

Accounting for Manager Course Information

Visiting professor, Dr. Ruslana Kuzina

Faculty of Economics and Business

Introduction

- **Ruslana Kuzina** (Odessa, Ukraine)
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- D.S. in Accounting, Certified auditor, ACCA DipFR, CAP
- Teaching experience more than 20 years, Provided consulting and training services on implementation of International Financial Reporting Standards
- 2018-2019 Hubert H. Humphrey Fellowship Program in Higher Education Administration, Planning and Policy, Penn State, College of Education (USA)
- Independent contractor, International Federation of Accountants, Q&D department, Capacity building project (New York, USA) ; SDG project

BOOK

BOOK	SLIDES
C1 MANAGEM. ACCOUNTING	17.11 INTRO IN MA INTRO IN COST ACC.
C2 COST TERMS & PURPOSES	18.11 COST BEHAV. TYPES OF COST & COST BEH
C3 COST VOLUME PROFIT ANALYSIS	24-25.11 CVP MARGINAL & ABSORPTION COST + CVP
C4 JOB COSTING	14-2.12 JOB COSTING ABC (") + ABM
C5 ACTIVITY BASED COSTING/MANAGEM	
C6 MASTER BUDGET & RESPONSIBILITY ACCOUNT.	8-9.12 BUDGETTING MASTER BUDG.&RESP. ACC
C11 DECISION MAKING & RELEVANT INFO	15-16.12 relevant costing (")

Course Information

Aim

- provide a basic understanding of **management accounting** information
- **The focus is on costing**
- Develop skills to in using relevant management accounting information in making decisions.



Course Information

- **Why Accounting for Manager worth Studying?**
 - It is the language of business
 - Nobody working in business can afford financial illiteracy.
 - It also helps you in decision making.

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Course Information

Expected Learning Outcomes

Upon completion of this course, students will be able to:

- Understand the role of accounting information in management decision making.
- Understand the implication of different product cost terms, such as product vs. period costs, direct vs. indirect costs, and fixed vs. variable costs.
- Critically compare and evaluate the nature of costs, their classification, and their behavior.
- Utilize cost behavior for cost estimation and perform a cost-volume-profit analysis.
- Understand the basic cost flow model and be able to assign costs in a job/process/activity based systems.
- Prepare costing systems' (e.g., Job order) reports and analyze them.
- Explain how costs are presented in financial statements.
- Apply profit planning by preparing budgets and understand the relationship between company strategy and budgets.
- Use managerial accounting information to make informed business strategy decisions.

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Q&A

- You can reach me out any time by email
ruslana.kuzina@kuleuven.be
- If you would like to come in my office – please make an appointment in advance.
- We will have a Q&A Session on the 30th of January at 14:00.
- The Q&A Session will be online in Collaborate.
- It is not mandatory to attend the Q&A Session.
- In the Q&A session, I answer your question (If you have any).
- You must submit the question beforehand. You should submit your questions by the 30th of January at 13:00.

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Course Evaluation

The result of the exam will be communicated as a whole number on a scale of 20.

The evaluation consists

1. 75% of a final exam(15 points) and
2. 25% two assignments:
 - one quiz (2,5 points) and,
 - one case (2,5 points)).

The final exam is a written closed book exam with different types of questions.

The assignments should be done solo.

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Exam Information

- Evaluation format: The exam will be an on-campus exam (with an exception).
- Type(s) of questions:

This exam consists of three parts:

- Part A: 20 multiple choice questions (worth a total of 30 points), and
 - Part B1: 1 Problem (worth a total of 20 points)_Option 1, and
 - Part B2: 1 Problem (worth a total of 20 points)_Option 2,
- Part A is mandatory. However, you must choose either Part B1 or Part B2.

You are NOT allowed to choose both Part B1 and Part B2.

Material that may be used during the examination: No material is allowed in the exam except a simple calculator

✓ A minimum grade of 25 out of 50 in the final exam is required to pass the exam.

Exam Information

- Learning materials to be used during the study: Any uploaded material + book (with the exception of the materials labeled by 'Extra')
- The scoring: This means that the final grade is a weighted score and consists of 75% Final exam and 25% case reports.
- The date of the exam: Tuesday 31/01/2023 at 12:00. The date and time is provisional and can still be adjusted. Any change in the date of the exam will be communicated via the Individual Examination Schedule.
- The duration of the exam is 180 minutes. For students with facilities, the +1/3 time and other facilities are safeguarded.

31-01-2023

12:00-15:00

D0N83A

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PDS - 01.30 (aula Pieter De Somer)

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Accounting for Manager

Financial Accounting Review Session

Visiting professor, Dr. Ruslana
Kuzina

Faculty of Economics and Business

Revision of financial accounting (what we would have known): how to build income statements or balance sheets

What Is Accounting?

Accounting consists of three basic activities:

- identifies, = we have ≠ events that happen in entrepresis: supply, pay salaries, different operations > all different operations should be included in accounting info
- records, and
- communicates

the economic events of an organization to interested users.

Many people need these information

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USERS



Managerial accounting is for
INTERNAL USERS

Internal users of accounting information are **managers** who plan, organize, and run the business. These include marketing managers, production supervisors, finance directors, and company officers. In running a business, internal users must answer many important questions.

Cleaning lady: she can't effect the decisions of managers so she is external
Internal = people involved in decision making

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USERS

EXTERNAL USERS

External users are individuals and organizations outside a company who want financial information about the company. The two most common types of external users are investors and creditors. **Investors** (owners) use accounting information to make decisions to buy, hold, or sell ownership shares of a company. **Creditors** (such as suppliers and bankers) use accounting information to **evaluate the risks of granting credit** or lending money.

Taxing authorities, such as the Internal Revenue Service, want to know whether the company **complies with tax laws**. **Regulatory agencies**, such as the Securities and Exchange Commission or the Federal Trade Commission, want to know whether the company is operating within prescribed rules.



Should they buy or sell shares, they can only rely on **financial statements** to decide this



financial accounting



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STANDARDS

Generally Accepted Accounting Principles



IFRS vs. GAAP

Common set of standards is called **generally accepted accounting principles (GAAP)**. These standards indicate how to report economic events.

The annual accounts of Belgian companies must be drafted in accordance with **Belgian Generally Accepted Accounting Principles (GAAP)**.

Every country has its own set of standards

In the United States, these standards are known as **U.S. GAAP**. Companies required to meet GAAP standards must do so in all financial reporting or risk facing significant consequences.

Many countries outside of the United States have adopted the accounting standards issued by the International Accounting Standards Board (IASB). These standards are called **International**

Financial Reporting Standards (IFRS). For example: Mc Donalds
For international stock companies = listed companies

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The financial statements

Financial statements are written records that illustrates the business activities and the financial performance of a company.

In most cases they are audited to ensure accuracy for tax, financing, or investing purposes.

The common **purpose** of financial statements is to obtain information that is useful for their economic decisions from financial statements.

- **Balance Sheet** = a picture in a point in time = assets, liability, equity at a point in time
- **The income statement (Profit & loss account)** = profit = revenue - expenses = a period in time
- **Cash flow statement** = related to liquidity 3 types of cash
- **Statement of changes in stock holder's equity** = changes in capital
 1. Operation
 2. Financial
 3. Investment
- **The notes to financial statements**

Change in equity that happens every year: our capital = our shares, we would like to earn profit (changes in capital) > if we have profit we can pay dividends

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= an amount of information where you explain what happens in your statements

A Balance Sheet (Statement of financial position)

Balance Sheet is a snapshot at a point in time.

On the top half you have the company's assets and on the bottom half its liabilities and Shareholders' Equity (or Net Worth).

The assets and liabilities are typically listed in order of liquidity and separated between current and non-current.

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more time
look up

ASSETS		=	LIABILITIES & EQUITY	
Current Assets			Liabilities	
Checking Account	5,000		Current Liabilities	
Savings Account	1,000		Accounts Payable	12,000
Prepaid Insurance	6,000		Line of Credit	20,000
Accounts Receivable	22,000		Payroll Liabilities	7,000
Inventory	15,000		Total Current Liabilities	39,000
Total Current Assets	49,000		Noncurrent Liabilities	
Noncurrent Assets			Long-term Debt (loan)	
Accumulated Depreciation	4,000		Total Liabilities	87,000
Computer	7,000		Equity	
Building	65,000		Owner's Capital	35,000
Land	40,000		Retained Earnings	15,000
Total Noncurrent Assets	127,000		Total Equity	50,000
Total Assets	177,000		Total Liabilities & Equity	177,000

RULE:
 $177 = 49,5 + 127$
 $= (39 + 48) + 90$
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We see current assets and non current assets: difference is time

> current = 12 months

> non current = you can use it more then 1 year

- Machine
- Equipment
- Land

Idem defenition for liabilities: curren & non current

Balance Sheet

The Balance sheet has 3 main categories:

1. Assets:

Current

Expected to be converted into cash in less than 1 year (Accounts receivable, inventory)

Non-current

Expected to be held greater than 1 year (Property, plant, and equipment)

2. Liabilities

Current

Will be paid in less than 1 year (Trade accounts payable)

Non-current

Repayment terms longer than 1 year (Loan repayable over a 5 year)

3. Equity

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Balance Sheet

The following formula summarizes what a balance sheet shows:

Formula for calculating Net Worth

cuemath

ASSETS = LIABILITIES + SHAREHOLDERS' EQUITY

ASSETS
e.g. - Owned Property

LIABILITIES
e.g. - car loan

NET WORTH

ASSETS = LIABILITIES + SHAREHOLDERS' EQUITY

A company's assets have to equal, or "balance," the sum of its liabilities and shareholders' equity.

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Interpreting the Balance Sheet

Balance statements only show the state of the company at the end of the reporting period, not the activities along the way.

Components of a Balance Sheet

- **Assets** are valuable properties, cash, investments, patents, or trademarks owned by a company. Assets can be **current** (can be liquidated within a year) or **noncurrent** (will take longer than a year to sell). Some noncurrent assets are fixed, or not sellable, because they are needed to operate the business, such as vehicles or office furniture.
- **Liabilities** are debts the company owes for supplies, business loans, rent on a property, payroll, and other obligations. Liabilities can also be **current** or **long term**.
- **Shareholders' equity**, also called capital or net worth, is the cash value of the company if all assets were to be sold and all liabilities paid off. Shareholders' equity is the amount owners invested in the company's stock plus or minus the company's earnings or losses since its inception

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B Income statement (Statement of operation/profit and loss)

The income statement covers a **period of time**, such as a quarter or year.

It illustrates the profitability of the company from an accounting (accrual and matching) perspective.

It starts with the revenue line and after deducting expenses derives net income.

EXAMPLE CORPORATION
INCOME STATEMENT
FOR YEAR ENDED DECEMBER 31, 2020

Revenue	\$800,000
Cost of Goods Sold	-340,000
Gross Profit	460,000
Operating Expenses	
Marketing Expenses	50,000
Rent	30,000
Utilities	10,000
Insurance	12,000
General & Admin	28,000
Depreciation	43,000
Total Operating Expenses	-173,000
Operating Income	194,000
Interest Expense	42,000
Income Before Income Taxes	152,000
Income Tax Expense	53,200
Net Income	98,800

* Revenue - COGS = gross profit
* Gross profit - operating expenses = net income

Managerial accounting = how to manage managerial expenses

> Budget cashflow = to plant your profit and expenses

> Operating expenses = about your company: how you supply the raw materials fabric and how to pay for this

> Intrest = not related with work or operating = income but not main source of income

Income statement

Company X Income Statement

Operating Items	Sales revenues	\$100,000	Recurring Items
	COGS	-60,000	
	Gross Profit	\$40,000	
	Operating Expenses	-10,000	
	Depreciation & Amortisation	-4,000	
	Operating Income (EBIT)	\$26,000	
	Operating Margin	26%	
Non-Operating Items	Interest Income	\$500	
	Interest Expense	-\$5,500	
	Income Before Tax (EBT)	\$21,000	
	Income Tax Expense	-\$3,500	
	Net Income (from Continuing Ops)	\$17,500	
	Income from Discontinued Ops	\$23,000	
	Loss from lawsuit	-\$3,500	
	Net Income	\$37,000	

Cost of sales COGS

Cost of goods sold or Cost of sales:

May be shown as summarised line item or May be broken Down to its expense items

1. **Direct Materials** (e.g. materials used in manufacturing) = raw material = fabric
2. **Direct Labor** ((e.g. professional services delivered) = people who make clothes (not the manager)
3. **Direct overhead** (to the production of the goods or services) = equipment used for clothing
Equipment for other stuff = indirect!

Type of expenses

Selling, general and administrative expenses



Advertising and promotion cost
= related to business



Legal, Insurance and accounting expenses.



Office supplies



Other related expenses.

= for example you have clients abroad and they pay you money and there is an exchange rate: there is a difference between those that you have to pay

Interpreting the Income Statement

Components of an Income Statement Mean idea = result

- The report starts with the "gross revenue," or the total amount of revenue earned through the sale of products or services. "Gross" indicates that this total is not final, as it does not reflect the whole story because expenses have not been addressed.
- After stating the revenue earned, the statement will list and deduct the amount of money the company cannot collect from the sales it made (due to such things as returns or discounts). The "net" revenues, or the amount of money remaining after the deductions, will be stated.
- Several expenses then are taken from the net revenue. These deductions vary, but usually start with the cost of making sales. The total after deducting these expenses is called the "gross profit" or "gross margin." Once again, "gross" indicates that the figure is not final as more deductions for expenses are to come. Operating expenses such as marketing costs, staff salaries, and product research are then deducted from the total.

Prof: we do not need to create a balance or income statement, we should only analyse or understand what it means

1. Which of the following assets would most likely be measured at historical cost instead of fair value?

- a. Land
 if you bought a car 5y ago, the fair value is the money for which you can sell it right now
- b. Investment in equity securities *bonds = financial instrument*
- c. Pension surplus *surplus from pension funds*
- d. Investment in debt securities *other financial instrument*
equity: gives you the possibility to be owner
money you receive

cost coming from the past, which you payed when you received it

2. Which of the following assets would most likely be measured at fair value instead of historical cost? *we know the fair value of what we can sell easily*

- a. Buildings *no } non current assets ≠ easily used*
- b. Patents *no }*
- c. Inventories
- d. Marketable securities *= because it's a financial instrument*

3. Which of the following assets would most likely be measured at fair value instead of historical cost?

- a. Financial Instruments *= same answer as previous question*
- b. Brands *= product name = intangible assets*
- c. Trademarks
- d. Accounts Receivable

7. Which of the following assets would most likely be reported under "noncurrent assets" on the balance sheet?

- a. Accounts receivable
- b. Goodwill *= non current*
- c. Cash and cash equivalents
- d. Inventory
- e. Short-term investments

8. At the end of fiscal year 2018, Retail Bank's loans to its customers amounted to \$13,500,000. The bank estimated that \$500,000 of these loans would subsequently default and recorded a loan loss expense of \$350,000 for the year. During the year, customers with loans valued at \$120,000 had defaulted. Given these events, the change in loan loss allowance during the year had amounted to:

- a. -\$230,000
- b. \$270,000
- c. \$230,000
- d. -\$270,000
- e. None of the answers are correct

expected loss = \$350k } Δ = \$230k
defaulted = \$120k }

9. ABC Corp. produces widgets with \$1,000 of direct materials. It also estimates \$300 of overhead is directly attributable to these widgets. At the end of the year, the company has sold no widgets but estimates they can sell them for \$1,100. How much should the company value this inventory on the balance sheet?

- a. \$1,000
- b. \$1,300
- c. \$1,100
- d. \$1,400
- e. \$900

4. On January 1, Liz Co. purchases \$100,000 of trading securities. On March 31, the securities have appreciated 10%, with a market value of \$110,000. Which of the following is true?

- a. The book value on March 31 is \$110,000.
- b. There is no effect to net income.
- c. There is no effect to total equity.
- d. Trading securities cannot be measured at fair value.

financial instrument: we use fair value = market value

5. What is the common characteristic possessed by all assets?

- a. Future economic benefit *: if you cannot find the benefit, it's not an asset*
- b. Readily determinable fair value
- c. Tangible *: legally enforceable ≠ about assets*
- d. The claims to it are legally enforceable
- e. Unrestricted use by the entity *not really*

6. Which of the following assets would most likely be reported under "current assets" on the balance sheet?

- a. Accounts receivable *because they will pay in 2 to 3 months*
- b. Goodwill *= from people who want to invest in the company = reputation = intangible = artificial*
- c. Plant, property, and equipment
- d. Marketable securities
- e. Deferred income taxes

10. What is not an essential condition described in the definition of liabilities?

- a. Probable future sacrifice of economic benefits
- b. Obligation is present, known, and measurable
- c. Obligation is based on events that have already happened
- d. Legally enforceable

11. What is an essential condition described in the definition of liabilities?

- a. The obligating event has already occurred
- b. Legally enforceable claim
- c. Can be settled in cash
- d. Known identity of the counterparty (or "obligator")

12. Which of the following current liabilities would most likely be classified as nonoperating?

- a. Interest payable *= financial activity*
- b. Unearned revenue
- c. Accrued liability
- d. Warranty reserve *= operational*

13. A company is a defendant in a lawsuit and management believes there is a probable likelihood of a losing verdict. However, a reasonable estimate of the magnitude of the loss cannot be made. How should the company account for this litigation?
- Record a liability
 - Reduce net income
 - Record a liability and reduce net income
 - Disclose the lawsuit in the footnotes but do not record effect on financial statements
 - No effect on financial statements or footnotes—do not disclose or recognize
14. Which of the following transactions would have no impact on liabilities?
- Selling a computer game for cash today with a promise of free support and upgrades for two years.
 - Agreeing to reduce the principal on a note the company had loaned to a supplier previously.
 - Signing a two-year lease.
 - Converting some of the firm's borrowings into common shares
 - None of the answers are correct (i.e., all would affect liabilities)
15. What is the purpose of depreciation?
- To allocate the cost of an asset over time
 - To reflect reduction in the asset's intrinsic value
 - To account for cash outflows of an asset each period

What does **good information** mean?

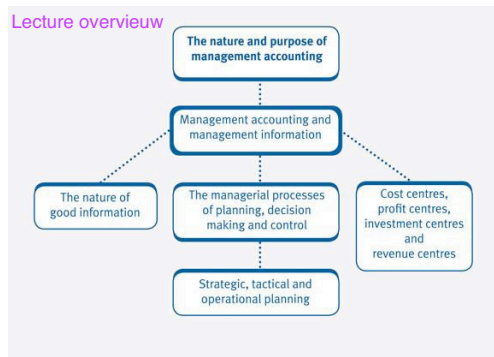
> management accounting and management information

> difference between cost centers

> strategical planning and other kinds of planning

The nature and purpose of management accounting

Lecture overview



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Accounting for Manager Intro in Cost Accounting

Visiting professor, Dr. Ruslana Kuzina

Faculty of Economics and Business

Data and information: What's difference between
Data and Information?

Data = everything in a structured way (is everything, raw material, facts)

Information = what you can use



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Data and information: What's difference between Data and Information?

- **'Data'** means facts.

Data consists of numbers, letters, symbols, raw facts, events and transactions which have been recorded but not yet processed into a form suitable for use.

Information is data which has been processed in such a way that it is meaningful to the person who receives it (for making decisions).

- The terms data and information are often used interchangeably in everyday language. Make sure that you can distinguish between the two.
- As data is converted into information, some of the detail of the data is eliminated and replaced by summaries which are easier to understand.

Good information: **ACCURATE**

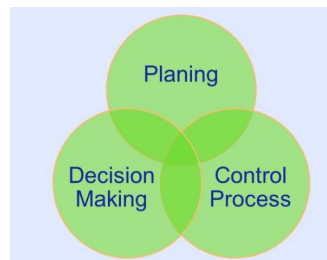
Accurate
Complete
Cost effective
Understandable
Relevant
Accessable
Timely

Easy: you can use it without special knowledge

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Planning , Decision-making, and Control: The Five-step Decision-making Process



1. Identify the problem/uncertainties
2. Obtain information
3. Make predictions about the future
4. Make decisions by choosing among alternatives
5. Implement the decision, evaluate performance and learn.

Planning, control, and decision making are important aspects of the management process. Here are the five steps in the decision making process in planning and control. The first four of these steps fall under Planning and step five falls under Control.

