, and so the Walmart manager might respond to Target's sale price by discounting the same detergent at Walmart.

? Concept Check

1. What is competition, and what is the role of strategy in competition?.
2. When does a firm have a competitive advantage over its rivals?
3. Explain the differences between the three business-level generic competitive strategies.

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6.8: Strategic Positioning

Learning Objectives

- What elements go into determining a firm's strategic position?

A manager who has done all of the analysis described so far in this chapter has some decisions to make based on all of the information the analysis has revealed. A firm's decisions on how to serve customers and compete against rivals is called **strategic positioning**. In order to develop its position, a firm combines its understanding of the competitive environment, including the firm's own resources and capabilities, its industry situation, and facts about the macro environment. A strategic position includes a choice of generic competitive strategy, which a firm selects based on its own capabilities and in response to the positions already staked out by its industry rivals. The firm also determines which customers to serve and what those customers are willing to pay for. A strategic position also includes decisions about what geographic markets to participate in.

Most importantly, a firm's strategic position should try to be unique in some way that competitors cannot imitate quickly or easily. Competitive advantage is achieved when a firm attracts more customers or makes more profit than rivals. This cannot happen unless the firm organizes its activities to provide customers with better value than rivals.

Concept Check

1. How does strategic analysis help a firm develop its own strategic position?

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CHAPTER OVERVIEW

7: Total Quality Management and Lean

Would you order a delivery pizza for dinner from a restaurant advertising delivery in 6 hours? How about a restaurant that can bring you a cold, stale pizza in only 5-minutes? To meet the consumer's needs, the pizza shop must be able to give customers the number of pizzas they want when they want it. Preparing pizzas in advance is too wasteful because most consumers are not likely to buy a stale pizza. Meanwhile, if you take too long to deliver the pizza, you will lose customers to a more responsive competitor. The concept of just-in-time focuses on making what you need to meet customer demand only when you need it. For a pizza delivery shop, that probably means a fresh pizza at the customer's door in around 30 minutes. This philosophy can apply to a range of operations, from simply washing a car to manufacturing a complex aircraft.

Similarly, the concept of lean manufacturing refers to eliminating waste in the manufacturing process. The Toyota Product System is the model for modern manufacturers that want to control waste. In this unit, we will look at seven types of waste and processes for controlling them. In addition, we will explore the origins of the "Just-in-Time" (JIT) philosophy and the use of pull systems to control inventory.

7.1: Lean Manufacturing and Control
7.2: Five Core Principles of Lean
7.3: Just-In-Time (JIT) Systems

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7.1: Lean Manufacturing and Control

Lean control, or simply lean, has become an immensely popular business control and improvement methodology in recent years. Lean control is a highly refined example of non-financial controls in action. Lean is a system of non-financial controls used to improve product and service quality and decrease waste. Lean was initially focused on improving manufacturing operations but is now used to improve product development, order processing, and a variety of other nonmanufacturing processes (sometimes called "lean in the office").

Lean's popularity has both resulted from, and been driven by, an explosion in the volume of lean-related educational resources. Amazon offers almost 1,800 books and other materials about lean, and Yahoo! hosts over 90 online discussion groups relating to lean. Colleges and universities, industry trade associations, and private consulting firms routinely offer courses, seminars, and conferences to explain what lean is and how to use it.

Lean control is a number of things. According to James Womack, "it is a process for measuring and reducing inventory and streamlining production. It is a means for changing the way a company measures plant performance. It is a knowledge-based system. It takes years of hard work, preparation, and support from upper management. Lean is so named because it purports to use much less of certain resources (space, inventory, workers, etc.) than is used by normal mass-production systems to produce comparable output." The term came into widespread use with the 1990 publication of the book *The Machine That Changed the World*, by James P. Womack, Daniel T. Jones, and Daniel Roos. [1]

Lean will always be associated with Toyota Motor Corporation because most lean tools and techniques were developed by Toyota in Japan beginning in the 1950s. After World War II, Toyota's leaders were determined to make the company a full-range car and truck manufacturing enterprise, but they faced several serious challenges. The Japanese motor vehicle market was small and yet demanded a fairly wide range of vehicle types. This meant that Toyota needed to find a way to earn a profit while manufacturing a variety of vehicles in low volumes. In addition, capital was extremely scarce, which made it impossible for Toyota to make large purchases of the latest production equipment. To succeed, or even survive, Toyota needed a way to build vehicles that would require fewer resources. To achieve this goal, Toyota's leaders, principally Eiji Toyoda and Taiichi Ohno, began to create and implement the production techniques and tools that came to be known as lean.