The managerial processes of decision making and control

The main functions that management are involved with are:



- **planning**

= trying to set up goals, aims, establish objectives and strategys how to reach these goals.
> short term planning = tactical planning
> long term planning = strategical planning

- **decision making**

= information used for decision making
The first part of decision making is planning and the second part is control

- **control**

32) Briefly explain the planning and control activities in management accounting. How are these two activities linked to each other?

Answer: **Planning business operations** relates to designing, producing, and marketing a product or service. This includes preparing budgets and determining the prices and cost of products and services. A company must know the cost of each product and service to decide which products to offer and whether to expand or discontinue product lines.

Controlling business operations includes comparing actual results to the budgeted results and taking corrective action when needed.

Feedback links planning and control. The control function provides information to assist in better future planning.

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1. It's a budget = planning. But it's also decision making: because you put some concrete information in the budget
2. Decision making and control. Control because process of revising + dection making because you have to make a decision
3. Only DM
4. Planning + DM

The managerial processes

	Planning	Control	DM
Preparation of the annual budget for a cost centre	√		√
Revise budgets for next period for a cost centre		×	×
Implement decisions based on information provided			×
Set organisation's objectives for next period	×		×
Compare actual and expected results for a period		×	×

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Always DM when a choise has to be made

Strategic, tactical and operational planning

- **Strategic planning** – senior managers formulate long term objectives (goals) and plans (strategies) for an organisation. For 5 to 10 years
- **Tactical planning** – senior managers make short term plans for the next year. Sort period: 1y or 6 months
- **Operational planning** – all managers (including junior managers) are involved in making day to day decisions about what to do next and how to deal with problems as they arise.



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What is strategy?

Strategy is difficult to define; it is a topic with several different aspects and the word is used to mean several different things.

Strategy is the direction and scope of an organization over the long term, which achieves advantage in a changing environment through its configuration of resources and competences with the aim of fulfilling stakeholder expectations.

Strategic decisions are made under conditions of complexity and uncertainty; they have wide impact on the organization and often lead to major change.

Then what is Strategic Management?

Strategic Management: The art and science of formulating, implementing, and evaluating cross-functional decisions that enable an organization to achieve its objectives

The competitive advantage is the attribute that allows an organization to outperform its competitors. There are at least **two broad strategies** that might lead to competitive advantage.

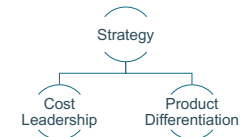
1. **Cost leadership** pertains to a firm's ability to create economies of scale through extremely efficient operations that produce a large volume. Cost leaders include organizations like Walmart, McDonald's and other large firms generating a high volume of goods that are distributed at a relatively low cost (compared to the competition).

Strategic Decisions and the Management

Accountant- (1 of 2)

- Strategy specifies how an organization matches its own capabilities with the opportunities in the marketplace = how to act in a certain situation
- There are **two broad strategies**: cost leadership and product differentiation.
 - = cheap but good = McDonalds
 - = very nice expensive brand = selling less, earning more
- Strategic cost management describes cost management that specifically focuses on strategic issues.

Depending on the strategy you should build your cost accounting > very good but cheap = hard (combi of both strategy is hard)



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2. **Differentiation** refers to a firm's ability to create a good that is difficult to replicate, thereby fulfilling niche needs.

This strategy can include creating a powerful brand image, which allows the organization to sell its products or services at a premium. Mercedes is a good example of differentiation.

Strategic cost management describes cost management that specifically focuses on strategic issues.

Deciding between the two broad strategies of cost leadership or product differentiation is a critical part of what managers do.

Management accountants work closely with managers in various departments to formulate strategies by providing information about the source of competitive advantage, such as (1) the company's cost, productivity or efficiency advantage relative to competitors or (2) the premium prices a company can charge over its cost for distinctive product or service features.

Strategic cost management describes cost management that specifically focuses on strategic issues.

For instance,

Deciding between the two broad strategies of cost leadership or product differentiation is a critical part of what managers do.

Management accountants work closely with managers in various departments to formulate strategies by providing information about the source of competitive advantage, such as (1) the company's cost, productivity or efficiency advantage relative to competitors or (2) the premium prices a company can charge over its cost for distinctive product or service features.

Strategic Decisions and the Management

Accountant (2 of 2)

HOW CAN MA INFO HELP MANAGERS FORMULATE STRATEGIES

- Management accounting information helps managers formulate strategy by answering questions such as the following: **PORTER'S 5 FORCES**
- Who are our most important customers and what critical capability do we have to be competitive and deliver value to our customers? **COMPETITIVE RIVALRY**
- What is the bargaining power of our customers? **BUYER'S POWER**
- What is the bargaining power of our suppliers? **SUPPLIER'S POWER**
- What substitute products exist in the marketplace and how do they differ from our product in terms of features, price, cost and quality? **SUBSTITUTES**
- Will adequate cash be available to fund the strategy, or will additional funds need to be raised? **NEW ENTRANTS?**



Value-chain and Supply-Chain Analysis and

Key Success Factors (1 of 2)

How to create value = important
> for customers it's important to receive goods or services

- **Creating value is an important part of planning and implementing strategy.**

Definition: • **Value is the usefulness a customer gains** from a company's product or service. The **entire customer experience determines the value** a customer derives from a product.

Creating value is an important part of planning and implementing strategy.

So, what is Value? Value is the usefulness a customer gains from a company's product or service.

Customers demand much more than just a fair price – they expect quality products delivered in a timely manner.

That experience is the VALUE derived from purchasing a particular product or service.

In fact, the entire customer experience determines the value a customer derives from a product.

Value-chain and Supply-Chain Analysis

and Key Success Factors (2 of 2)

The value chain is the sequence of business functions by which a product is made progressively more useful to customers. The value chain consists of:

- Research & Development **We create value: you would like to find something new in the market so you can earn more**
- Design of Products and Processes **If you have a specific design you can bring more value to your product**
- Production **What kind of materials do you buy, which quality: they create value. To create value = by optimising production**
- Marketing (including Sales) **Without marketing and investment in promoting you cannot sell**
- Distribution **You can ship fast = creating value, how you distribute = how you create value**
- Customer Service **= to ensure customers come back
= after sales communication (you'll feel better as customer)**

The Value chain is the sequence of business functions by which a product is made progressively more useful to customers.

The Value chain consists of:

1. Research & development (generating and experimenting with ideas related to new products, services or processes)
2. Design of Products and Processes (detailed planning, engineering and testing of products and processes)
3. Production (procuring, transporting and storing, coordinating and assembling resources to produce a product or deliver a service)
4. Marketing (promoting and selling products or services)
5. Distribution (processing orders and shipping products or services to customers)
6. Customer service (providing after-sales service to customers)

Cost centres, profit centres, Investment centres and Revenue centres: Responsibility accounting

Responsibility accounting is based on identifying individual parts of a business which are the responsibility of a single manager.

The main responsibility centres are:

- cost centre = general administration, accounting department, ...
- profit centre = where you have revenue and costs (for example a branch)
- investment centre = the cash flows we use to invest = additional profit (by receiving interest)
- revenue centre = the same like costs centers without cost (so just revenue)



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Cost centres/Profit centres

A **cost centre** is a production or service location, function, activity or item of equipment whose costs are identified and recorded.

For a paint manufacturer cost centres might be: mixing department; packaging department; administration; or selling and marketing departments.

A **profit centre** is a part of the business for which both the costs incurred and the revenues earned are identified.

At the retailer Walmart, different departments selling different products could be divided into profit centers for analysis. For example, clothing could be considered one profit center while home goods could be a second

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- A profit center is a branch or division of a company that directly adds to the corporation's bottom line profitability.
- A profit center is treated as a separate business, with revenues accounted for on a stand alone basis.
- The opposite of a profit center is a cost center, a corporate division, or department that does not generate revenue.

- An investment center is a business unit that a firm utilizes with its own capital to generate returns that benefit the firm.
- The financing arm of an automobile maker or department store is a common example of an investment center.
- Investment centers are increasingly important for firms as financialization leads companies to seek profits from investment and lending activities in addition to core production.

Investment centre/Revenue centre

Managers of **investment centres** are responsible for investment decisions as well as decisions affecting costs and revenues.

Investment centre managers are therefore accountable for the performance of capital employed as well as profits (costs and revenues).

The performance of investment centres is measured in terms of the profit earned relative to the capital invested (employed). This is known as the return on capital employed (ROCE = Profit/Capital employed)

A **revenue centre** is a part of the organisation that earns sales revenue. It is similar to a cost centre, but only accountable for revenues, and not costs.

- Revenue centres are generally associated with selling activities, for example, a regional sales managers may have responsibility for the regional sales revenues generated.

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- Revenue centre: While retail and wholesale companies are traditional revenue center businesses, service companies may also add additional centers to improve the profitability of current business operations. For example, hotels may add a small restaurant or snack bar for guests, gas stations may add convenience stores

Management accounting and management information

Financial accounting focuses on reporting financial information to external parties such as investors, governmental agencies, banks, and suppliers, based on GAAP.

Financial accounting involves recording the financial transactions of an organisation and summarising them in periodic financial statements for external users who wish to analyse and interpret the financial position of the organisation.

= insufficient for the needs of managers because it only reports the past and managers plan for the future

Information produced by the financial accounting system is usually insufficient for the needs of management. Managers usually want to know about: the costs of individual products and services and the profits made by individual products and services

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Cost Accounting/ Management accounting

Cost Accounting measures, analyzes and reports financial and nonfinancial information related to the costs of acquiring or using resources in an organization.

Management accounting has cost accounting at its essential foundation.

The main differences between management accounting and cost accounting are as follows:

- **Cost accounting** is mainly concerned with establishing the historical cost of a product/service.
- **Management accounting** is concerned with historical information but it is also forward looking.
- It is concerned with both historical and future costs of products/services. (For example, budgets and forecasts).

- Cost accounting involves a careful evaluation of the resources used within the enterprise.
- The techniques employed in cost accounting are designed to provide financial information about the performance of the enterprise and possibly the direction that future operations should take.
- The terms 'cost accounting' and 'management accounting' are often used to mean the same thing.

In this slide, a graphical representation highlighting the major differences between management and financial accounting is presented.

The categories compared are the:

Purpose of the information, primary users, rules of measurement and reporting, time span and type of reports, and behavioral implications.

Take the case of Purpose of information as an example:

Management accounting helps managers make decisions while financial accounting communicates an organization's financial position to investors, banks, regulators, and other outside parties

This is from page 23.

Major Differences Between Management and Financial Accounting

EXHIBIT 1.1 Major Difference Between Management and Financial Accounting

	Management Accounting	Financial Accounting
Purpose of information	Help managers make decisions to fulfill an organization's goals = how to reach strategy/goals	Communicate an organization's financial position to investors, banks, regulators, and other outside parties = external partners for investment
Primary users	Managers of the organization	External users such as investors, banks, regulators, and suppliers
Focus and emphasis	Future-oriented (budget for 2017 prepared in 2016)	Past-oriented (reports on 2016 performance prepared in 2017)
Rules of measurement and reporting	Internal measures and reports do not have to follow GAAP but are based on cost-benefit analyses	Financial statements must be prepared in accordance with GAAP and be certified by external, independent auditors
Time span and type of reports	Varies from hourly information to 15 to 20 years, with financial and nonfinancial reports on products, departments, territories, and strategies	Annual and quarterly financial reports, primarily on the company as a whole
Behavioral implications	Designed to influence the behavior of managers and other employees = relevant information analysis, ABC analysis, budget,...	Primarily reports economic events but also influences behavior because manager's compensation is often based on reported financial results

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The role of management accounting within an organisation's management information system

The management information system of an organisation is likely to be able to prepare the following:

Examples of what we can prepare=

- annual statutory accounts
- budgets and forecasts
- product profitability reports
- cash flow reports
- capital investment appraisal reports
- standard cost and variance analysis reports

= info needed for making decisions about cost and selling

= cannot be shared with external users because otherwise competitors can access it



Management information is generally supplied to management in the form of reports. Reports may be routine reports prepared on a regular basis (e.g. monthly) or they may be prepared for a special purpose (e.g. ad hoc report).

Customer Relationship Management (CRM)

- CRM is a strategy that integrates people and technology in all business functions to deepen relationships with customers, partners and distributors.
- CRM initiatives use technology to coordinate all customer-facing activities and design and production activities necessary to get products to customers.

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Supply-Chain Analysis

1. R&D
2. Design
3. Production
4. Marketing
5. Distribution
6. Customer S.

- Production and Distribution are the parts of the value chain associated with producing and delivering a product or service.

- These two functions together are known as the Supply Chain.

- The supply chain describes the flow of goods, services and information from the initial sources of materials, services and information to their delivery regardless of whether the activities occur in one organization or in multiple organizations.

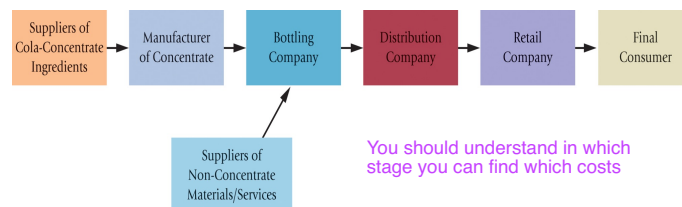
To increase efficiency in these areas, in other words to increase performance and reduce costs, suppliers may be asked to deliver small quantities of materials frequently instead of one larger shipment.

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Supply Chain

The Supply Chain describes the flow of goods, services and information from the initial sources of materials and services to the delivery of a product to consumers, regardless of whether those activities occur in one organization or in multiple organizations.

EXHIBIT 1.3 Supply Chain for a Cola Bottling Company



Cost management is most effective when it integrates and coordinates activities across all companies in the supply chain as well as across each business function in an individual company's value chain. Attempts are made to restructure all cost areas to be more cost-effective.

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The parts of the value chain associated with producing and delivering a product or service— production and distribution—are referred to as the supply chain. The supply chain describes the flow of goods, services, and information from the initial sources of materials and services to the delivery of products to consumers. Consider Coke and Pepsi: Many companies play a role in bringing these products to consumers as the supply chain in Exhibit 1-3 shows. Part of cost management emphasizes integrating and coordinating activities across all companies in the supply chain to improve performance and reduce costs. For example, to reduce materials-handling costs, both the Coca-Cola Company and Pepsi Bottling Group require their suppliers (such as plastic and aluminum companies and sugar refiners) to frequently deliver small quantities of materials directly to their production floors. Similarly, to reduce inventory levels in the supply chain, Walmart requires its suppliers, such as Coca-Cola, to directly manage its inventory of products to ensure the right amount of them are in its stores at all times.

Key Success Factors

Customers want companies to use the value chain and supply chain to deliver ever-improving levels of performance when it comes to several (or even all) of the following: **Are spoiled and what a lot:**

- Cost and efficiency
- Quality
- Time
- Innovation
- Sustainability

•Cost and efficiency: Most of the activities inside organization involve costs. Managers must understand the activities that cause costs to arise as well as monitor the marketplace to determine the prices customers are willing to pay for products or services

•Quality: The customers expect high levels of quality. Total Quality Management (TQM) is an integrative philosophy of management for continuously improving the quality of products and processes.

•Time: When we talk about time here, we actually refer to two important dimensions of time. The new-product development time and customer-response time

•Innovation: A constant flow of innovative products or services is the basis for the ongoing success of a company.

•Sustainability: The development & impl. of strategies to achieve long-term financial, social & environmental goals.

Answers

	Planning	Control	DM
Preparation of the annual budget for a cost centre	√		√
Revise budgets for next period for a cost centre		√	√
Implement decisions based on information provided			√
Set organisation's objectives for next period	√		√
Compare actual and expected results for a period		√	√

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Cost Classification: (Production, Selling, Distribution, Administrative, Finance)

18.11 – slide 10

Overalls for machine workers	Production
Cost of printer cartridges in general office	Administrative
Salary of factory supervisor	Production
Salary of payroll supervisor	Administrative
Rent of warehouse for storing goods ready for sale	Distribution
Loan interest	Finance
Salary of factory security guard	Production
Early settlement discounts for customers who pay early	Selling
Salary of the Chairman's PA	Administrative
Road tax licence for delivery vehicles	Distribution
Bank overdraft fee	Finance
Salesmen's commissions	Selling/Distribution

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Identify whether the following costs are materials, labour or expenses and whether they are direct or indirect.

18.11 – slide 14

Cost	Materials, labour or expense	Direct or indirect?
The hire of tools or equipment	Expense	D
Rent of a factory	Expense	I
Packing materials, e.g. cartons and boxes	Materials	I
Supervisors' salaries	Labour	I
Oil for lubricating machines	Materials	I
Wages of factory workers involved in production	Labour	D
Depreciation of equipment	Expense	I

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Accounting for Manager

Types of cost and cost behaviour

Visiting professor, Dr. Ruslana Kuzina

Learning Objectives

- 2.1 Define and illustrate a cost object
- 2.2 Distinguish between direct costs and indirect costs
- 2.3 Explain variable costs and fixed costs
- 2.4 Interpret unit costs cautiously
- 2.5 Distinguish inventoriable costs from period costs
- 2.6 Illustrate the flow of inventoriable and period costs
- 2.7 Describe, using graphs, the following types of cost behaviour and give examples of each: fixed costs; variable costs; stepped fixed costs; and semivariable costs

Added by the professor:

2.8. Use high/low analysis to separate the fixed and variable elements of total costs including situations involving stepped fixed costs and changes in the variable cost per unit

2.9. Explain the structure of linear functions and equations (of the form

$$y = a + bx)$$

Basic Cost

Terminology (1 of 2)

Cost – a sacrificed or forgone (to give up) resource to achieve a specific objective. = something we spend

Actual cost – a cost that has occurred (Historical)

Budgeted cost – a predicted cost

Cost object – anything for which a cost measurement is desired = products, department, company in general



A **cost** is a resource sacrificed or forgone to achieve a specific objective. A cost (such as the cost of labor or advertising) is usually measured as the monetary amount that must be paid to acquire goods or services. An **actual cost** is the cost incurred (a historical or past cost), as distinguished from a **budgeted cost**, which is a predicted, or forecasted, cost (a future cost).

When you think of a cost, you invariably think of it in the context of putting a price on a particular thing. We call this "thing" a **cost object**, which is anything for which a cost measurement is desired.

Here, we have some additional terminology:

Cost accumulation: a collection of cost data in an organized way by means of an accounting system

Cost assignment: general term that encompasses the gathering of accumulated costs to a cost object in two ways:

- Tracing/Assigning accumulated costs with a direct relationship to the cost object and
- Allocating accumulated costs with an indirect relationship to a cost object

Basic Cost Terminology (2 of 2)

- **Cost Accumulation** – the collection of cost data in an organized way by means of an accounting system
- **Cost Assignment** – a general term that encompasses the gathering of accumulated costs to a cost object in two ways:
 - **Tracing costs** with a direct relationship to the cost object, and
 - **Allocating accumulated costs** with an indirect relationship to a cost object.

When we are thinking of the cost of something, it is a particular something: a car, a piano, a new outfit. That THING about which we want to know the cost is called a cost object. In this slide, we have some examples of different things about which we may want to know the costs. e.g., the cost object can be a product. In BMW, a particular model such as BMW X6 can be a cost object. Alternatively, we might be interested in the cost of our safety department. If so, the safety department is the cost object.

Exhibit 2-1 page 51 COST OBJECT EXAMPLES AT BMW

Cost Object	Illustration
Product	A BMW X6 sports activity vehicle
Service	Telephone hotline providing information and assistance to BMW dealers
Project	R&D project on DVD system enhancement in BMW cars
Customer	Herb Chambers Motors, a dealer that purchases a broad range of BMW vehicles
Activity	Setting up machines for production or maintaining production equipment
Department	Environmental, Health and Safety department

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Classifying costs

Costs can be classified in a number of different ways.

The main cost elements that you need to know about are materials, labour and expenses.

Element costs are classified as materials, labour or expenses (overheads).

Nature costs are classified as being direct or indirect.

Behaviour costs are classified as being fixed, variable, semivariable or stepped fixed.

Function costs are classified as being production or non production costs.

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Classification by element

Materials - all costs of materials purchased for production or non production activities. For example, raw materials, components, cleaning materials, maintenance materials and stationery.

Labour costs - all staff costs relating to employees on the payroll of the organisation.

Expenses - all other costs which are not materials or labour. This includes all bought in services, for example, rent, telephone, subcontractors and costs such as the depreciation of equipment.

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Classification by function production costs

Direct Labor Costs

Direct Material Costs

Direct expenses

Variable production Overhead Costs

Fixed production Overhead Costs

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Direct Labor Costs

Direct labor consists of the fully burdened cost of all labor directly involved in the production of goods. This usually means those people working on production lines or in work cells. Other types of production labor are recorded within the category of factory overhead costs.

Direct Material Costs for ex. cotton (clothes)

Direct materials consists of those materials consumed as part of the production process, including the cost of normal scrap that occurs as part of the process.

Direct expenses (depreciation for machine, special tools)

Variable production Overhead Costs = lighting, heating, water, \$ supervisors

Fixed production Overhead Costs if we produce 2 lines in 1 building

Factory Overhead Costs

Factory overhead consists of those costs required to maintain the production function, but which are not directly consumed on individual units. Examples are utilities, insurance, materials management salaries, production salaries, maintenance wages, and quality assurance wages.

Selling Expenses - also called **Selling and Distribution Expenses**.

Examples: advertising costs, salaries and commission of sales personnel, storage costs, shipping, delivery, CS

General Expenses - also called **General and Administrative Expenses**.

Examples: executive salaries, salaries of administrative staff, accounting expenses, legal expenses, R&D, and other costs related to general administration of the organization.

Financial Expenses - means any interest, commission, fees, discounts, prepayment fees, premiums or charges and other finance payments arising from indebtedness, whether paid or payable

B

Classification by function non production costs

Non production

costs are costs that are not directly associated with the production processes in a manufacturing organisation.

Selling Expenses = including distribution

Distribution Expenses

General Expenses

Administrative Expenses

Financial Expenses

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Cost Classification: (Production, Selling, Distribution, Administrative, Finance)

Overalls for machine workers	
Cost of printer cartridges in general office	
Salary of factory supervisor	
Salary of payroll supervisor	
Rent of warehouse for storing goods ready for sale	
Loan interest	
Salary of factory security guard	
Early settlement discounts for customers who pay early	
Salary of the Chairman's PA	
Road tax licence for delivery vehicles	
Bank overdraft fee	
Salesmen's commissions	

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Direct and indirect costs

Direct costs are costs which can be directly identified with a specific cost unit or cost centre. There are three main types of direct cost:

- **Direct materials** for example, cloth for making shirts
- **Direct labour** for example, the wages of the workers stitching the cloth to make the shirts
- **Direct expenses** for example, the cost of maintaining the sewing machine used to make the shirts.

The total of direct costs is known as the **prime cost**.

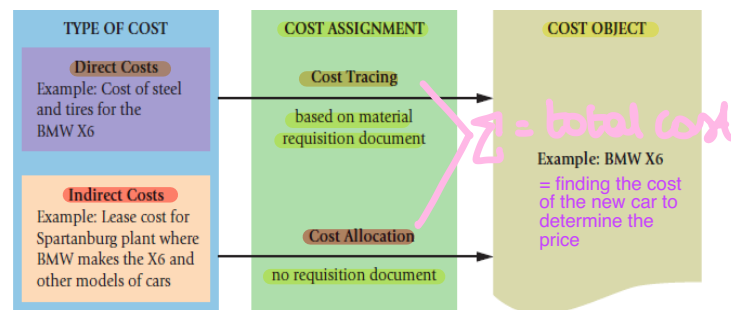
Direct and indirect costs

Indirect costs are costs which cannot be directly identified with a specific cost unit or cost centre. Examples of indirect costs include the following:

- **Indirect materials** these include materials that cannot be traced to an individual shirt, for example, cotton
- **Indirect labour** for example, the cost of a supervisor who supervises the shirtmakers
- **Indirect expenses** for example, the cost of renting the factory where the shirts are manufactured.

The total of indirect costs is known as **overheads**.

Cost Assignment to a Cost Object (BMW Example)



Going back to our X6 BMW example, we see here an illustration of how costs for that line would be collected to the cost object.

If the BMW X6 is our cost object, the direct costs can be traced but the indirect costs must be allocated.

Added together, we'll obtain total costs for the cost object.

Exhibit 2-2 page 51.

Identify whether the following costs are materials, labour or expenses and whether they are direct or indirect.

Cost	Materials, labour or expense	Direct or indirect?
The hire of tools or equipment (Rent)	Expense	Indirect (or direct depends on info)
Rent of a factory	Expenses	Indirect
Packing materials, e.g. cartons and boxes	Materials	Direct
Supervisors' salaries	Labour	Indirect or indirect
Oil for lubricating machines	Materials	Direct
Wages of factory workers involved in production	Labour	Direct: if only one product
Depreciation of equipment	Expense	Direct or indirect, depends on type of equipment Most common: indirect

Cost Allocation Challenges

Direct Costs

- Material (steel or tires for a car, as an example)
- Labor (Assembly line wages)

Indirect Costs

- Electricity
- Rent
- Property taxes
- Plant administration expenses

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To get a better understanding of the types of items that fit into each type of cost (direct or indirect), we present some examples on this slide.

One way to think about this is that association between the direct costs and the specific request for those items in the production process. We need 4 tires and x lbs of steel for each car, but we don't request some number of hours of administration time or rent for each car or for the line.

Please note that the precision and accuracy of the direct costs is often much higher than the indirect costs.

Managers are much more confident about the accuracy of the direct costs of cost objects, such as the cost of steel and tires of the X6, because these costs can be easily traced to the cost object.

Indirect costs are a different story. Some indirect costs can be assigned to cost objects with reasonable accuracy. Others are more difficult.

Factors Affecting Direct/Indirect Cost Classifications.

- The ^{significance} **materiality** of the cost in question.
- The **available information-gathering technology**.
- **Design of operations**.

NOTE: a specific cost may be both a direct cost of one cost object and an indirect cost of another cost object.

The direct/indirect classification depends on the choice of the cost object.

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Several factors affect whether a cost is classified as direct or indirect:

- **The materiality of the cost in question.** The smaller the amount of a cost—that is, the more immaterial the cost is—the less likely it is economically feasible to trace it to a particular cost object. Consider a mail-order catalog company such as Lands' End. It would be economically feasible to trace the courier charge for delivering a package to an individual customer as a direct cost. In contrast, the cost of the invoice paper included in the package would be classified as an indirect cost. Why? Although the cost of the paper can be traced to each customer, it is not cost-effective to do so. The benefits of knowing that, say, exactly 0.5¢ worth of paper is included in each package do not exceed the data processing and administrative costs of tracing the cost to each package. The time of the sales administrator, who earns a salary of \$45,000 a year, is better spent organizing customer information to help with a company's marketing efforts than tracking the cost of paper.
- **Available information-gathering technology.** Improvements in information-gathering technology make it possible to consider more and more costs as direct costs. Bar codes, for example, allow manufacturing plants to treat certain low-cost materials such as clips and screws, which were previously classified as indirect costs, as direct costs of products. At Dell, component parts such as the computer chip and the DVD drive display a bar code that can be scanned at every point in the production process. Bar codes can be read into a manufacturing cost file by waving a "wand" in the same quick and efficient way supermarket checkout clerks enter the cost of each item purchased by a customer.
- **Design of operations.** Classifying a cost as direct is easier if a company's facility (or some part of it) is used exclusively for a specific cost object, such as a specific product or a particular customer. For example, General Chemicals classifies the cost of its facility dedicated to manufacturing soda ash (sodium carbonate) as a direct cost of soda ash.

A few factors affect the direct/indirect cost classification: Materiality, Technology, Operation.

The **materiality** of the cost in question (the smaller the cost, the less likely it will be economically feasible to trace the cost)

Note: Materiality, in accounting terms, assumes the significance that certain facts or data have in the decision making of a reasonable user, and how their inclusion or omission within the financial statements will have consequences in the evaluation of past, present and future events.

The available information-gathering technology (technology makes it possible to consider more and more costs as direct).

Design of operations (if parts of a facility are dedicated to a particular cost object such as a specific product or a particular customer, we are generally able to classify more costs as direct)

Fixed and variable costs: Cost behaviour

4 different types of costs depending on how they behave:

- variable cost
- fixed cost
- stepped fixed cost
- semivariable cost.

Costs may be classified according to the way that they behave. Cost behaviour is the way in which input costs vary with different levels of activity.

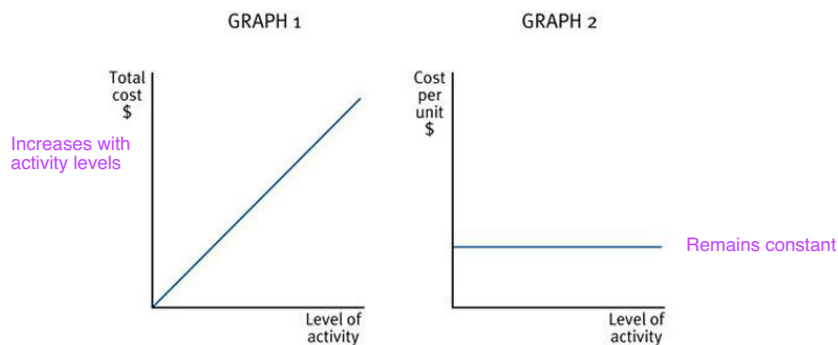
Cost behaviour tends to classify costs as one of the following:

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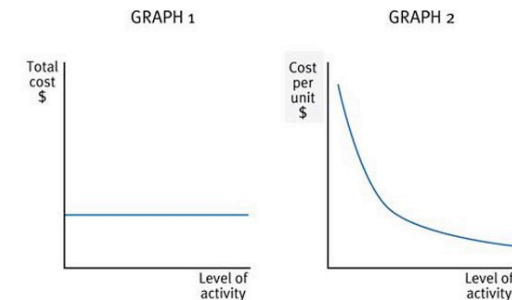
Variable costs

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Note that as total costs increase with activity levels, the cost per unit of variable costs remains constant. Examples of variable costs include direct costs such as raw materials and direct labour.

Fixed costs - cost is a cost which is incurred for an accounting period, and which, within certain activity levels remains constant.



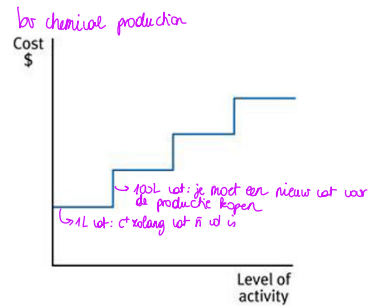
Note that the total cost remains constant over a given level of activity but that the cost per unit falls as the level of activity increases.

Examples of fixed costs:

- rent
- business rates
- executive salaries.

Stepped fixed costs - that is only fixed within certain levels of activity.

Once the upper limit of an activity level is reached then a new higher level of fixed cost becomes relevant.



Examples of stepped fixed costs:

- warehousing costs (as more space is required, more warehouses must be purchased or rented)
- supervisors' wages (as the number of employees increases, more supervisors are required).

In this chart, we have a summary of the way our costs change in total or per unit.

Variable cost TOTAL DOLLARS change in proportion with output but remain unchanged PER UNIT.

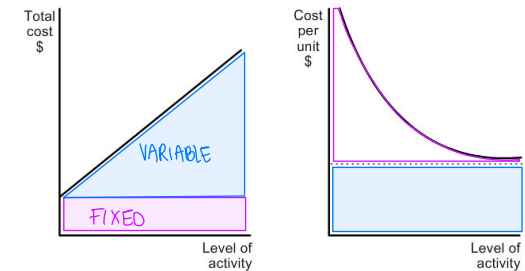
Fixed cost TOTAL DOLLARS remain unchanged in relation to output but change INVERSELY per unit.

Cost Behavior Summarized

-	TOTAL DOLLARS	COST PER UNIT
VARIABLE COSTS	Change in proportion with output (more output = more cost)	Unchanged in relation to output
FIXED COSTS	Unchanged in relation to output (within the relevant range)	Change inversely with output (more output = lower cost per unit)

Semivariable costs - contain both fixed and variable cost elements and are therefore partly affected by fluctuations in the level of activity.

For example phone: je hebt je abonnement (fixed) en als je een limiet hebt kun je bijbetalen voor extra GB internet (variable)

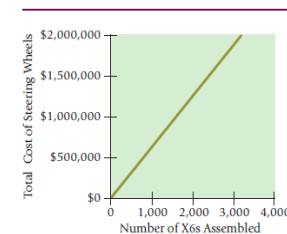


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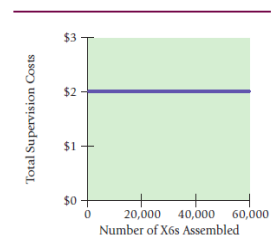
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Graphs of variable and fixed costs

PANEL A: Variable Costs of Steering Wheels at \$60 per BMW X6 Assembled



PANEL B: Supervision Costs for the BMW X6 Assembly Line (in Millions)



In these charts, we see the graphs for variable and fixed costs using the number of steering wheels for the BMW X6. Panel A shows a graph of the total variable cost of steering wheels. The cost begins at zero because if we make no X6s, we'll incur no cost for the steering wheels.

Fixed Costs are presented in Panel B where we have a line across at the \$2,000,000 mark. The Annual total fixed supervision costs for the X6 are that amount and will be that amount whether we assemble zero, 20,000, 40,000 or 60,000 cars.

Of course, over time, that may change. At a consistent assembly rate of zero, we may eliminate the supervisor position. At an assembly rate of greater than 60,000, we may need a second supervisory position.

Exhibit 2-3 page 54.

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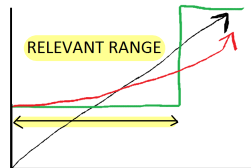
In this slide, we consider a few additional concepts.

Mixed costs – contain both fixed and variable elements

A cost driver is a variable, such as the level of activity or volume, that causally affects costs over time.

The relevant range is the band or range of normal activity within which the fixed costs would not change. The idea of the relevant range is that at some point of increased production, fixed costs will increase.

Other Cost Concepts



Mixed costs have both fixed and variable elements

Cost driver – a variable, such as the level of activity or volume, that causally affects costs over a given time span.

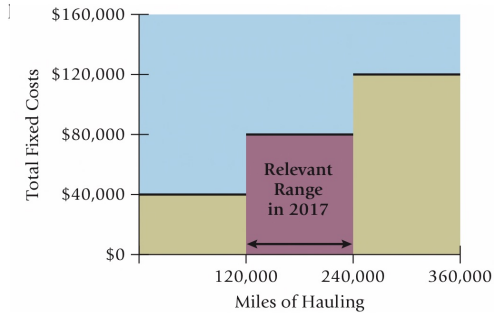
Relevant range – the band or range of normal activity level (or volume) in which there is a specific relationship between the level of activity (or volume) and the cost in question.

Fixed costs are considered fixed only within the relevant range.

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Relevant range is the band or range of normal activity level or volume in which there is a specific relationship between the level of activity or volume and the cost in question. For example, a fixed cost is fixed only in relation to a given wide range of total activity or volume (at which the company is expected to operate) and only for a given time span (usually a particular budget)



Once again using the BMW X6 as an example, we see here examples of the various combinations that can occur for direct/indirect and variable/fixed costs.

E.g., The cost of tires are direct and variable while the salary of supervisor is direct but fixed. Exhibit 2-5, page 57.

Examples of the Multiple Classifications Of Costs

		Assignment of Costs to Cost Object	
		Direct Costs	Indirect Costs
Cost-Behavior Pattern	Variable Costs	<ul style="list-style-type: none"> Cost object: BMW X6s produced Example: Tires used in assembly of automobile More cars > more tires For one car: 4 tires 	<ul style="list-style-type: none"> Cost object: BMW X6s produced Example: Power costs at Spartanburg plant. Power usage is metered only to the plant, where multiple products are assembled. E cost: more cars > more E, but not directly related to 1 car
	Fixed Costs	<ul style="list-style-type: none"> Cost object: BMW X6s produced Example: Salary of supervisor on BMW X6 assembly line Salary: we see which cars are produced 	<ul style="list-style-type: none"> Cost object: BMW X6s produced Example: Annual lease costs at Spartanburg plant. Lease is for whole plant, where multiple products are produced.

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Double check

Classify the following items of expenditure according to their behaviour i.e. as fixed, variable, semivariable or stepped fixed costs. Small exercise:

- (1) Monthly rent Fixed (does not change)
- (2) Council tax charge Fixed
- (3) Bank loan interest Fixed
- (4) Petrol Variable
- (5) Electricity bill Semivariable
- (6) Telephone bill Semivariable
- (7) Annual salary Fixed
- (8) Depreciation of one, two and three factory machines Step fixed (more than 1: rise a little bit)
- (9) Raw materials Variable

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Different Types of Firms

- Manufacturing-sector** Raw materials > products > goods (3 to 4 steps)
companies **purchase materials and components** and convert them into various finished goods.
Only sell, do not produce
- Merchandising-sector**
companies purchase and then sell tangible products without changing their basic form.
- Service-sector** companies **provide services** (intangible products) like legal advice or audits.



Next, please think. What type of firms can use cost/management accounting?

Cost accounting is used for all types of firms including: 1. Manufacturing-sector companies who purchase materials and components and convert them into various finished goods 2. Merchandising-sector companies who purchase and then sell tangible products without changing their basic form

3. Service-sector companies who provide services (intangible products) like legal advice or audits

In order to manufacture any item, manufacturing costs will be incurred.

Three terms are commonly used when describing manufacturing costs. These terms build on the direct versus indirect cost distinctions we discussed earlier.

Indirect manufacturing costs are also referred to as manufacturing overhead costs or factory overhead costs.

Types of Inventory – Manufacturing

Different types of inventories:

Direct materials – resources in-stock and available for use

Work-in-process (or progress) – goods partially worked on but not yet completed, often abbreviated as WIP

Finished goods – goods completed but not yet sold
= goods we can sell

If we sell something, we call it costs
> here we can 3 the 3 types in balance sheets
> the costs: can be found in profit and loss statement

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Types of Inventory - Merchandising



Merchandising-sector companies hold only one type of inventory: **merchandise inventory**

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Commonly Used Classifications of Manufacturing Costs

Also known as inventoriable costs:

Direct materials – acquisition costs of all material that will become part of the cost object.

Direct labor – compensation of all manufacturing labor that can be traced to the cost object.

Indirect manufacturing – all manufacturing costs that are related to the cost object but cannot be traced to that cost object in an economically feasible way.

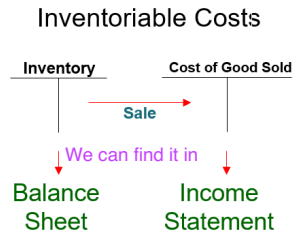
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Inventoriable Costs VS. Period Costs

Inventoriable costs are all costs of a product that are considered assets in a company's balance sheet when the costs are incurred and that are expensed as cost of goods sold only when the product is sold.

For manufacturing companies, all manufacturing costs are inventoriable costs.

because managers expect these costs to increase revenues in only that period and not in future periods.

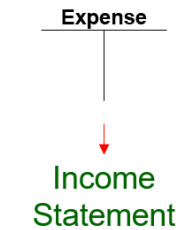


Inventoriable Costs VS. Period Costs

Period costs are all costs in the income statement other than cost of goods sold.
= administrative, selling,...

They are treated as expenses of the accounting period in which they are incurred.

Period costs

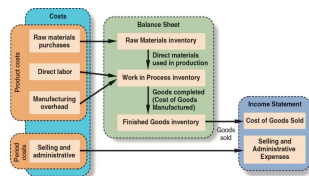


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Here we begin our conversation about the flow of costs. Costs will flow from the balance sheet to the income statement or will originate on the income statement. Let's take a closer look.

Cost Flows



The Cost of Goods Manufactured and the cost of goods sold section of the income statement are accounting representations of the actual flow of costs through a production system.

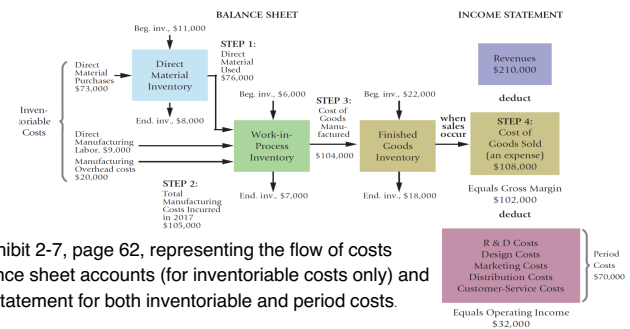
Note how inventoriable costs go through the balance sheet accounts of direct materials, work-in-process and finished goods inventory before entering the cost of good sold in the income statement.