To gain the most benefits from lean, managers must be able to determine what specific lean tools and techniques will be effective in their particular business. And to make that determination, they must clearly understand what lean is designed to accomplish (its primary objectives) and what core principles lean is based on. With this understanding, managers can decide which lean tools will work well in their business, which lean tools will need to be modified or adapted to work well, and which tools are simply not appropriate.

What, then, are the major objectives and core principles of lean? Despite the arguments and debates that often surround attempts to define and describe lean, it is clear that the ultimate objective of lean is the avoidance of *muda*, or wasteful activity, in all business operations. Muda comprises seven deadly wastes. In the lean world, waste means any activity or condition that consumes resources but creates no value for customers. Therefore, seven deadly wastes include the following:

1. **Defects** prevent the customer from accepting the product produced. The effort to create these defects is wasted. New waste management processes must be added in an effort to reclaim some value for the otherwise scrap product.
2. **Over-production** is the production or acquisition of items before they are actually required. It is the most dangerous waste of the company because it hides the production problems. Over-production must be stored, managed, and protected.
3. **Transportation** is a cost with no added value. In addition, each time a product is moved it stands the risk of being damaged, lost, and delayed. Transportation does not transform the product in any way that the consumer is willing to pay for.
4. **Waiting** refers to both the time spent by the workers waiting for resources to arrive, the queue for their products to empty as well as the capital sunk in goods and services that are not yet delivered to the customer. It is often the case that there are processes to manage this waiting.
5. **Inventory** in the form of raw materials, work-in-progress, or finished goods represents a capital outlay that has not yet produced an income either by the producer or for the consumer. Any of these three items not being actively processed to add value is waste.

6. **Motion** refers to the actions performed by the producer, worker, or equipment. Motion has significance to damage, wear, and safety. It also includes the fixed assets and expenses incurred in the production process.
7. **Over-processing** is defined as using a more expensive or otherwise valuable resource than is needed for the task or adding features that are designed for but unneeded by the customer. There is a particular problem with this item regarding people. People may need to perform tasks that they are overqualified for to maintain their competency. This training cost can be used to offset the waste associated with over-processing.

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7.2: Five Core Principles of Lean

Lean methodologies are lean because they enable a business to do more with less. A lean organization uses less human effort, less equipment, less facilities space, less time, and less capital—while always coming closer to meeting customers' exact needs. Therefore, lean is not just another cost-cutting program of the kind we often see in business organizations. Lean is much more about the conservation of valuable resources than it is about cost cutting.

In their best-selling book, Lean Thinking, James Womack and Daniel Jones identified five core principles of lean.[1]

Let's examine them one by one:

Define Value from the Customer's Perspective

The first core principle in the Womack/Jones lean framework is that value must be defined and specified from the customer's perspective. While this seems simple enough, it requires much more than high-sounding, generic statements. To be meaningful, value must be defined in terms of specific products. This means that managers must understand how each specific product meets the needs of specific customers at a specific price and at a specific time.

Describe the Value Stream for Each Product or Service

The second core principle of lean is to describe the value stream for each product or service (or, in some cases, for groups or families of similar products). The value stream is the set of activities that the business is performing to bring a finished product to a customer. It includes both direct manufacturing activities and indirect activities such as order processing, purchasing, and materials management. Developing a detailed description or map of each value stream usually reveals huge amounts of waste. It enables managers to identify which value stream activities add value to the product, which activities add no value but cannot be immediately eliminated for various reasons, and which activities create no value and can be immediately eliminated (or at least reduced substantially).

Create Flow in Each Value Stream

The third essential principle of lean is embodied in the word flow. When a value stream has been completely described as unnecessary, non-value-adding activities have been eliminated, the basic idea of flow is to arrange the remaining activities sequentially, so that products will move smoothly and continuously from one activity to the next. However, flow means more than ease of movement. Flow is the lean principle that directly challenges the traditional "batch-and-queue" model of manufacturing, where people and equipment are organized and located by function, and products (and component parts) are manufactured in large batches. Lean organizations strive to improve flow by reducing the size of production batches, and in the process, they increase flexibility and lower costs.