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Cost Flows Illustrated

EXHIBIT 2.7 Flow of Revenue and Costs for a Manufacturing-Sector Company, Cellular Products (in thousands)



Here, we see Exhibit 2-7, page 62, representing the flow of costs through the balance sheet accounts (for inventoriable costs only) and into the income statement for both inventoriable and period costs.

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Multiple-Step Income Statement, Part One

Exhibit 2.8 Income Statement and Schedule of Cost of Goods
Manufactured of a Manufacturing-Sector Company, Cellular Products

	Home	Insert	Page Layout	Formulas	Data	Review	View	
1	PANEL A: INCOME STATEMENT							
2	Cellular Products							
3	Income Statement							
4	For the Year Ended December 31, 2017 (in thousands)							
5	Revenues						\$210,000	
6	Cost of goods sold:							
7	Beginning finished goods inventory, January 1, 2017			\$ 22,000				
8	Cost of goods manufactured (see Panel B)			104,000				
9	Cost of goods available for sale			126,000				
10	Ending finished goods inventory, December 31, 2017			18,000				
11	Cost of goods sold						108,000	
12	Gross margin (or gross profit)						102,000	
13	Operating (period) costs:							
14	R&D, design, mtg., dist., and cust.-service cost			70,000				
15	Total operating costs						70,000	
16	Operating income						\$ 32,000	

To report the flow of costs just illustrated on the income statement, we calculate cost of goods sold as follows:

Beginning Finished Goods inventory
Plus Cost of Goods Manufactured (see next slide)
Equals Cost of Goods available for sale
Subtract Ending Finished Goods inventory
Equals Cost of Goods Sold

If you subtract Cost of Goods Sold from Net Revenues, you get Gross Margin,
From Gross Margin, we subtract period costs to obtain Operating Income
Exhibit 2-8, page 63

* Cost of goods available for sale = finished goods inventory_{t=0} + COGM
* COGS = Cost of goods av. for s - finished goods inventory_{t=t}

GROSS MARG. = Net revenue - COGS
OPERATING INC = GM - period costs

Multiple-Step Income Statement, Part Two

Exhibit 2.8 Income Statement and Schedule of Cost of Goods
Manufactured of a Manufacturing-Sector Company, Cellular Products

	18	PANEL B: COST OF GOODS MANUFACTURED							
	19	Cellular Products							
	20	Schedule of Cost of Goods Manufactured*							
	21	For the Year Ended December 31, 2017 (in thousands)							
STEP 1	22	Direct materials:							
	23	Beginning inventory, January 1, 2017			\$ 11,000				
	24	Purchases of direct materials			73,000				
	25	Cost of direct materials available for use			84,000				
	26	Ending inventory, December 31, 2017			8,000				
	27	Direct materials used				\$ 76,000			
	28	Direct manufacturing labor				9,000			
	29	Manufacturing overhead costs:							
	30	Indirect manufacturing labor			\$ 7,000				
	31	Supplies			2,000				
	32	Heat, light, and power			5,000				
	33	Depreciation—plant building			2,000				
	34	Depreciation—plant equipment			3,000				
	35	Miscellaneous			1,000				
	36	Total manufacturing overhead costs				20,000			
	37	Manufacturing costs incurred during 2017				106,000			
	38	Beginning work-in-process inventory, January 1, 2017				6,000			
	39	Total manufacturing costs to account for				111,000			
	40	Ending work-in-process inventory, December 31, 2017				7,000			
	41	Cost of goods manufactured (to income statement)				\$104,000			
	42	*Note that this schedule can become a schedule of cost of goods manufactured and sold simply by including the beginning and ending finished goods inventory figures in the supporting schedule rather than in the body of the income statement.							

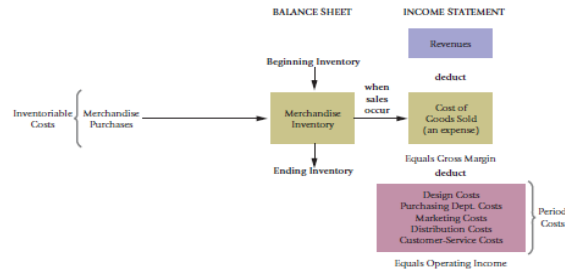
From our first panel on the Multiple-Step Income Statement, we used a figure called Cost of Goods Manufactured.

Let's see how that is calculated.

1. calculate cost of direct materials used by adding beginning direct materials to purchases, then subtracting out ending direct materials inventory
2. calculate the total manufacturing costs incurred which includes the cost of direct materials used plus direct manufacturing labor plus manufacturing overhead.
3. to Beginning Work in Process inventory, we add the manufacturing costs calculated in step 2. That gives us the total manufacturing costs to account for. In other words, these costs will either remain in Work in Process or they will be transferred to Finished Goods.
4. subtracting ending work in process from total manufacturing costs to account for, we get the Cost of Goods Manufactured that we used in the last slide.

Flow Of Revenues and Costs for a Merchandising Company

Exhibit 2.10 Flow of Revenues and Costs for a Merchandising Company (Retailer or Wholesaler)



Inventoriable costs and period costs flow through the balance sheet and income statement at a merchandising company similar to the way costs flow at a manufacturing company.

At a merchandising company, however, the flow of costs is much simpler to understand and track. That flow is depicted in the exhibit shown here.

Step 3: Cost of goods manufactured in 2017. Cost of goods manufactured refers to the cost of goods brought to completion, whether they were started before or during the current accounting period.

Note how the work-in-process inventory box in Exhibit 2-7 has a very similar structure to the direct materials inventory box described in Step 1. Beginning work-in-process inventory of \$6,000 and total manufacturing costs incurred in 2017 of \$105,000 “fill up” the work-in-process inventory box. Some of the manufacturing costs incurred during 2017 are held back as the cost of the ending work-in-process inventory. The ending work-in-process inventory of \$7,000 becomes the beginning inventory for the next year, and the \$104,000 cost of goods manufactured during 2017 “empties out” the work-in-process inventory while “filling up” the finished-goods inventory box.

The cost of goods manufactured in 2017 (shaded green) is calculated in Exhibit 2-8, Panel B, as follows:

Beginning work-in-process inventory, January 1, 2017	\$ 6,000
+ Total manufacturing costs incurred in 2017	<u>105,000</u>
= Total manufacturing costs to account for	111,000
– Ending work-in-process inventory, December 31, 2017	<u>7,000</u>
= Cost of goods manufactured in 2017	<u>\$104,000</u>

Step 1: Cost of direct materials used in 2017. Note how the arrows in Exhibit 2-7 for beginning inventory, \$11,000, and direct material purchases, \$73,000, “fill up” the direct materials inventory box and how direct materials used, \$76,000, “empties out” direct material inventory, leaving an ending inventory of direct materials of \$8,000 that becomes the beginning inventory for the next year.

The cost of direct materials used is calculated in Exhibit 2-8, Panel B (light blue-shaded area), as follows:

Beginning inventory of direct materials, January 1, 2017	\$11,000
+ Purchases of direct materials in 2017	73,000
– Ending inventory of direct materials, December 31, 2017	<u>8,000</u>
= Direct materials used in 2017	<u>\$76,000</u>

Step 2: Total manufacturing costs incurred in 2017. Total manufacturing costs refers to all direct manufacturing costs and manufacturing overhead costs incurred during 2017 for all goods worked on during the year. Cellular Products classifies its manufacturing costs into the three categories described earlier.

(i) Direct materials used in 2017 (shaded light blue in Exhibit 2-8, Panel B)	\$ 76,000
(ii) Direct manufacturing labor in 2017 (shaded blue in Exhibit 2-8, Panel B)	9,000
(iii) Manufacturing overhead costs in 2017 (shaded dark blue in Exhibit 2-8, Panel B)	20,000
Total manufacturing costs incurred in 2017	<u>\$105,000</u>

Note how in Exhibit 2-7 these costs increase work-in-process inventory.

Step 4: Cost of goods sold in 2017. The cost of goods sold is the cost of finished-goods inventory sold to customers during the current accounting period. Looking at the finished-goods inventory box in Exhibit 2-7, we see that the beginning inventory of finished goods of \$22,000 and cost of goods manufactured in 2017 of \$104,000 “fill up” the finished-goods inventory box. The ending inventory of finished goods of \$18,000 becomes the beginning inventory for the next year, and the \$108,000 cost of goods sold during 2017 “empties out” the finished-goods inventory.

This cost of goods sold is an expense that is matched against revenues. The cost of goods sold for Cellular Products (shaded olive green) is computed in Exhibit 2-8, Panel A, as follows:

Beginning inventory of finished goods, January 1, 2017	\$ 22,000
+ Cost of goods manufactured in 2017	<u>104,000</u>
– Ending inventory of finished goods, December 31, 2017	<u>18,000</u>
= Cost of goods sold in 2017	<u>\$108,000</u>

Exhibit 2-9 shows related general ledger T-accounts for Cellular Products’ manufacturing cost flow. Note how the cost of goods manufactured (\$104,000) is the cost of all goods completed during the accounting period. These costs are all inventoriable costs. Goods completed during the period are transferred to finished-goods inventory. These costs become cost of goods sold in the accounting period when the goods are sold. Also note that the direct materials, direct manufacturing labor, and manufacturing overhead costs of the units in work-in-process inventory (\$7,000) and finished-goods inventory (\$18,000) as of December 31, 2017, will appear as an asset in the balance sheet. These costs will become expenses next year when the work-in-process inventory is converted to finished goods and the finished goods are sold.

Flow of Costs - Review

- Manufacturing Costs (MC)
- Cost of Goods Manufactured (CGM or COGM)
- Cost of Goods Sold (CGS or COGS)

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Direct labor and manufacturing overhead (also called conversion costs) used in production are added to direct materials to arrive at total manufacturing costs.

Flow of Costs - Review

Raw Materials	Manufacturing Costs	Work In Process
Beginning raw materials inventory	Direct materials	Conversion costs are costs incurred to convert the direct material into a finished product.
+ Raw materials purchased	+ Direct labor	
= Raw materials available for use in production	+ Mfg. overhead	
- Ending raw materials inventory	= Total manufacturing costs	
= Raw materials used in production		

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Raw material purchases made during the period are added to beginning raw materials inventory. The ending raw materials inventory is deducted to arrive at the raw materials used in production. As items are removed from the raw materials inventory and placed into the production process, they are called direct materials.

Flow of Costs - Review

Raw Materials	Manufacturing Costs	Work In Process
Beginning raw materials inventory	Direct materials	
+ Raw materials purchased		
= Raw materials available for use in production		
- Ending raw materials inventory		
= Raw materials used in production		

As items are removed from raw materials inventory and placed into the production process, they are called direct materials.

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Total manufacturing costs are added to the beginning work in process to arrive at total work in process.

Flow of Costs - Review

Raw Materials	Manufacturing Costs	Work In Process
Beginning raw materials inventory	Direct materials	Beginning work in process inventory
+ Raw materials purchased	+ Direct labor	+ Total manufacturing costs
= Raw materials available for use in production	+ Mfg. overhead	= Total work in process for the period
- Ending raw materials inventory	= Total manufacturing costs	
= Raw materials used in production		

All manufacturing costs incurred during the period are added to the beginning balance of work in process.

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The ending work in process inventory is deducted from the total work in process for the period to arrive at the cost of goods manufactured.

Flow of Costs - Review

Raw Materials	Manufacturing Costs	Work In Process
Beginning raw materials inventory	Direct materials	Beginning work in process inventory
+ Raw materials purchased	+ Direct labor	+ Total manufacturing costs
= Raw materials available for use in production	= Total manufacturing costs	= Total work in process for the period
		- Ending work in process inventory
		= Cost of goods manufactured

Costs associated with the goods that are completed during the period are transferred to finished goods inventory.

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The cost of goods manufactured is added to the beginning finished goods inventory to arrive at cost of goods available for sale. The ending finished goods inventory is deducted from this figure to arrive at cost of goods sold.

Flow of Costs - Review

Work In Process	Finished Goods
Beginning work in process inventory	Beginning finished goods inventory
+ Manufacturing costs for the period	+ Cost of goods manufactured
= Total work in process for the period	= Cost of goods available for sale
- Ending work in process inventory	- Ending finished goods inventory
= Cost of goods manufactured	= Cost of goods sold

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What is Leslie's cost of goods sold?

- A) \$390,000
 B) \$240,000
 C) \$239,000
 D) \$389,000

Revenue	\$460,000
Beginning inventory of direct materials, January 1, 2015	26,000
Purchases of direct materials	156,000
Ending inventory of direct materials, December 31, 2015	14,000
Direct manufacturing labor	30,000
Indirect manufacturing costs	41,000
Beginning inventory of finished goods, January 1, 2015	46,000
+ Cost of goods manufactured	239,000
- Ending inventory of finished goods, December 31, 2015	45,000
Operating costs	150,000

$$46 + 239 - 45 = 240$$

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Howard Manufacturing Company had the following account balances for the quarter ending March 31, unless otherwise noted:

Work-in-process inventory (January 1)	\$ 140,400 = BEGINNING
Work-in-process inventory (March 31)	171,000 = END
Finished goods inventory (January 1)	540,000 = BEGINNING
Finished goods inventory (March 31)	510,000 = END

EXPENSES OF MFG?	Direct materials used	420,000
* manufacturer cost used	Indirect materials used	84,000
* direct labor used	Direct manufacturing labor	480,000
* overhead	Indirect manufacturing labor	186,000
- prod. overhead:	Property taxes on manufacturing plant building	28,800
1. plant utilities	Salespersons' company vehicle costs	12,000
2. ind. lab.	Depreciation of manufacturing equipment	264,000
3. ind. mat.	Depreciation of office equipment	123,600
4. plant overh.	Miscellaneous plant overhead	135,000
5. prop. tax	Plant utilities	92,400
6. depr. of man.	General office expenses	305,400
	Marketing distribution costs	30,000

Required:

a. Prepare a cost of goods manufactured schedule for the quarter. 790 200

b. Prepare a cost of goods sold schedule for the quarter. 540 - 510 + 790 200 = 820 200

a.

begin 140 400
 + man part 1 690 200
 = 1 830 600

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Answer:

a. **Howard Manufacturing Company**
Cost of Goods Manufactured Schedule
For quarter ending March 31

Direct materials used	\$ 420,000
Direct manufacturing labor	480,000
Manufacturing overhead	
Depreciation of manufacturing equipment	\$264,000
Indirect manufacturing labor	186,000
Indirect materials	84,000
Miscellaneous plant overhead	135,000
Plant utilities	92,400
Property taxes on building	28,800
	<u>790,200</u>
Manufacturing costs incurred	\$1,690,200
Add beginning work-in-process inventory	<u>140,400</u>
Total manufacturing costs	\$1,830,600
Less ending work-in-process inventory	<u>(171,000)</u>
Cost of goods manufactured	<u>\$1,659,600</u>

b. **Howard Manufacturing Company**
Cost of Goods Sold Schedule
For the quarter ending March 31

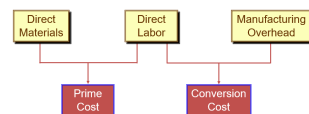
Beginning finished goods inventory	\$ 540,000
Cost of goods manufactured	<u>1,659,600</u>
Cost of goods available for sale	2,199,600
Ending finished goods inventory	<u>(510,000)</u>
Cost of goods sold	<u>\$1,689,600</u>

Diff: 3

Objective: 6

AACSB: Application of knowledge

Other Cost Considerations



- **Prime cost** is a term referring to **all direct manufacturing costs** (materials and labor).
- **Conversion cost** is a term referring to **direct labor and indirect manufacturing costs**.

Here we have some additional classifications of costs.

Prime cost is a term referring to all direct manufacturing costs (materials and labor).

Conversion cost is a term referring to direct labor and indirect manufacturing costs.

Note that direct manufacturing labor costs are a part of both prime costs and conversion costs.

Different Product Costs for Different Purposes (1 of 2)

Pricing and product-mix decisions – decision about pricing and maximizing profits

Contracting with government agencies – very specific definitions of allowable costs for “cost plus profit” contracts

Preparing external-use financial statements – GAAP-driven product costs only

Many cost terms used by organizations have ambiguous meanings. Consider the term product cost as an example. A product cost is the sum of the costs assigned to a product for a specific purpose. Some different purposes might include:

Pricing and product-mix decisions—decisions about pricing and maximizing profits

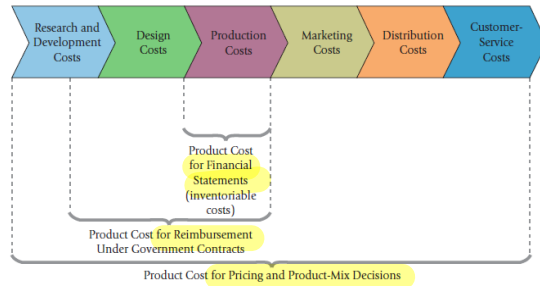
Contracting with government agencies—very specific definitions of allowable costs for “cost plus profit” contracts

Preparing external-use financial statements—GAAP-driven product costs only

These different purposes can result in different measures of product costs. You can see a pictorial view of this concept on the next slide.

Different Product Costs for Different Purposes (2 of 2)

Here we see a pictorial view of how we can have different costs for different purposes.



These ideas are developed further in Chapters 3 through 11. The ideas also form the foundation for the study of various topics later in the book.

A Framework for Cost Accounting and Cost Management

The following three features of cost accounting and cost management can be used for a wide range of applications (for helping managers make decisions):

1. Calculating the cost of products, services, and other cost objects
2. Obtaining information for planning and control, and performance evaluation
3. Analyzing the relevant information for making decisions

Analysis of costs into fixed and variable elements

Cost estimation

A number of methods exist for analysing semivariable costs into their fixed and variable elements. The two main methods are:

- high/low method
- least squares regression

High/low method

Step 1 select the highest and lowest activity levels, and their associated costs. (Note: do not take the highest and lowest costs)

Step 2 find the variable cost per unit

$$\text{Variable cost per unit} = \frac{\begin{array}{l} \text{Cost at high level of activity} \\ - \text{cost at low level of activity} \end{array}}{\begin{array}{l} \text{High level of activity} \\ - \text{low level of activity} \end{array}} \quad (\text{Divided})$$

High/low method

Step 3 find the fixed cost by substitution, using either the high or low activity level

$$\text{Fixed cost} = \text{Total cost at activity level} - \text{Total variable cost}$$

High/low method

Output (Units)	Total cost (\$)
200	7,000
300	8,000
400	9,000

Required:

- Find the variable cost per unit.
- Find the total fixed cost.
- Estimate the total cost if output is 350 units.
- Estimate the total cost if output is 600 units.

High/low method

- Find the variable cost per unit.

Output (Units)	Total cost (\$)
200	7,000
400	9,000

200	2000
-----	------

$$\text{Variable cost per unit} = 2000/200 = 10$$

- Total fixed cost = $7000 - 10 \times 200 = 5000$ = total cost at activity level - total variable cost
 $= 9000 - 10 \times 400 = 5000$

- The total cost if output is 350 units = $10 \times 350 + 5000 = 6500$
 = variable cost * # units + fixed costs

- The total cost if output is 600 units = $10 \times 350 + 5000 = 11000$

1. Variable cost/unit

High/Low	#200	\$7000
	#400	\$9000

$$\frac{(\$9000 - \$7000)}{(\#400 - \#200)} = \frac{\$2000}{\#200} = 10$$

2. Total fixed cost

$$\$7000 - (\#200 \times \$10) = \$5000$$

Variable cost per unit

$$= (\text{cost of high level of activity} - \text{cost at low level of activity}) / (\text{high level of activity} - \text{low level of activity})$$

$$= (9000 - 7000) / (400 - 200) = 10$$

3. Output = 350

$$\text{total cost} = \text{variable} + \text{fixed}$$

$$= \$350 \times 10 + 5000$$

$$= \$8500$$

4. Output = 600

$$\text{total cost} = \text{variable} + \text{fixed}$$

$$= \$600 \times 10 + 5000$$

Cost equations

Equation of a straight line

The equation of a straight line is a linear function and is represented by the following equation:

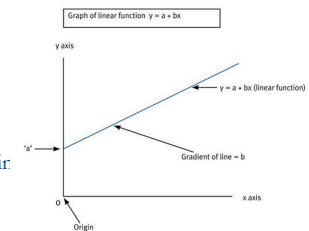
$$y = ax + b$$

• 'a' is the intercept, i.e. the point at which the line $y = a + bx$ cuts the y axis (the value of y when $x = 0$).

• 'b' is the gradient/slope of the line $y = a + bx$ (the change in y when x increases by one unit).

• 'x' = independent variable.

• 'y' = dependent variable (its value depends on the value of 'x').



Cost equations

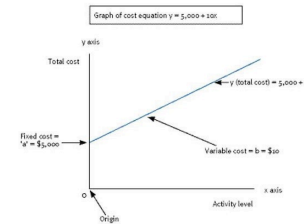
Cost equations are derived from historical cost data. Once a cost equation has been established, like the high/low method, it can be used to estimate future costs.

Cost equations have the same formula as linear functions:

- ‘a’ is the fixed cost per period (the intercept)
- ‘b’ is the variable cost per unit (the gradient)
- ‘x’ is the activity level (the independent variable)
- ‘y’ is the total cost = fixed cost + variable cost (dependent on the activity level)

Cost equations

Suppose a cost has a cost equation of $y = \$5,000 + 10x$, this can be shown graphically as follows:



Graph of cost equation $y = 5,000 + 10x$

Test your understanding

1. The total costs incurred at various output levels in a factory have been measured as follows:

Output	Total(units) cost (\$)	
26	6,566	Variable cost per unit = $(7310 - 6566) / (50 - 26)$ = $744 / 24$ = 31
30	6,510	
33	6,800	
44	6,985	
48	7,380	
50	7,310	

Required: Using the high/low method, analyse the total cost into fixed and variable components.

Test your understanding

If the total cost of a product is given as:

$$Y = 4,800 + 8x$$

- (a) The fixed cost is \$ 4800
- (b) The variable cost per unit is \$ 8
- (b) The total cost of producing 100 units is \$ = $4800 + 8 \times 100 = 5600$

Accounting for Manager

Marginal and absorption costing

Visiting professor, Dr. Ruslana Kuzina

Faculty of Economics and Business

Learning Objectives

- explain the importance of, and apply the concept of, contribution using data supplied
- calculate and discuss the effect of absorption and marginal costing on inventory valuation and profit determination using data supplied
- describe the advantages and disadvantages of absorption and marginal costing for a manufacturing business
- understand and use the concept of a contribution

Learning Objectives

- Explain the features of cost-volume-profit (CVP) analysis
- Determine the breakeven point and output level needed to achieve a target operating income
- Understand how income taxes affect CVP analysis
- Explain how managers use CVP analysis to make decisions
- Explain how sensitivity analysis helps managers cope with uncertainty

Learning Objectives

- Use CVP analysis to plan variable and fixed costs
- Apply CVP analysis to a company producing multiple products
- Apply CVP analysis in service and not-for-profit organizations
- Distinguish contribution margin from gross margin

The concept of contribution:

Marginal costing

Marginal costing is an accounting system in which variable costs are charged to cost units and fixed costs for the period are written off in full to the income statement.

- Marginal costing is an alternative costing system to absorption costing *(or later)*
- The marginal cost of a unit of product is the total of the variable costs of the product (i.e. direct materials, direct labour and variable overheads).
- The marginal cost of a product is therefore the additional cost of producing an extra unit of that product.



The contribution concept

The contribution concept lies at the heart of marginal costing. Contribution can be calculated as follows.

$$\text{Contribution} = \text{Sales price} - \text{Variable costs}$$



Illustration 1

The following information relates to a company that makes a single product, a specialist lamp, which is used in the diamond cutting business.

The cost card for the lamp is as follows.

Sales price	600
Direct materials	200
Direct labour	150
Direct expenses	0
Prime cost	350
Variable production overheads	50
Fixed production overheads	100
Total cost	500

For 1 lamp: contribution = sales price - variable costs = 600 - 500 = 100

100 x 1200

Fixed costs have been estimated to be \$120,000 based on a production level of 1,200 lamps.

We can see that the profit/lamp = increased from \$100 when 1,200 lamps are sold to \$120 when 1,500 lamps are sold. This is because **all of the variable costs** (direct materials, direct labour, direct expenses and variable overheads) have **increased but the fixed costs have remained constant at \$120,000**.

Let us look at the costs and revenues involved when different volumes of lamps are sold.

Based on what we have seen above, the idea of profit is not a particularly useful one as it depends on how many units are sold. For this reason, the contribution concept is frequently employed by management accountants.

	Sales of 1,200 lamps	Sales of 1,500 Lamps
Sales revenue	720,000 = 600.000	900,000 = 600.000
Direct materials	240,000 = 120.000	300,000
Direct labour	180,000 = 120.000	225,000
Direct expenses	0	0
Prime cost	= 420,000 = 120.000	525,000
Variable production Overheads	60,000 = 120.000	75,000 = 150.000
Marginal cost of		
Production	480,000 = 120.000	600,000 = 150.000
CONTRIBUTION	240,000 = 720.000 - 480.000	300,000
Fixed production Overheads	120,000 = 120,000	120,000
Total profit	120,000	180,000
Contribution per unit	200	200
Profit per unit	100	120

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The contribution concept

Contribution gives an idea of how much 'money' there is available to 'contribute' towards paying for the overheads of the organisation.

- At varying levels of output and sales, **contribution per unit is constant**.
- At varying levels of output and sales, **profit per unit varies**.

Total contribution = Contribution per unit x Sales volume.

Profit = Total contribution – Fixed overheads.

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Marginal costing and the decision-making process

Marginal costing (and therefore the contribution concept) is widely used in the decision-making process.

The study of marginal costing and decision making is very important in management accounting.

It involves the following topics which are relevant to your study of this topic:

- CVP analysis **Today**
- relevant costing **Last lecture**
- limiting factor analysis **If there is time**

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Illustration 2 a) > All direct cost is variable
> Total variable cost = 3 + 6 + 2 + 5 = 16
> Contribution per unit = sales price - variable cost = 21 - 16 = 5

Buhner Ltd makes only one product, the cost card of which is:

Direct materials	3
Direct labour	6
Variable production overhead	2
Fixed production overhead	4
Variable selling cost	5

The selling price of one unit is \$21.

Budgeted fixed overheads are based on budgeted production of 5,000 units. Opening inventory was 1,000 units and closing inventory was 4,000 units.

Sales during the period were 3,000 units and actual fixed production overheads incurred were **\$25,000**.

- Calculate the total contribution earned during the period.
- Calculate the total profit or loss for the period.

b)

- > total contribution earned = 3000 sold units * 5 dollar per unit = 15 000
- > total profit and loss for the period
 - the total overhead = 25 000
 - We earned 15 000
 - The result = 25k - 15 k = -10 k = a loss

Absorption and marginal costing

Marginal costing values inventory at the total variable production cost of a unit of product.

Absorption costing values inventory at the full production cost of a unit of product.
= used more for financial reporting

- Inventory values will therefore be different at the beginning and end of a period under marginal and absorption costing.
- If inventory values are different, then this will have an effect on profits reported in the income statement in a period. Profits determined using marginal costing principles will therefore be different to those using absorption costing principles.
Remember first lecture: profit can be reported in different ways

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Production overheads are usually calculated at the beginning of an accounting period in order to determine an OAR for products before they are sold to customers.

This means that budgeted (or expected) figures must be used for production overheads and activity levels (machine hours, labour hours).

The overhead absorption rate

The overhead absorption rate (OAR) may be calculated as follows:

$$\text{OAR} = \frac{\text{Total production overhead}}{\text{Total of absorption basis}}$$

The absorption basis is most commonly units of a product, labour hours, or machine hours.

Problem: production overhead (for example 14k) can only be known at the end of the month, that's why we use previous budgeting:

The predetermined OAR is calculated as follows.

$$\text{Predetermined OAR} = \frac{\text{Budgeted overheads}}{\text{Budgeted level of activity}}$$

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We produce product A and B:

- we can easily count: direct materials, direct labour, direct other expenses
- Indirect expenses = overhead = heating, lighting and renting

When we calculate the cost of a product we should allocate the indirect expenses on A and B

Production overhead absorption

Indirect expenses are also known as overheads.

Fixed production overheads = indirect materials + indirect labour + indirect expenses.

Absorption costing - Production overheads are recovered by absorbing them into the cost of a product and this process is therefore called absorption costing.

The main aim of absorption costing is to recover overheads in a way that fairly reflects the amount of time and effort that has gone into making a product or service.

Absorption costing involves the following stages:

- allocation and apportionment of overheads Allocation methods: hours of labour, hours of equipment, units produced,...
- reapportionment of service (nonproduction) cost centre overheads
- absorption of overheads. Otherwise you can't cover all expenses

Fixed production overheads of a factory will include the following costs:

- heating the factory
- lighting the factory
- renting the factory¹³

The total cost of a product also includes a share of the fixed production overheads. This is because organisations must recover their fixed production overheads and they do this by absorbing a fixed amount into each product that they make and sell. One way of recovering fixed production overheads is on a cost per unit basis.

Under and over absorption of overheads

If either or both of the estimates for the budgeted overheads or the budgeted level of activity are different from the actual results for the year then this will lead to one of the following:

- under absorption (recovery) of overheads
- over absorption (recovery) of overheads.

At the end of an accounting period, the overheads absorbed will be calculated as follows.

Overheads absorbed = predetermined OAR × actual level of activity

If at the end of this period, the overheads absorbed are greater than the actual overheads, then there has been an overabsorption of overheads.

If, on the other hand, the overheads absorbed are less than the actual overheads, then there has been an underabsorption of overheads.

Under absorption is sometimes referred to as under recovery of overheads and overabsorption is sometimes referred to as over recovery of overheads.

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Valuation of inventory – opening and closing inventory are valued at full production cost under absorption costing.

Valuation of inventory – opening and closing inventory are valued at full marginal cost under marginal costing.

Absorption costing income statement VS Marginal costing income statement

Absorption Costing Income Statement		Marginal Variable Costing Income Statement	
Sales = the same	\$ 540,000	Sales	\$ 540,000
Cost of Goods Sold		Variable Costs	
Beginning Inventory	\$ -	Cost of Goods Sold	
Cost of Goods Manufactured	740,000	Beginning Inventory	\$ -
Cost of Goods Available	740,000	Cost of Goods Manufactured	540,000
Ending Inventory	296,000	Cost of Goods Available	540,000
Cost of Goods Sold	444,000 = 310	Ending Inventory	216,000
Gross Profit	96,000	Cost of Goods Sold	324,000 = 540 - 216
Operating Expenses		Variable Selling and Admin	24,000 = 540 - 324
Variable Selling and Admin	24,000	Contribution Margin	192,000
Fixed Selling and Admin	50,000	Fixed Costs	
Net Income	\$ 22,000	Fixed Manufacturing Overhead	200,000
		Fixed Selling and Admin	50,000
		Net Income	\$ (8,000.00) = 192 - 200 - 50

Absorption costing

1. Beginning inventory
 2. Cost of goods produced (=direct labor, direct materials, direct expenses + fixed expenses)
 3. -Ending inventory (we sold the difference between beginning & end)
- = gross profit
4. Eliminate operating expenses
- Result is net income

Variable costing

1. Beginning inventory
 2. Cost of goods produced (only variable, direct expenses)
 3. End of inventory
 4. Minus variable selling and admin
- = contribution margin
5. Eliminate fixed cost
- Result is net income

Example

ABC Inc. produces skateboards and incurs the following manufacturing costs in producing 20,000 units:

- Direct Materials \$10/unit
- Direct Labour \$12/unit
- Variable Manufacturing Overhead \$5/unit
- Fixed Manufacturing Overhead \$200,000

There is no beginning inventory and 12,000 units were sold for \$45 each. The company incurs a variable selling expense of \$2 per unit and fixed selling and administrative expenses of \$50,000.

Reconciling Between Absorption and Variable Costing

Understanding the difference between absorption costing and variable costing allows us to quickly determine the effects of switching from method to the other, we call this reconciling. Simply, by either adding or subtracting the difference in costs we can use the income from one costing method to find the income from the other.

Change in Inventory Units x Difference in Unit Cost = Difference in Net Income

- When Units Produced > Units Sold
 - Inventory increases
 - Absorption Costing Net Income > Variable Costing Net Income
 - Absorption Costing Inventory > Variable Costing Inventory
- When Units Produced < Units Sold
 - Inventory decreases
 - Absorption Costing Net Income < Variable Costing Net Income
 - Absorption Costing Inventory < Variable Costing Inventory

Illustration 3

A company commenced business on 1 March making one product only, the cost card of which is as follows:

Direct labour	£
Direct material	8
Variable production overhead	2
Fixed production overhead	5
Standard production cost	\$20 = sum of everything

The fixed production overhead figure has been calculated on the basis of a budgeted normal output of 36,000 units per annum. The fixed production overhead incurred in March was \$15,000 each month.

Selling, distribution and administration expenses are:

Fixed	\$10,000 per month
Variable	1% of the sales value

The selling price per unit is \$35 and the number of units produced and sold were:

Production in March	2,000 units
Sales in March	1,500 units

Prepare the absorption costing and marginal costing income statements for March.

Illustration 3 (Answ)

Marginal cost of production = \$(5 + 8 + 2) = \$15 = only direct variable cost = direct labour, direct material and variable production overhead

Full cost of production = \$20 (as above)

Difference in cost of production = \$5 which is the fixed production overhead element of the full production cost.

This means that each unit of opening and closing inventory will be valued at \$5 more under absorption costing.

Sales: 1500 goods sold * 35\$/unit = 52500

Closing inventory at the end of March is the difference between the number of units produced and the number of units sold, i.e. 500 units (2,000 – 1,500)

Loss for March under absorption costing = \$375 (as calculated in Slide 20).

Loss for March under marginal costing = \$2,875 (as calculated in Slide 19).

Illustration 3

Marginal costing

Sales = $1500 \times 35 = 52\,500$

Beginning Inventory = 0

Cost of Goods manufactured = $2000 \times 15 = 30\,000$

Ending Inventory = $500 \times 15 = 7500$

Cost of Goods Sold = $30\,000 - 7500 = 22\,500$

Variable Selling expenses = $52500 \times 15\% = 7875$

Contribution Margin = $52500 - 22500 - 7875 = 22125$

Fixed production overhead 15000

Administrative fixed expenses 10000

Net Loss $22125 - 15000 - 10000 = 2875$

NET $22125 - 15000 - 10000 = 2875$

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Illustration 3

Absorption costing

Sales = $1500 \times 35 = 52\,500$

Beginning Inventory = 0

Cost of Goods manufactured = $2000 \times 20 = 40\,000$

Ending Inventory = $500 \times 20 = 10000$

Cost of Goods Sold = $40000 - 10000 = 30\,000$

Gross Profit = $52500 - 30000 = 22500$

(Under)/over-absorption = Overheads absorbed ($2000 \times 5(20-15)$) - Overheads incurred = $15000 - 5000 = 10000$

Variable Selling expenses = $52500 \times 15\% = 7875$

Administrative fixed expenses 10000

Net Loss $22500 - 30000 - 7875 - 10000 = 375$

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Illustration 3

Difference in loss (profits) = $\$2,875 - \$375 = \$2,500$.

This difference can be analysed as being due to the fixed overhead held in inventory, i.e. 500 units of inventory 'holding' \$5 fixed overhead per unit.

$500 \times \$5 = \$2,500$ which is the difference between the profit in the profit statements under the different costing methods for March.

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The advantages and disadvantages of absorption and marginal costing: Advantages of marginal costing

1. Contribution per unit is constant unlike profit per unit which varies with changes in sales volumes.
2. There is no under or over absorption of overheads (and hence no adjustment is required in the income statement).
3. Fixed costs are a period cost and are charged in full to the period under consideration.
4. Marginal costing is useful in the decision-making process.
5. It is simple to operate.

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The advantages and disadvantages of absorption and marginal costing: Advantages of absorption costing

- Absorption costing includes an element of fixed overheads in inventory values
- Analysing under/over absorption of overheads is a useful exercise in controlling costs of an organisation.
- In small organisations, absorbing overheads into the costs of products is the best way of estimating job costs and profits on jobs.

The main disadvantages of marginal costing are that closing inventory is not valued in accordance with GAAP principles and that fixed production overheads are not 'shared' out between units of production, but written off in full instead.

- The main disadvantages of absorption costing are that it is more complex to operate than marginal costing and it does not provide any useful information for decision making (like marginal costing does).

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Contribution to sales ratios and breakeven points: CVP analysis

CVP analysis makes use of the contribution concept in order to assess the following measures for a single product:

- With it we can calculate
- contribution to sales (C/S) ratio
- breakeven point
- margin of safety
- target profit.



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Accounting for Manager

Cost Volume Profit Analysis

Visiting professor, Dr. Ruslana Kuzina

Faculty of Economics and Business

WHAT IF...?

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Essentials of CVP Analysis

- Managers want to know how profits will change as the units sold of a product or service changes.
- Managers like to use "what-if" analysis to examine the possible outcomes of different decisions so they can make the best one.

CVP is an abbreviation for Cost Volume Profit. This is an analysis tool that managers use to understand how profits will change as units sold, variable costs, fixed costs, selling price, or some combination of these, change.

Managers like to use "what-if" analysis to examine the possible outcomes of different decisions so they can make the best one.

The what-if scenario analysis is a management process that evaluates different scenarios to predict their effects – both positive and negative – on the company's objectives.

Businesses can use it to examine different potential impacts of negative and positive events, such as:

What are the possible impacts on the business of an economic slowdown?

What happens to revenue and profitability if the cost of various raw materials rises?

What revenues might be generated by a new product line?

How would the business be impacted by the unexpected market entry of new competitors?

Scenario analysis doesn't attempt to predict a single outcome from any of these events.

Instead, it examines a spectrum of different potential situations and outcomes, typically ranging from a best-case to worst-case scenario.

Scenario analysis is not new. It was pioneered by the U.S. military during the mid-1900s, and Shell Oil started using it during the 1970s to analyze and respond to fluctuations in global oil supplies.

It's now widely used by businesses.

In chapter 2, we discussed revenues, variable costs and fixed costs. In this chapter, we take a closer look at the relationship among these elements (selling price, variable costs, fixed costs).

Foundational Assumptions Used in CVP Analysis

- Changes in production/sales volume are the sole cause for cost and revenue changes. Als volume increases (you sell more) > total variable cost increases directly with a change in volume
- Total costs consist of fixed costs and variable costs.
- Revenue and costs behave and can be graphed as a linear function (a straight line).
- Selling price, variable cost per unit and fixed costs are all known and constant.
- In many cases, only a single product will be analyzed. If multiple products are studied, their relative sales proportions are known and constant.
- The time value of money (interest) is ignored.

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Contribution Margin (CM)

Contribution Income Statement

Racing Bicycle Company Contribution Income Statement For the Month of June	
Revenue/Total Revenue/Sale (500 bicycles)	\$ 250.000
Less: Total Variable Costs	- 150.000
Contribution margin	100.000
Less: Fixed Costs	- 80.000
Operating Income	\$ 20.000

} marginal costing

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Contribution Margin (CM)

Sales, variable expenses, and contribution margin can also be expressed on a per unit basis. If Racing sells an additional bicycle, \$200 additional CM will be generated to cover fixed expenses and profit.

Racing Bicycle Company Contribution Income Statement For the Month of June		
	Total	Per Unit
Total Revenue (500 bicycle):	\$ 250.000	\$ 500
Less: Total Variable Costs	150.000	300
Contribution margin	100.000	\$ 200
Less: Fixed Costs	80.000	
Operating Income	\$ 20.000	

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Each month, RBC must generate at least \$80,000 in total contribution margin to break-even (which is the level of sales at which profit is zero).

Contribution Margin (CM)

Each month, RBC must generate at least \$80,000 in total contribution margin to break-even (which is the level of sales at which profit is zero).

Racing Bicycle Company Contribution Income Statement For the Month of June		
	Total	Per Unit
Total Revenue (500 bicycles)	\$ 250.000	\$ 500
Less: Total Variable Costs	150.000	300
Contribution margin	100.000	\$ 200
Less: Fixed Costs	80.000	
Operating Income	\$ 20.000	

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If RBC sells 400 units in a month, it will be operating at the break-even point.
The break-even point in economics, business—and specifically cost accounting—is the point at which total cost and total revenue are equal, i.e. "even".
In other words, the operating income is zero in the break-even point.