Produce at the Pace (Pull) of Actual Customer Demand

Producing at the pace or pull of actual customer demand is the fourth key principle of lean. One of the greatest benefits of moving from traditional batch-and-queue manufacturing to continuous flow production is that lead times fall dramatically. Reduced lead times and increased flexibility mean that lean organizations can respond to actual customer demand rather than attempt to predict in advance what that level of demand will be. This allows lean organizations to substantially lower both finished goods and work-in-process inventories.

Strive to Continuously Improve All Business Operations

The fifth core principle of lean is continuous improvement, expressed in Japanese by the word *kaizen*. Companies that implement lean adopt the mind-set that it is always possible to improve any business activity, and they regularly conduct *kaizen* events throughout their organizations to improve specific processes or operations. Today, Toyota is recognized as one of the most "lean" business enterprises in the world. Even more daunting, and humbling, is the fact that Toyota is still striving to improve.

Let's talk simulation

Mean Time Before Failure (MTBF)

MTBF is a measure of product reliability, indicating the average time (in hours) a product is expected to operate before failing. This is an area of quality and increased quality generally costs more. In Capsim's Foundation simulation:

- **Customer Expectations**: Each market segment has specific MTBF ranges that customers expect. Products with MTBF below these ranges lose customer satisfaction and demand[1].
- **Cost Implications**: Increasing MTBF improves product reliability but also raises material costs. Each additional 1,000 hours of MTBF increases material costs by $0.30[1].
- **Balancing Act**: It's crucial to balance MTBF with cost efficiency to meet customer expectations without overspending[1].

Total Quality Management (TQM)

TQM in Capsim's Foundation simulation involves investing in initiatives to improve product quality, reduce costs, and enhance efficiency. Key aspects include:

- **Cost Reduction**: TQM initiatives can lower material, labor, and administrative costs. For example, Continuous Process Improvement (CPI) reduces material costs, while Quality Initiative Training (QIT) reduces labor costs[2].
- **Efficiency Improvement**: TQM can shorten R&D cycle times, making it faster to develop new products and improve existing ones[2].
- **Demand Increase**: Investing in TQM can boost demand by improving product quality and customer satisfaction. Initiatives like Channel Support Systems enhance the effectiveness of sales budgets[2].
- **Sustainability**: Some TQM initiatives focus on environmental sustainability, which can also improve your company's reputation and demand[2].

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7.3: Just-In-Time (JIT) Systems

Just-in-time (JIT) is a management philosophy that originated in the 1970s. Taiichi Ohno is credited with developing JIT and perfecting it for Toyota's manufacturing plants in Japan. The main goal of JIT is to eliminate anything that does not add value from the customer's perspective. Non-value-added activities are referred to as "waste" in JIT. Examples of waste include:

- Overproduction beyond what is needed to satisfy immediate demand
- Waiting time (work-in-process, customer waiting)
- Unnecessary transportation (material handling, customer travel through a facility, etc.)
- Processing waste (yield rates, start-up costs)
- Inventory storage waste (space, deterioration, obsolescence, etc.)
- Unnecessary motion and activity (waste in work techniques, etc.)
- Waste from product and service defects (rework, scrap, warranty, etc.)

There are three essential elements that contribute to the successful practice of JIT:

1. JIT manufacturing principles
2. Total Quality Management (TQM)
3. Employee empowerment

JIT Manufacturing Principles

There are several JIT principles that are applied in a manufacturing setting. The following are some of these main principles:

- Inventory reduction to expose waste
- Use of a "demand-pull" production system
- Quick setups to reduce lot sizes
- Flexible resources
- Cellular layouts

Inventory Reduction to Expose Waste

Inventory covers up a lot of wasteful practices (poor equipment, weak vendors, bad quality, long setup times, etc.). By gradually lowering inventory, the weaknesses of the production system can be revealed and addressed one by one. Machines can be replaced or better maintained, vendors quality and delivery can be improved, machine setup procedures can be streamlined, quality practices can be implemented, and labor and equipment can be laid out more efficiently. These improvements allow the organization to operate with less inventory, less costs, and faster response times in meeting customer needs.