The Contribution Approach

If RBC sells 400 units in a month, it will be operating at the break-even point.

Racing Bicycle Company Contribution Income Statement For the Month of June		
	Total	Per Unit
Total Revenue (400 bicycles)	\$ 200.000*	\$ 500
Less: Total Variable Costs	120.000*	300
Contribution margin	80.000	\$ 200
Less: Fixed Costs	80.000	
Operating Income	0	

#500
250
150
 $250 \cdot 500 = 125.000$
 $150 \cdot 300 = 45.000$
 $125.000 - 45.000 = 80.000$

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If RBC sells one more bike (401 bikes), net operating income will increase by \$200.
We do not need to prepare an income statement to estimate profits at a particular sales volume.
Simply multiply the number of units sold above break-even by the contribution margin per unit: 1 multiply by 200 unit contribution margin will be equal to 200.

The Contribution Approach

Question: What will be the operating income if Racing Bike sells 430 Bikes.
If Racing sells 430 bikes, its net operating income will be \$6,000. How did you calculate it?

If RBC sells one more bike (401 bikes), net operating income will increase by \$200.

Racing Bicycle Company Contribution Income Statement For the Month of June		
	Total	Per Unit
Total Revenue (401 bicycles)	\$ 200.500	\$ 500
Less: Variable Costs	120.300	300
Contribution margin	80.200	\$ 200
Less: Fixed Costs	80.000	
Operating Income	\$ 200	

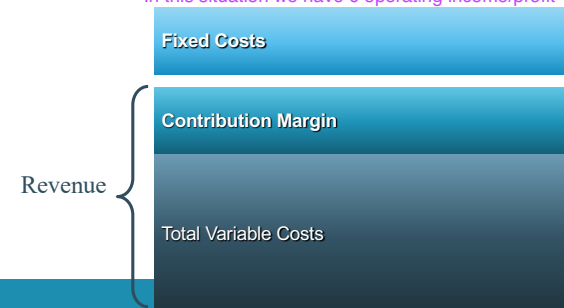
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Lets delve deeper into the Relationships Among Contribution Margin, Fixed Costs, and Profit
If **Fixed Cost = Contribution Margin**, we are in the break even point.
This means that we have 0 operating income/profit.

Relationships Among Contribution Margin, Fixed Costs, and Operating Income/Profit

Fixed Costs = Contribution Margin

In this situation we have 0 operating income/profit = break even point



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If Fixed Cost is smaller than Contribution Margin, **we are earning profit.**

Relationships Among Contribution Margin, Fixed Cost, and Operating Income/Profit



	Total	Per Unit
Total Revenue (10 000 units)	1 000 000	100
Total variable costs	700 000	70
Contribution Margin	300 000 = 1M - 0.7M	30
Fixed costs	240 000	
Operating Income	60 000 = CM - fixed costs	

Calculate Break even:

$$CM - \text{fixed costs} = 0$$

$$30 \cdot x - 240\,000 = 0$$

$$x = 8000$$

Earn OE of 60k

$$30x - 240\,000 = 60\,000$$

$$x = 10\,000$$

$$= +2000 \text{ extra}$$

Main idea: total cost = total revenue

> Contribution margin = fixed cost

> Equal method: to calculate break even point, then sales = variable cost + fixed costs

Then operating income is 0

> Break even point = variable cost + fixed cost

• sale price = 100. Total sales = $x \cdot 100$ unit

• Total variable cost = $70 \cdot$ unit

• Fixed cost = 240 000

Break even: sales = variable cost + fixed cost $\Leftrightarrow 100x = 70x + 240\,000 \Leftrightarrow 30x = 240\,000 \Leftrightarrow x = 8000$

If we sell 8000 units, our profit will be zero and we will break even

	Total	Per Unit
Total Revenue (10 000 units)	1 000 000 $1000\,000/10\,000 = 100$	100
Total variable costs	700 000	70
Contribution Margin	300 000	30
Fixed costs	240 000	
Operating Income	60 000	

> Sale price per unit of quantity = variable cost/unit of quantity + fixed cost

So break even point in units:

Fixed cost (240 000)/price (100) - variable cost per unit = contribution margin per unit

$240\,000/\text{contribution margin per unit} (= 100 - 70 = 30) = 8000$

> contribution ratio: contribution margin/ total sales (=total revenue) if we have the total amounts, otherwise we can

contribution margin per unit/total sales per price

$= 30/100 = 0.3$

So break even = fixed cost/ratio = 800 000

> how many units should we sell? = (fixed cost + operating income) / contribution margin per unit = $(240k + 60k) / 30$

ratio = 300 k/ratio = 2000 units

If we would like to earn 60 000 operating income we should sell break even (8000) + 2000 units more

> operating income = sales - all expenses (fixed expenses + variable expenses)

> net income = operating income - taxes (operating income * tax rate)

We previously prepare the contribution income statement to find out about Operating Income.

We can instead use equation.

The contribution format income statement can be expressed in the following equation:

Operating Income = (Sales – Variable Cost) – Fixed Costs

CVP Relationships in Equation Form

The contribution format income statement can be expressed in the following equation:

Operating Income = (Sales – Total Variable Costs) – Fixed Costs

Racing Bicycle Company Contribution Income Statement For the Month of June		
	Total	Per Unit
Total Revenue (401 bicycles)	\$ 200.500	\$ 500
Less: Total Variable Costs	120.300	300
Contribution margin	80.200	\$ 200
Less: Fixed Costs	80.000	
Operating Income	\$ 200	

This equation can be used to show the profit RBC earns if it sells 401. Notice, the answer of \$200 mirrors our earlier solution.

If RBC produces 401 units the operating income will be 200.

CVP Relationships in Equation Form

$$\text{Operating Income} = (\text{Total Revenue} - \text{Variable Costs}) - \text{Fixed Costs}$$

$401 \text{ units} \times \500
 $\$80,000$
 $401 \text{ units} \times \300

$$\text{\$200} = (\text{\$200,500} - \text{\$120,300}) - \text{\$80,000}$$

Profit

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CVP Relationships in Equation Form

When a company has **only one product** we can further refine this equation as shown on this slide.

$$\text{Operating Income} = (\text{Total Revenue} - \text{Variable Costs}) - \text{Fixed Costs (FC)}$$

Quantity sold (Q) × Selling price per unit (SP) = Total Revenue (Q × SP)	Quantity sold (Q) × Variable Costs per unit (VC) = Variable expenses (Q × VC)
--	---

$$\text{OI} = (\text{SP} \times \text{Q} - \text{VC} \times \text{Q}) - \text{FC}$$

= Contribution margin - FC

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When a company has only 1 product we can further refine this equation as shown on this slide.

Operating Income = (Selling Price times Quantity Sold – Variable Cost per unit times Quantity Sold) – Fixed Costs

We can show this equation in the following abbreviated form.

$$\text{OI/OP} = (\text{SP} \times \text{Q} - \text{VC} \times \text{Q}) - \text{FC}$$

OI: Operating Income

Some books and texts use OP instead of OI. OP means Operating Profit.

OP: Operating Profit

SP: Sale price per unit

VC: Variable Cost per unit

Q: Quantity Sold

Note: Some texts use P instead of SP and V instead of VC. So

P: Sale price per unit

V: Variable Cost per unit

This equation can also be used to show the \$200 profit RBC earns if it sells 401 bikes.

We have the formula: $\text{OI/OP} = (\text{SP} \times \text{Q} - \text{VC} \times \text{Q}) - \text{FC}$, Then we have

$$\text{OI/OP} = (\text{SP} - \text{VC}) \times \text{Q} - \text{FC}$$

What is $(\text{SP} - \text{VC})$?

Note: Some books might show it as follows:

$$\text{OI/OP} = (\text{P} \times \text{Q} - \text{V} \times \text{Q}) - \text{FC}$$

$$\text{OI/OP} = (\text{P} - \text{V}) \times \text{Q} - \text{FC}$$

What is $(\text{P} - \text{V})$?

We replace the parameters with the numbers. Then, we will have 200!

CVP Relationships in Equation Form

This equation can also be used to show the \$200 profit RBC earns if it sells 401 bikes.

$$\text{Operating Income} = (\text{Sales} - \text{Total Variable Costs}) - \text{Fixed Costs}$$

$$\text{OI/OP} = (\text{SP} \times \text{Q} - \text{VC} \times \text{Q}) - \text{FC}$$

$$\text{\$200} = (\text{\$500} \times 401 - \text{\$300} \times 401) - \text{\$80,000}$$

It is often useful to express the simple profit equation in terms of the unit contribution margin (Unit CM) as follows: If we dissect our basic equation in this manner, it helps to emphasize the relationships between these cost elements. That understanding of the relationships will provide a greater understanding of the concepts that follow such as breakeven.

We can look at these relationships in several ways (methods).

The Equation Method and the Contribution Margin method are two of these methods.

We'll discuss the graph method (third method) a bit later.

CVP Relationships in Equation Form

$$\text{OI} = (\text{SP} \times \text{Q} - \text{VC} \times \text{Q}) - \text{FC}$$

$$\text{OI} = (\text{SP} - \text{VC}) \times \text{Q} - \text{FC}$$

$$\text{OI} = \text{Unit CM} \times \text{Q} - \text{FC}$$

$$\text{OI} = (\text{\$500} - \text{\$300}) \times 401 - \text{\$80,000}$$

$$\text{OI} = \text{\$200} \times 401 - \text{\$80,000}$$

$$\text{OI} = \text{\$80,200} - \text{\$80,000}$$

$$\text{OI} = \text{\$200}$$



The relationships among revenue, cost, profit, and volume can be expressed graphically by preparing a CVP graph. Racing Bicycle developed contribution margin income statements at 0, 200, 400, and 600 units sold. We will use this information to prepare the CVP graph.

CVP Relationships in Equation Form

It is often useful to express the simple profit equation in terms of the unit contribution margin (Unit CM) as follows:

Unit CM = Selling Price per unit – Variable Costs per unit

Unit CM = SP – VC

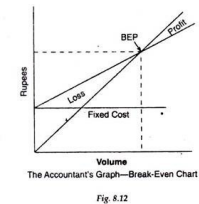
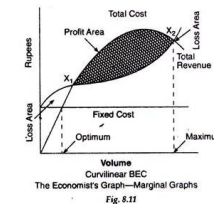
$$\text{Operating Income} = (\text{SP} \times \text{Q} - \text{VC} \times \text{Q}) - \text{FC}$$

$$\text{Operating Income} = (\text{SP} - \text{VC}) \times \text{Q} - \text{FC}$$

$$\text{Operating Income} = \underbrace{(\text{SP} - \text{VC})}_{\text{Unit CM}} \times \text{Q} - \text{FC}$$

This equation can also be used to compute RBC's \$200 operating income if it sells 401 bikes.

Cost-Volume-Profit (CVP) Graph



In a CVP graph, **unit volume** is usually represented on the horizontal (X) axis and **dollars on the vertical (Y) axis**.

CVP Relationships in Graphic Form

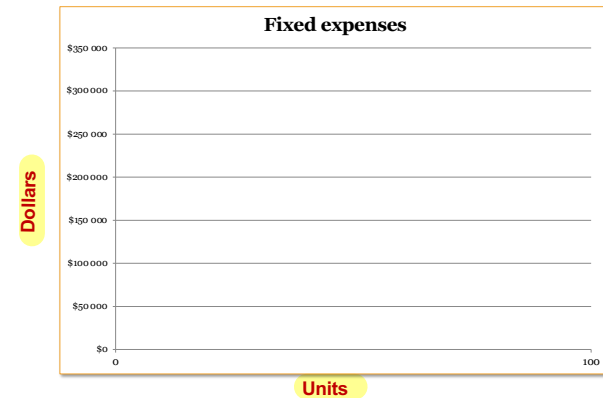
The relationships among revenue, cost, profit, and volume can be expressed graphically by preparing a CVP graph. Racing Bicycle developed contribution margin income statements at 0, 200, 400, and 600 units sold. We will use this information to prepare the CVP graph.

	Units Sold			
	0	200	400	600
Total Revenue	\$ -	\$ 100.000	\$ 200.000	\$ 300.000
Total Variable Costs	-	60.000	120.000	180.000
Contribution margin	-	40.000	80.000	120.000
Fixed Costs	80.000	80.000	80.000	80.000
Operating income (loss)	\$ (80.000)	\$ (40.000)	\$ -	\$ 40.000

Break even

The relationships among revenue, cost, profit, and volume can be expressed graphically by preparing a CVP graph. Racing Bicycle developed contribution margin income statements at 0, 200, 400, and 600 units sold. We will use this information to prepare the CVP graph.

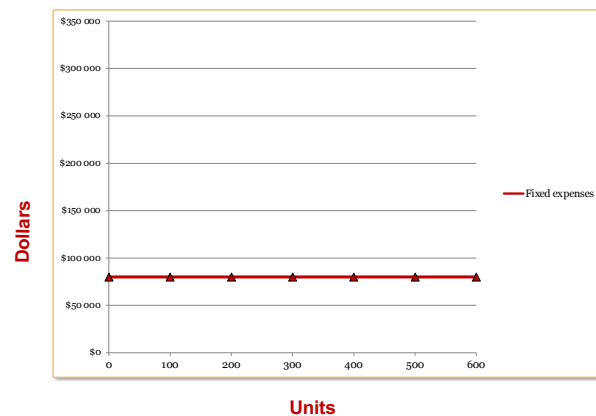
Preparing the CVP Graph



KU LEUVEN

Draw a line parallel to the volume axis to represent total fixed costs. The fixed costs are 80000.

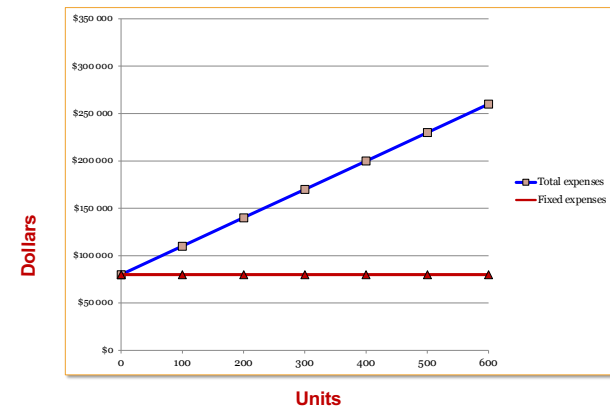
Preparing the CVP Graph



KU LEUVEN

Choose some sales volume, say 400 units, and plot the point representing total costs (fixed and variable). Draw a line through the data point back to where the fixed expenses line intersects the dollar axis.

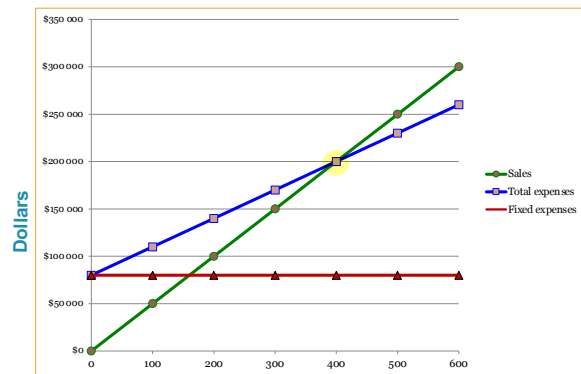
Preparing the CVP Graph



KU LEUVEN

Choose some sales volume, say 400 units, and plot the point representing total sales.
Draw a line through the data point back to the point of origin.

Preparing the CVP Graph



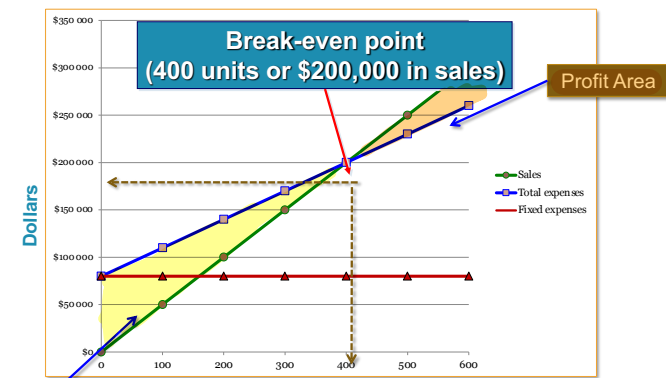
We can find a break even point

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Here we can see the Break-even point (400 units or \$200,000 in sales).

Preparing the CVP Graph



Loss Area

Profit Area

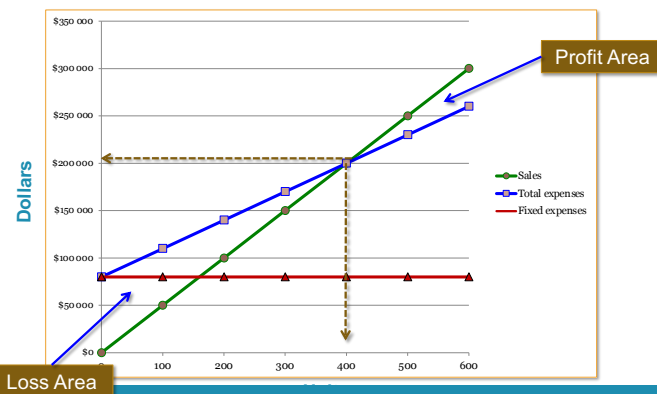
48

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You can also find the Loss and Profit Areas.

An even simpler form of the CVP graph is called the profit graph.
Here we use the formula $OI = \text{Unit CM} \times Q - FC$

Preparing the CVP Graph



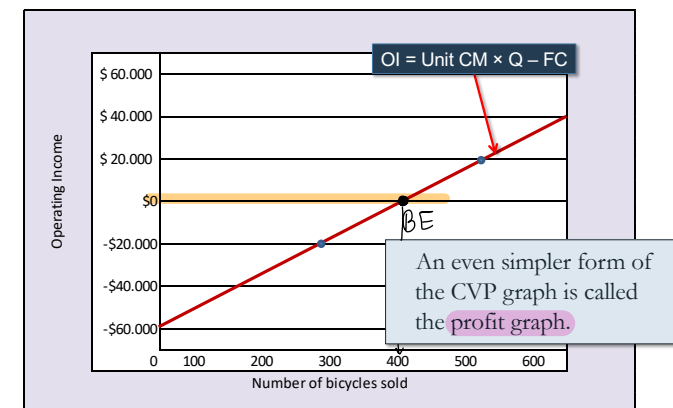
Loss Area

Profit Area

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Preparing the CVP Graph

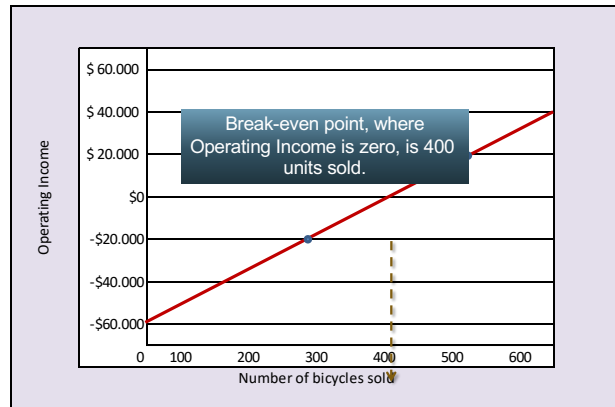


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Break-even point, where Operating Income is zero, is 400 units sold.

Preparing the CVP Graph



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Next, we are going to use the contribution margin ratio (CM ratio) to compute changes in contribution margin and net operating income resulting from changes in sales volume.

Using the **contribution margin ratio (CM ratio)** to compute changes in contribution margin and net operating income resulting from changes in sales volume.

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Here, I will like to introduce CM ratio.

The **CM ratio** is calculated by dividing the total contribution margin by total sales.

Here, in this example, the CM Ratio is calculated as follows: contribution margin \$100,000 ÷ Total Sale / Revenue \$250,000 = 40%.

What does 40% mean?

It means that each \$1 increase in sales results in a total contribution margin increase of 40¢.

Contribution Margin Ratio (CM Ratio)

The CM ratio is calculated by dividing the total contribution margin by total sales.

Racing Bicycle Company Contribution Income Statement For the Month of June			
	Total	Per Unit	CM Ratio
Sales (500 bicycles)	\$ 250.000	\$ 500	100%
Less: Variable Costs	150.000	300	60%
Contribution margin	100.000	\$ 200	40%
Less: Fixed Costs	80.000		
OI	\$ 20.000		

$$\$100,000 \div \$250,000 = 40\%$$

Each \$1 increase in sales results in a total contribution margin increase of 40¢.

The CM ratio can also be calculated by dividing the contribution margin per unit by the selling price per unit.

Contribution Margin Ratio (CM Ratio)

The contribution margin ratio at Racing Bicycle is:

$$\text{CM Ratio} = \frac{\text{CM per unit}}{\text{SP per unit}} = \frac{\$200}{\$500} = 40\%$$

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If Racing Bicycle increases sales from 400 to 500 bikes (\$50,000), contribution margin will increase by \$20,000 (\$50,000 × 40%).

A \$50,000 increase in sales revenue results in a \$20,000 increase in CM (\$50,000 × 40% = \$20,000).

Contribution Margin Ratio (CM Ratio)

If Racing Bicycle increases sales from 400 to 500 bikes (\$50,000), contribution margin will increase by \$20,000 (\$50,000 × 40%). Here is the proof:

	400 Units	500 Units
Sales	\$ 200.000	\$ 250.000
Less: Variable Costs	120.000	150.000
Contribution margin	80.000	100.000
Less: Fixed Costs	80.000	80.000
Operating Income	\$ -	\$ 20.000

A \$50,000 increase in sales revenue results in a \$20,000 increase in CM (\$50,000 × 40% = \$20,000).

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CM ratio is calculated as unit contribution margin divided by unit selling price. If we insert the numbers, we get the contribution margin of 0,758.

Quick Check ✓

Coffee Onan is an espresso stand in a downtown office building. The average selling price of a cup of coffee is \$1.49 and the average variable costs per cup is \$0.36. The average fixed costs per month is \$1,300. An average of 2,100 cups are sold each month. What is the CM Ratio for Coffee Onan?

- a. 1.319
- b. 0.758**
- c. 0.242
- d. 4.139

$$\begin{aligned}
 \text{CM Ratio} &= \frac{\text{Unit contribution margin}}{\text{Unit selling price}} \\
 &= \frac{(\$1.49 - \$0.36)}{\$1.49} \\
 &= \frac{\$1.13}{\$1.49} = 0.758
 \end{aligned}$$

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During this lecture, we are going to have a few additional questions for which we use Coffee Onan as an example. Please read the example and try to solve it at home.

Quick Check ✓

Coffee Onan is an espresso stand in a downtown. The average selling price of a cup of coffee is \$1.49 and the average variable costs per cup is \$0.36. The average fixed costs per month is \$1,300. An average of 2,100 cups are sold each month. What is the CM Ratio for Coffee Onan?

- a. 1.319
- b. 0.758
- c. 0.242
- d. 4.139



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The relationship between profit and the CM ratio can be expressed using the following equation:

Operating Income equals to Contribution margin ratio times Sales minus FC.

If Racing Bicycle increased its sales volume to 500 bikes, what would management expect profit/operating income to be? We insert the numbers and we get 20000.

Contribution Margin Ratio (CM Ratio)

The relationship between profit and the CM ratio can be expressed using the following equation:

$$\text{OI} = (\text{CM ratio} \times \text{Sales}) - \text{FC}$$

If Racing Bicycle increased its sales volume to 500 bikes, what would management expect profit/operating income to be?

$$\begin{aligned}
 \text{OI} &= (40\% \times \$250,000) - \$80,000 \\
 \text{OI} &= \$100,000 - \$80,000 \\
 \text{OI} &= \$20,000
 \end{aligned}$$

KU LEUVEN

Next, we are going to talk about the effects on operating income of changes in variable costs, fixed costs, selling price, and volume.

The effects on net operating income of changes in variable costs, fixed costs, selling price, and volume

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Here, we introduce another ratio: The Variable Costs Ratio.

The variable costs ratio is the ratio of variable costs to sales. It can be computed by dividing the total variable costs by the total sales.

Or, in a single product analysis, it can be computed by dividing the variable costs per unit by the unit selling price.

The Variable Costs Ratio

The variable costs ratio is the ratio of variable costs to sales. It can be computed by dividing the total variable costs by the total sales, or in a single product analysis, it can be computed by dividing the variable costs per unit by the unit selling price. $= 1 - \text{CM ratio}$

Racing Bicycle Company Contribution Income Statement For the Month of June			
	Total	Per Unit	CM Ratio
Sales (500 bicycles)	\$ 250.000	\$ 500	100%
Less: Variable Costs	150.000	300	60%
Contribution margin	100.000	\$ 200	40%
Less: Fixed Costs	80.000		
Operating income	\$ 20.000		

KU LEUVEN

Now, we focus on the change in fixed costs and sales volume.

What is the profit impact if Racing Bicycle can increase unit sales from 500 to 540 by increasing the monthly advertising budget by \$10,000?

Changes in Fixed Costs and Sales Volume



What is the profit impact if Racing Bicycle can increase unit sales from 500 to 540 by increasing the monthly advertising budget by \$10,000?

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Here, we prepare the contribution income statement.

Sales increases to 540 units. This means that we have 270,000 dollar revenue (sale).

However, the fixed costs also increases. Here the increase is 10,000 dollars.

Sales increased by \$20,000, but net operating income decreased by \$2,000.

Changes in Fixed Costs and Sales Volume

\$80,000 + \$10,000 advertising = \$90,000

	500 units	540 units
Sales	\$ 250.000	\$ 270.000
Less: Variable Costs	150.000	162.000
Contribution margin	100.000	108.000
Less: Fixed Costs	80.000	90.000
Net operating income	\$ 20.000	\$ 18.000

Sales **increased** by \$20,000, but net operating income **decreased** by \$2,000.

62

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Now, let's see the shortcut solution. Here, we use incremental (change) analysis. We already know that $OI = Unit\ CM \times Q - FC$. We can easily show that $Changes\ in\ OI = Unit\ CM \times changes\ in\ Q - changes\ in\ FC$. We show it as follows: Δ means changes. It is pronounced as delta. $\Delta OI = unit\ CM \times \Delta Q - \Delta FC$

Changes in Fixed Costs and Sales Volume

Please insert the numbers. You will have -2000 as an answer.

A shortcut solution using incremental analysis

Increase in CM (40 units X \$200)	\$ 8,000
Increase in advertising expenses	10,000
Decrease in net operating income	<u>\$ (2,000)</u>

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We prepare the contribution income statement. The variable costs per unit is now 310 dollars. And the number of units sold is 580.

As seen, Sales increase by \$40,000 and net operating income increases by \$10,200.

Change in Variable Costs and Sales Volume

580 units × \$310 variable cost/unit = \$179,800

	500 units	580 units
Sales	\$ 250.000	\$ 290.000
Less: Variable Costs	150.000	179.800
Contribution margin	100.000	110.200
Less: Fixed Costs	80.000	80.000
Net operating income	\$ 20.000	\$ 30.200

Sales **increase** by \$40,000 and net operating income **increases** by \$10,200.

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Now, we focus on the change in variable costs and sales volume.

What is the profit impact if Racing Bicycle can use higher quality raw materials, thus increasing variable costs per unit by \$10, to generate an increase in unit sales from 500 to 580?

Change in Variable Costs and Sales Volume

What is the profit impact if Racing Bicycle can use higher quality raw materials, thus increasing variable costs per unit by \$10, to generate an increase in unit sales from 500 to 580?



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Now, we focus on the change in Fixed Cost, Sales Price, and Volume.

What is the profit impact if RBC: (1) cuts its selling price \$20 per unit, (2) increases its advertising budget by \$15,000 per month, and (3) increases sales from 500 to 650 units per month?

Change in Fixed Cost, Sales Price, and Volume

What is the profit impact if RBC:

- (1) cuts its selling price \$20 per unit,
- (2) increases its advertising budget by \$15,000 per month, and
- (3) increases sales from 500 to 650 units per month?

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As seen, Sales increase by \$62,000, fixed costs increase by \$15,000, and net operating income increases by \$2,000.

Change in Fixed Cost, Sales Price, and Volume

$$650 \text{ units} \times \$480 = \$312,000$$

	500 units	650 units
Sales	\$ 250.000	\$ 312.000
Less: Variable Costs	150.000	195.000
Contribution margin	100.000	117.000
Less: Fixed Costs	80.000	95.000
Net operating income	\$ 20.000	\$ 22.000

Sales **increase** by \$62,000, fixed costs increase by \$15,000, and net operating income **increases** by \$2,000.

As seen, Sales increase by \$37,500, fixed expenses decrease by \$6,000, and net operating income increases by \$12,375.

Change in Variable Cost, Fixed Cost, and Sales Volume

$$575 \text{ units} \times \$315 = \$181,125$$

	500 units	575 units
Sales	\$ 250.000	\$ 287.500
Less: Variable Costs	150.000	181.125
Contribution margin	100.000	106.375
Less: Fixed Costs	80.000	74.000
Net operating income	\$ 20.000	\$ 32.375

Sales **increase** by \$37,500, fixed expenses **decrease** by \$6,000, and net operating income **increases** by \$12,375.

Now, another example related to change in Variable Cost, Fixed Cost, and Sales Volume.

What is the profit impact if RBC: (1) pays a \$15 sales commission per bike sold instead of paying salespersons flat salaries that currently total \$6,000 per month, and (2) increases unit sales from 500 to 575 bikes?

Change in Variable Cost, Fixed Cost, and Sales Volume

What is the profit impact if RBC:

- (1) pays a \$15 sales commission per bike sold instead of paying salespersons flat salaries that currently total \$6,000 per month, and
- (2) increases unit sales from 500 to 575 bikes?



Now, we analyze an example in which the sales price changes.

Please read the example, and try to solve it.

If RBC has an opportunity to sell 150 bikes to a wholesaler without disturbing sales to other customers or fixed costs, what price would it quote to the wholesaler if it wants to increase monthly profits by \$3,000?

Change in Regular Sales Price

If RBC has an opportunity to sell 150 bikes to a wholesaler without disturbing sales to other customers or fixed costs, what price would it quote to the wholesaler if it wants to increase monthly profits by \$3,000?

We want to increase profits by 3000.
 This means that we increase profit by 20 per bike.
 Each bike as variable cost of 300.
 So the selling price will be 320.

Change in Regular Sales Price

$$\begin{aligned} \$ 3,000 \div 150 \text{ bikes} &= \$ 20 \text{ per bike} \\ \text{Variable cost per bike} &= 300 \text{ per bike} \\ \text{Selling price required} &= \underline{\underline{\$ 320 \text{ per bike}}} \end{aligned}$$

$$\begin{aligned} 150 \text{ bikes} \times \$320 \text{ per bike} &= \$ 48,000 \\ \text{Total variable costs} &= 45,000 \\ \text{Increase in net operating income} &= \underline{\underline{\$ 3,000}} \end{aligned}$$

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The equation and formula methods can be used to determine the unit sales and dollar sales needed to achieve a target profit of zero.

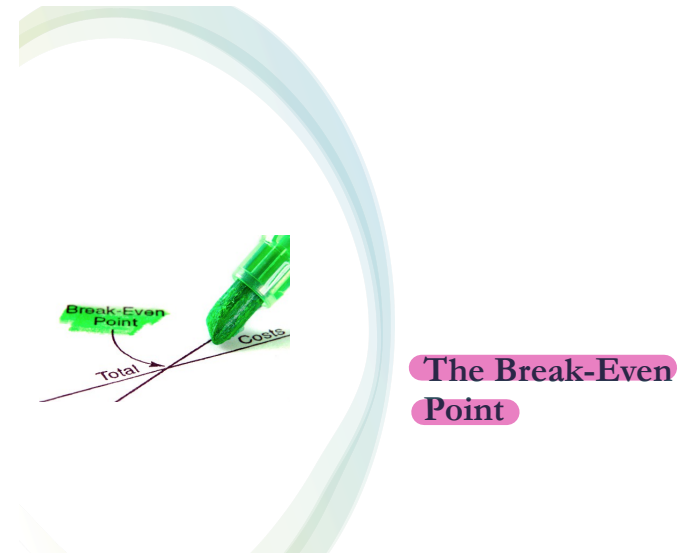
Let's use the RBC information to complete the break-even analysis.

Break-even Analysis

Let's use the RBC information to complete the break-even analysis

Racing Bicycle Company Contribution Income Statement For the Month of June			
	Total	Per Unit	CM Ratio
Sales (500 bicycles)	\$ 250.000	\$ 500	100%
Less: Variable Costs	150.000	300	60%
Contribution margin	100.000	\$ 200	40%
Less: Fixed Costs	80.000		
Net operating income	\$ 20.000		

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We know that $OI = \text{Unit CM} \times Q - FC$

Suppose RBC wants to know how many bikes must be sold to break-even (earn a target profit of \$0).

Replace OI with 0. Then we have

$$0 = \text{Unit CM} \times Q - FC$$

Break-even in Unit Sales: Equation Method

$$OI = \text{Unit CM} \times Q - FC$$

Suppose RBC wants to know how many bikes must be sold to break-even (earn a target profit of \$0).

$$0 = \text{Unit CM} \times Q - FC$$

$$\rightarrow \$0 = \$200 \times Q - \$80,000$$

Profits are zero at the break-even point.

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As seen, at the quantity of 400 bikes, we are in the Break-Even point.

Break-even in Unit Sales: Equation Method

$$OI = \text{Unit CM} \times Q - FC$$

$$\$0 = \$200 \times Q + \$80,000$$

$$\$200 \times Q = \$80,000$$

$$Q = 400 \text{ bikes}$$

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We know that $OI = \text{Unit CM} \times Q - FC$

Suppose RBC wants to know how many bikes must be sold to break-even (earn a target profit of \$0).

Replace OI with 0. Then we have

$$0 = \text{Unit CM} \times Q - FC$$

Then we have

$$Q = FC / \text{Unit CM}$$

Break-even in Unit Sales: Formula Method

ALTERNATIVE

Let's apply the formula method to solve for the break-even point.

$$\text{Unit sales to break even (Q)} = \frac{FC = \text{fixed costs}}{\text{CM per unit}}$$

$$\text{Unit sales} = \frac{\$80,000}{\$200}$$

$$\text{Unit sales} = 400$$

KU LEUVEN

Suppose Racing Bicycle wants to compute the sales dollars required to break-even (earn a target profit of \$0). Let's use the equation method to solve this problem.

Solve for the unknown "Sales."

$$OI/OP = (SP \times Q - VC \times Q) - FC$$

Break-even in Dollar Sales: Equation Method

Suppose Racing Bicycle wants to compute the sales dollars required to break-even (earn a target profit of \$0).

Let's use the equation method to solve this problem.

$$OI = \text{CM ratio} \times \text{Sales} - FC$$

Solve for the unknown "Sales."

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After inserting the numbers, we have sales=200,000.

Break-even in Dollar Sales: Equation Method

$$\text{Profit} = \text{CM ratio} \times \text{Sales} - FC$$

$$\$0 = 40\% \times \text{Sales} - \$80,000$$

$$40\% \times \text{Sales} = \$80,000$$

$$\text{Sales} = \$80,000 \div 40\%$$

$$\text{Sales} = \$200,000$$

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We know that $OI = CM \text{ ratio} \times \text{Sales} - FC$.

At the break even point, the OI is zero.

This leads to : $\text{Sales (Break Even Point)} = FC/CM \text{ ratio}$

Break-even in Dollar Sales: Formula Method

Now, let's use the formula method to calculate the dollar sales at the break-even point.

$$\text{Dollar sales to break even} = \frac{FC}{CM \text{ ratio}}$$

$$\text{Dollar sales} = \frac{\$80,000}{40\%}$$

$$\text{Dollar sales} = \$200,000$$

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Quick Check ✓

Coffee Onan is an espresso stand in a downtown office building. The average selling price of a cup of coffee is \$1.49 and the average variable costs per cup is \$0.36. The average fixed costs per month is \$1,300. An average of 2,100 cups are sold each month. What is the break-even sales dollars?

- a. \$1,300
- b. \$1,715**
- c. \$1,788
- d. \$3,129

$$\begin{aligned} \text{Break-even sales} &= \frac{FC}{CM \text{ Ratio}} \\ &= \frac{\$1,300}{0.758} \\ &= \$1,715 \end{aligned}$$

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Quick Check ✓

Coffee Onan is an espresso stand in a downtown office building. The average selling price of a cup of coffee is \$1.49 and the average variable costs per cup is \$0.36. The average fixed costs per month is \$1,300. An average of 2,100 cups are sold each month. What is the break-even sales dollars?

- a. \$1,300
- b. \$1,715
- c. \$1,788
- d. \$3,129



80

KU LEUVEN

Quick Check ✓

Coffee Onan is an espresso stand in a downtown office building. The average selling price of a cup of coffee is \$1.49 and the average variable costs per cup is \$0.36. The average fixed costs per month is \$1,300. An average of 2,100 cups are sold each month. What is the break-even sales in units?

- a. 872 cups
- b. 3,611 cups
- c. 1,200 cups
- d. 1,150 cups



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Quick Check ✓

Coffee Onan is an espresso stand in a downtown office building. The average selling price of a cup of coffee is \$1.49 and the average variable costs per cup is \$0.36. The average fixed costs per cup is \$1.13. An average of 2,100 cups are sold each month. What is the break-even point?

- a. 872 cups
- b. 3,611 cups
- c. 1,200 cups
- d. 1,150 cups

$$\begin{aligned}\text{Break-even} &= \frac{\text{FC}}{\text{CM per Unit}} \\ &= \frac{\$1,300}{\$1.49/\text{cup} - \$0.36/\text{cup}} \\ &= \frac{\$1,300}{\$1.13/\text{cup}} \\ &= 1,150 \text{ cups} \\ &= 1,150 \text{ cups}\end{aligned}$$

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Previously, we had a focus on break even point. At the break even point the profit / Operating income was zero. Now, we would like to Determine the level of sales needed to achieve a desired target profit.

Determine the level of sales needed to achieve a desired **target profit**.

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We can compute the number of units that must be sold to attain a target profit using either:
(1) Equation method, or
(2) Formula method.

Target Profit Analysis

We can compute the number of units that must be sold to attain a target profit using either:

- (1) Equation method, or
- (2) Formula method.



KU LEUVEN

Here, our goal is to solve for the unknown "Q" which represents the quantity of units that must be sold to attain the target profit.

Equation Method

$$\text{Profit/OI} = \text{Unit CM} \times Q - \text{FC}$$



KU LEUVEN

Suppose RBC's management wants to know how many bikes must be sold to earn a target profit of \$100,000. After inserting the numbers, we have Q=900.

Target Profit Analysis

Suppose RBC's management wants to know how many bikes must be sold to earn a target profit of \$100,000.

$$\text{Profit/OI} = \text{Unit CM} \times Q - \text{FC}$$

$$\text{\$100,000} = \text{\$200} \times Q - \text{\$80,000}$$

$$\text{\$200} \times Q = \text{\$100,000} - \text{\$80,000}$$

$$Q = (\text{\$100,000} + \text{\$80,000}) \div \text{\$200}$$

$$Q = 900$$

KU LEUVEN

We know that $\text{Profit/OI} = \text{Unit CM} \times Q - \text{FC}$

We will find Q:

$$Q = (\text{Profit} + \text{FC}) / \text{Unit CM}$$

The Formula Method

The formula uses the following equation.

$$\text{Unit sales to attain the target profit} = \frac{\text{Target profit} + \text{FC}}{\text{CM per unit}}$$



KU LEUVEN

Suppose Racing Bicycle Company wants to know how many bikes must be sold to earn a profit of \$100,000. Then Unit sales will be 900.

Target Profit Analysis in Terms of Unit Sales

Suppose Racing Bicycle Company wants to know how many bikes must be sold to earn a profit of \$100,000.

$$\text{Unit sales to attain the target profit} = \frac{\text{Target profit} + \text{FC}}{\text{CM per unit}}$$

$$\text{Unit sales} = \frac{\text{\$100,000} + \text{\$80,000}}{\text{\$200}}$$

$$\text{Unit sales} = 900$$

KU LEUVEN

The same story for sales in terms of dollars.

Target Profit Analysis

We can also compute the target profit in terms of **sales dollars** using either the equation method or the formula method.

Equation Method

OR

Formula Method

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Our goal is to solve for the unknown “Sales,” which represents the dollar amount of sales that must be sold to attain the target profit.

Suppose RBC management wants to know the sales volume that must be generated to earn a target profit of \$100,000.