Demand-pull Production System

The traditional approach to manufacturing management promotes a strong focus on machine and labor utilization. The view was that if managers make sure that workers and machines are always busy, then surely, the factory will be productive and efficient. This approach is called the "push" system of manufacturing, where raw material and work-in-process are continuously pushed through the factory in the pursuit of high utilization. The problem with this approach is that it usually produces high levels of inventories, long lead times, overtime costs, high levels of potential rework, and workers who are competing with one another rather than working cooperatively.

In contrast to the push system, JIT applies a "demand-pull" system that operates on the rule that work should flow to a work center only if that work center needs more work. If a work center is already occupied with work activity, the upstream work center should stop production until the downstream work center communicates a need for more material. The emphasis on maintaining high utilization is removed in a JIT environment. The focus of a JIT environment is on addressing the challenges that affect the overall effectiveness of the factory in meeting its strategic goals (setup time reduction, quality improvement, enhanced production techniques, waste elimination, etc.), rather than allowing excess inventory to cover up inefficiencies that reduce the factory's competitiveness.

One of the tools that is used in JIT systems to facilitate the pull system and coordinate activities (such as picking up a new raw material or work-in-process or the production itself) between different workstations is called *Kanban*. *Kanban* is a ticket or signal

that is given from one part of the process to another part to let them know that they are allowed to start their next activity. This supports the very concept of pull production and avoiding the waste by not doing things at the time that they are not needed. *Kanban* is also a signboard which is used to organize what needs to be done, what is under progress, and what is done. This aspect of *Kanban* has been used in Agile workflow management systems.

Quick Setups to Reduce Lot Sizes

The longer it takes, and the more expensive it is to set up equipment and labor to produce an item, the greater the quantity of items that have to be produced in a given production run. Traditional production management philosophy promoted the notion that long production runs of the same item were the key to driving down unit costs. The problem was that large production runs created large quantities of WIP and finished goods inventory that far exceeded the demand. These items would consequently cause high levels of inventory costs, long lead times, high potential rework, low flexibility in responding to customer needs, etc.

Driving down setup costs and setup times are key to dramatically improving factory competitiveness in a JIT environment. In the 1980s, the 3M company converted a factory that made a few adhesive products in long production runs into a factory that made over 500 adhesive products in small production runs. To keep unit production costs under control, 3M studied the setups on its coating machines. Since the cost of chemical waste disposal was a major part of the cost of changing over a coating machine to make another product, 3M shortened the length of hoses that needed purging and redesigned the shape of the adhesive solution holding pan on the coating machine to be shallower. 3M also used quick-connect devices, disposable filters, and work teams to speed up setups. The result was that 3M could maintain low unit costs on its coating machines while producing small lots of hundreds of products to meet market demand quickly.

Flexible Resources

The enemy of JIT is uncertainty. A JIT environment thrives on predictability in customer demand, production processes, suppliers, and workers. Of course, uncertainty cannot be completely eliminated in most organizational environments.

The defense against uncertainty that cannot be driven out is to implement flexible resources that can adapt easily to changing circumstances. General-purpose, moveable equipment that can fulfill a wide variety of production requirements is one way to improve flexibility. For example, drilling machines with quick-change bits, which can be wheeled into position to form new work cells, allow the factory to maximize efficiency while producing exactly what is needed to satisfy immediate demand. Another example is Toyota's use of paint canisters that attach to paint sprayers. Any car can be painted any color without having to purge hoses in switching from one color to another.

Multifunctional workers are another way to bring flexibility to the work environment. At Honeywell's heating and cooling controls plant, workers are trained to operate all the machines on their work line. The flexibility that comes from multifunctional workers changes the nature of how work gets done. Instead of workers being trained on one machine and working independently of one another, multifunctional workers have a "big picture" view of the production line, where every worker understands all aspects of the line and how to work together to meet quality and schedule goals regardless of the circumstances.

Cellular Flow Layouts

Cellular layouts promote JIT goals by featuring unidirectional product flows, high visibility, and fast throughput times. Workers with multifunctional skills are assigned to individual cells and have responsibility and control of the products they produce. Workers in a cell environment tend to have a greater sense of ownership and pride in their work because they have a "big picture" view of the product as it is converted from raw material to a finished good. This deeper understanding of the production process increases the opportunities for workers to contribute ideas for process improvements.

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