Equation Method

$$\text{Profit} = \text{CM ratio} \times \text{Sales} - \text{FC}$$

Our goal is to solve for the unknown “Sales,” which represents the dollar amount of sales that must be sold to attain the target profit.

Suppose RBC management wants to know the sales volume that must be generated to earn a target profit of \$100,000.

$$\$100,000 = 40\% \times \text{Sales} - \$80,000$$

$$40\% \times \text{Sales} = \$100,000 + \$80,000$$

$$\text{Sales} = (\$100,000 + \$80,000) \div 40\%$$

$$\text{Sales} = \$450,000$$

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We know that $\text{Profit} = \text{CM ratio} \times \text{Sales} - \text{FC}$

We will find Sales.

Sales will be $(\text{Profit} + \text{FC}) / \text{CM Ratio}$

Formula Method

We can calculate the dollar sales needed to attain a target profit (net operating profit) of \$100,000 at Racing Bicycle.

$$\text{Dollar sales to attain the target profit} = \frac{\text{Target profit} + \text{FC}}{\text{CM ratio}}$$

$$\text{Dollar sales} = \frac{\$100,000 + \$80,000}{40\%}$$

$$\text{Dollar sales} = \$450,000$$

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There are two examples that you might want to work at home.

Quick Check ✓

Coffee Onan is an espresso stand in a downtown office building. The average selling price of a cup of coffee is \$1.49 and the average variable costs per cup is \$0.36. The average fixed costs per month is \$1,300. Please determine how many cups of coffee would have to be sold to attain target profits of \$2,500 per month.

- a. 3,363 cups
- b. 2,212 cups
- c. 1,150 cups
- d. 4,200 cups



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KU LEUVEN

The margin of safety calculation answers a very important question:

If budgeted revenues are above the breakeven point, how far can they fall before the breakeven point is reached.

In other words, how far can they fall before the company will begin to lose money.

Quick Check ✓

Coffee Onan is an espresso stand in a downtown office building. The average selling price of a cup of coffee is \$1.49 and the average variable costs per cup is \$0.36. The average fixed costs per month is \$1,300. Please determine how many cups of coffee would have to be sold to attain target profits of \$2,500 per month.

$$\begin{aligned} \text{Unit sales to attain target profit} &= \frac{\text{Target profit} + \text{FC}}{\text{Unit CM}} \\ &= \frac{\$2,500 + \$1,300}{\$1.49 - \$0.36} \\ &= \frac{\$3,800}{\$1.13} \\ &= 3,363 \text{ cups} \end{aligned}$$

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Quick Check ✓

Coffee Onan is an espresso stand in a downtown office building. The average selling price of a cup of coffee is \$1.49 and the average variable costs per cup is \$0.36. The average fixed costs per month is \$1,300. Please determine the **sales dollars** that must be generated to attain target profits of \$2,500 per month.

- a. \$2,550
- b. \$5,013
- c. \$8,458
- d. \$10,555



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Quick Check ✓

Coffee Onan is an espresso stand in a downtown office building. The average selling price of a cup of coffee is \$1.49 and the average variable costs per cup is \$0.36. The average fixed costs per month is \$1,300. Use the **formula method** to determine the **sales dollars** that must be generated month.

- a. \$2,550
- b. \$5,013
- c. \$8,458
- d. \$10,555

$$\begin{aligned}\text{Sales \$ to attain target profit} &= \frac{\text{Target profit} + \text{FC}}{\text{CM ratio}} \\ &= \frac{\$2,500 + \$1,300}{(\$1.49 - 0.36) \div \$1.49} \\ &= \frac{\$3,800}{0.758} \\ &= \$5,013\end{aligned}$$

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The margin of safety and its significance



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Margin of Safety-Defined

- The **margin of safety** calculation answers a very important question:
- If **budgeted revenues are above the breakeven point**, **how far can they fall before the breakeven point is reached.**
- In other words, how far can they fall before the company will begin to lose money.

The margin of safety calculation answers a very important question:

If budgeted revenues are above the breakeven point, how far can they fall before the breakeven point is reached.

In other words, how far can they fall before the company will begin to lose money.

The Margin of Safety in Dollars

The margin of safety in dollars is the excess of budgeted (or actual) sales over the break-even volume of sales.

$$\text{Margin of safety in dollars} = \text{Budgeted sales} - \text{Break-even sales}$$

Let's look at Racing Bicycle Company and determine the margin of safety

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The Margin of Safety Percentage

RBC's margin of safety can be expressed as 20% of sales.
(\$50,000 ÷ \$250,000)

RBC's margin of safety can be expressed as **20%** of sales.
(\$50,000 ÷ \$250,000)

	Break-even sales 400 units	Actual sales 500 units
Sales	\$ 200.000	\$ 250.000
Less: variable costs	120.000	150.000
Contribution margin	80.000	100.000
Less: fixed costs	80.000	80.000
Net operating income	\$ -	\$ 20.000

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The Margin of Safety in Dollars

If we assume that RBC has actual sales of \$250,000, given that we have already determined the break-even sales to be \$200,000, the **margin of safety** is \$50,000 as shown.

	Break-even sales 400 units	Actual sales 500 units
Sales	\$ 200.000	\$ 250.000
Less: variable costs	120.000	150.000
Contribution margin	80.000	100.000
Less: fixed costs	80.000	80.000
Net operating income	\$ -	\$ 20.000

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If we assume that RBC has actual sales of \$250,000, given that we have already determined the break-even sales to be \$200,000, the margin of safety is \$50,000 as shown.

The margin of safety can be expressed in terms of the number of units sold. The margin of safety at RBC is \$50,000, and each bike sells for \$500; hence, RBC's margin of safety is 100 bikes.

The Margin of Safety

The margin of safety can be expressed in terms of the number of units sold. The margin of safety at RBC is \$50,000, and each bike sells for \$500; hence, RBC's margin of safety is 100 bikes.

$$\text{Margin of Safety in units} = \frac{\$50,000}{\$500} = 100 \text{ bikes}$$

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Quick Check ✓

Coffee Onan is an espresso stand in a downtown office building. The average selling price of a cup of coffee is \$1.49 and the average variable costs per cup is \$0.36. The average fixed costs per month is \$1,300. An average of 2,100 cups are sold each month. What is the margin of safety expressed in cups?

- a. 3,250 cups
- b. 950 cups
- c. 1,150 cups
- d. 2,100 cups



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Quick Check ✓

Coffee Onan is an espresso stand in a downtown office building. The average selling price of a cup of coffee is \$1.49 and the average variable costs per cup is \$0.36. The average fixed costs per month is \$1,300. An average of 2,100 cups are sold each month. What is the margin of safety expressed in cups?

- a. 3,250 cups
- b. 950 cups
- c. 1,150 cups
- d. 2,100 cups

$$\begin{aligned} \text{Margin of safety} &= \text{Total sales} - \text{Break-even sales} \\ &= 2,100 \text{ cups} - 1,150 \text{ cups} \\ &= 950 \text{ cups} \end{aligned}$$

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Operating leverage is a measure of how sensitive operating income is to percentage changes in sales. It is a measure, at any given level of sales, of how a percentage change in sales volume will affect profits.

Operating Leverage

Operating leverage is a measure of how sensitive net operating income is to percentage changes in sales. It is a measure, at any given level of sales, of how a percentage change in sales volume will affect profits.

$$\text{Degree of operating leverage} = \frac{\text{Contribution margin}}{\text{Operating income}}$$



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Computing the degree of operating leverage at a particular level of sales



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To illustrate, let's revisit the contribution income statement for RBC.
As seen, the degree of operating leverage here is 5.

Operating Leverage

To illustrate, let's revisit the contribution income statement for RBC.

	Actual sales 500 Bikes
Sales	\$ 250.000
Less: variable costs	150.000
Contribution margin	100.000
Less: fixed costs	80.000
Net income	\$ 20.000

$$\text{Degree of Operating Leverage} = \frac{\$100,000}{\$20,000} = 5$$

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With an operating leverage of 5, if RBC increases its sales by 10%, net operating income would increase by 50%.
The next slide is the verification!

Operating Leverage

With an operating leverage of **5**, if RBC increases its sales by **10%**, net operating income would increase by **50%**.

Percent increase in sales	10%
Degree of operating leverage	× 5
Percent increase in profits	<u>50%</u>

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10% increase in sales from \$250,000 to \$275,000 ...
... results in a 50% increase in income from \$20,000 to \$30,000.

Operating Leverage

	Actual sales (500)	Increased sales (550)
Sales	\$ 250.000	\$ 275.000
Less variable costs	150.000	165.000
Contribution margin	100.000	110.000
Less fixed costs	80.000	80.000
Net operating income	\$ 20.000	\$ 30.000

10% increase in sales from
\$250,000 to \$275,000 ...

... results in a 50% increase in
income from \$20,000 to \$30,000.

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Quick Check ✓

Coffee Onan is an espresso stand in a downtown office building. The average selling price of a cup of coffee is \$1.49 and the average variable costs per cup is \$0.36. The average fixed costs per month is \$1,300. An average of 2,100 cups are sold each month. What is the operating leverage?

- a. 2.21
- b. 0.45
- c. 0.34
- d. 2.92



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Quick Check ✓

Coffee Onan is an espresso stand in a downtown office building. The average selling price of a cup of coffee is \$1.49, the average variable costs per cup is \$0.36, the average fixed costs per month is \$1,300, and an average of 2,100 cups are sold each month. If sales increase by 20%, by how much should net operating income increase?

	<i>Actual sales</i>
	<i>2,100 cups</i>
Sales	\$ 3.129
Less: Variable Costs	756
Contribution margin	2.373
Less: Fixed Costs	1.300
Net operating income	\$ 1.073

- a. 2.21
- b. 0.45
- c. 0.34
- d. 2.92

$$\text{Operating leverage} = \frac{\text{Contribution margin}}{\text{Net operating income}}$$

$$= \frac{\$2,373}{\$1,073} = 2.21$$

Quick Check ✓

At Coffee Onan the average selling price of a cup of coffee is \$1.49, the average variable costs per cup is \$0.36, the average fixed costs per month is \$1,300, and an average of 2,100 cups are sold each month. If sales increase by 20%, by how much should net operating income increase?

- a. 30.0%
- b. 20.0%
- c. 22.1%
- d. 44.2%



Quick Check ✓

At Coffee Onan the average selling price of a cup of coffee is \$1.49, the average variable costs per cup is \$0.36, the average fixed costs per month is \$1,300, and an average of 2,100 cups are sold each month. If sales increase by 20%, by how much should net operating income increase?

- a. 30.0%
- b. 20.0%
- c. 22.1%
- d. 44.2%

Percent increase in sales	20.0%
× Degree of operating leverage	2.21
Percent increase in profit	44.20%

Verify Increase in Profit

	<i>Actual sales</i>	<i>Increased sales</i>
	<i>2,100 cups</i>	<i>2,520 cups</i>
Sales	\$ 3.129	\$ 3.755
Less: Variable costs	756	907
Contribution margin	2.373	2.848
Less: Fixed costs	1.300	1.300
Net operating income	\$ 1.073	\$ 1.548
% change in sales		20,0%
% change in net operating income		44,2%

Computing the break-even point for a multiproduct company

So far, we had companies that they had one product. Now, we would like to computing the break-even point for a multiproduct company

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Sales mix is the relative proportion in which a company's products are sold. Different products have different selling prices, cost structures, and contribution margins. When a company sells more than one product, break-even analysis becomes more complex as the following example illustrates.

Let's assume Racing Bicycle Company sells bikes and carts and that the sales mix between the two products remains the same.

The Concept of Sales Mix

- Sales mix is the relative proportion in which a company's products are sold.
- Different products have different selling prices, cost structures, and contribution margins.
- When a company sells more than one product, break-even analysis becomes more complex as the following example illustrates.

Let's assume Racing Bicycle Company sells bikes and carts and that the sales mix between the two products remains the same.

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Bikes comprise 45% of RBC's total sales revenue and the carts comprise the remaining 55%. RBC provides the following information:

Multi-Product Break-Even Analysis

Bikes comprise 45% of RBC's total sales revenue and the carts comprise the remaining 55%. RBC provides the following information:

	Bicycle		Carts		Total	
Sales	\$ 250.000	100%	\$ 300.000	100%	\$ 550.000	100,0%
Variable Costs	150.000	60%	135.000	45%	285.000	51,8%
Contribution margin	100.000	40,0%	165.000	55%	265.000	48,2%
Fixed Costs					170.000	
Net operating income					\$ 95.000	
Sales mix	\$ 250.000	45%	\$ 300.000	55%	\$ 550.000	100%

$$\frac{\$265.000}{\$550.000} = 48.2\% \text{ (rounded)}$$

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Multi-Product Break-Even Analysis

$$\text{Dollar sales to break even} = \frac{\text{Fixed Costs}}{\text{CM ratio}}$$

$$\text{Dollar sales to break even} = \frac{\$170.000}{48.2\%} = \$352.697$$

	Bicycle		Carts		Total	
Sales	\$ 158,714	100%	\$ 193,983	100%	\$ 352,697	100.0%
Variable expenses	95,228	60%	87,293	45%	182,521	51.8%
Contribution margin	63,485	40%	106,691	55%	170,176	48.2%
Fixed expenses					170,000	
Net operating income					\$ 176	

Rounding error

Sales mix	\$ 158,714	45%	\$ 193,983	55%	\$ 352,697	100.0%
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CVP and Income Tax

In our chapter so far, we've been assuming that nonoperating revenues and nonoperating expenses are zero. For purposes of this income tax illustration, we will continue that assumption. We've been ignoring the effect of income taxes thus far but must now recognize that in many companies, managers' income targets are expressed in terms of net income rather than operating income. The key is to convert target net income into the corresponding target operating income which is what we use in our CVP formulae. The conversion formula, also shown on this slide, is **net income divided by (1 – tax rate) = operating income**.

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Contribution Margin versus Gross Margin

- Recall from Chapter 2 that **Gross Margin = Revenue – Cost of Goods Sold**
- In Chapter 3, we learned about **Contribution Margin which is Revenue – All Variable Costs**
- Gross Margin measures **how much a company charges for its products over and above the cost of acquiring or producing them**.
- Contribution Margin indicates **how much of a company's revenue is available to cover fixed costs**.
- This is especially significant in the manufacturing sector where businesses carry inventory

The gross margin is obtained by subtracting all manufacturing costs from revenues. Those manufacturing costs include fixed as well as variable components. Contribution margin is obtained by subtracting all variable costs, both manufacturing and non-manufacturing, from revenues. In a period where there is no change in inventory, the operating income will not differ between the two calculations. However, as inventory increases, the fixed manufacturing costs will be absorbed into inventory causing a higher operating income. Both formats are important for their particular purposes and one shouldn't be dismissed in favor of the other. Each should be used for the particular purpose.

CVP and Income Taxes

After-tax profit (Net Income) can be calculated by:

$$\text{Net Income} = \text{Operating Income} \times (1 - \text{Tax Rate})$$

Net income can be converted to operating income for use in the CVP equation

$$\text{Operating Income} = \frac{\text{Net Income}}{(1 - \text{Tax Rate})}$$

Note: the CVP equation will continue to use operating income. We'll use this conversion formula to obtain the operating income value when provided with Net Income.

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Formula Review:

Definitions

SP = Sale price per unit

VC = Variable cost per unit

Sales = SP × Q

Variable Costs = VQ

Unit Contribution Margin = Unit CM = (SP – VC)

Contribution Margin = CM = (SP × Q – VC × Q) = (SP – VC) × Q = Unit CM × Q

If P, V stay as before: $\Delta \text{CM} = (\text{SP} - \text{VC}) \times \Delta Q = \text{Unit CM} \times \Delta Q$

$$\text{CM Ratio} = \frac{\text{CM}}{\text{Sales}} = \frac{\text{Unit CM}}{\text{SP}}$$

$$\text{CM Ratio} = \frac{\text{Unit CM}}{\text{SP}} = \frac{\text{SP} - \text{VC}}{\text{SP}} = 1 - \frac{\text{VC}}{\text{SP}} = 1 - \frac{\text{VC} \times Q}{\text{SP} \times Q} = 1 - \frac{\text{Variable Costs}}{\text{Sales/Revenue}}$$

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Good news: You will have a formula list in the exam. The list will be more or less similar to these two slides. Please work on the exercise batch II.
Best wishes,
–

Formula Review – Cont.

Operating Income:

- Operating Income = (Sales – Variable Costs) – Fixed Costs
- OI = $(SP \times Q - VC \times Q) - FC$
- OI = $CM - FC = CM \text{ Ratio} \times \text{Sales} - FC$
- OI = $(SP - VC) \times Q - FC$
- OI = $\text{Unit CM} \times Q - FC$

$$\bullet Q = \frac{FC + OI}{SP - VC} = \frac{FC + OI}{\text{Unit CM}}$$

$$\bullet SP \times Q = SP \times \frac{FC + OI}{SP - VC} = \frac{SP}{SP - VC} \times \frac{FC + OI}{1} = \frac{FC + OI}{CM \text{ Ratio}}$$

Things to Do

- Exercise Batch II

Illustration 2 (answ)

a) Total variable costs = $\$(3 + 6 + 2 + 5) = \16

Contribution per unit (selling price less total variable costs) = $\$21 - \$16 = \$5$

Total contribution earned = $3,000 \times \$5 = \$15,000$

(b) Total profit/(loss) = Total contribution – Fixed production overheads incurred
= $\$(15,000 - 25,000) = \$(10,000)$

Accounting for Manager

Job Costing

Visiting professor, Dr. Ruslana Kuzina

Learning Objectives

1. Describe the building-block concepts of costing systems
2. Distinguish job costing from process costing. Process costing is too difficult for exam
3. Describe the approaches to evaluating and implementing job-costing systems
4. Outline the seven-step approach to normal costing
5. Distinguish actual costing from normal costing
6. Track the flow of costs in a job-costing system
7. Dispose of under- or over-allocated manufacturing overhead costs at the end of the fiscal year using alternative methods.
8. Understand variations from normal costing

2

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2

Basic Costing Terminology

Let's review several key terms from prior chapters:

- **Cost objects** are anything for which a cost measurement is desired
For job costing: it's mostly about production of big objects (like air planes, jachten,...)
- **Direct costs** of a cost object are costs that can be traced to that cost object in an economically feasible way
Direct cost = labour and material cost = very close to our unit
- **Indirect costs** of a cost object are costs that cannot be traced in an economically feasible way
So cost that cannot be tight to our unit



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3

And Some New Terms

A group of cost which we should identify, for example marketing (= a pool of all marketing expenses)

- **Cost Pool** – a grouping of individual indirect cost items. Cost pools simplify the allocation of indirect costs because the costing system does not have to allocate each cost individually.
- **Cost-allocation base** – a systematic way to link an indirect cost or group of indirect costs to cost objects.
Equipment depreciation: depends of how intensive it's used ~Machine hours
- The concepts represented by these five terms constitute the building blocks we will use to design the costing systems described in this chapter.

4

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4

Costing Systems

Differences between two systems

In a **JOB COSTING SYSTEM**, the cost object is a unit or multiple units of a distinct product or service which we call a job. Each job generally uses different amounts of resources.

Usually: big objects which we can calculate easily to track costs (so one plane but not tv's because we can produce a millions tv's = not easily to track)

In a **PROCESS COSTING SYSTEM**, the cost object is masses of identical or similar units of a product or service. In this type of system, we divide the total cost of producing an identical or similar product or service by the total number of units produced to obtain a per-unit cost.

= about different processes (A, B and C) for example TV's: you produce in process A the individual parts, than in process B the parts meet
= difficult to calculate because in each stage you add components which add value and it's different to allocate the different expenses

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5

When we speak about **cost = direct material cost + labour cost + overhead cost** (= the rest, is production but not direct for example depreciation, lighting, heating, rent, ...)

- For example: we use a special machine for production, the labour cost will decline but the overhead cost will rise (due to excessive machine cost = excessive depreciation cost). That's why allocation of overhead cost is very important

6

Costing Systems Illustrated Examples

EXHIBIT 4.1 Examples of Job Costing and Process Costing in the Service, Merchandising, and Manufacturing Sectors.

	Service Sector	Merchandising Sector	Manufacturing Sector
Job Costing Used	<ul style="list-style-type: none"> • Audit engagements done by PricewaterhouseCoopers • Consulting engagements done by McKinsey & Co. • Advertising-agency campaigns run by Ogilvy & Mather • Legal cases argued by Hale & Dorr • Computer-repair jobs done by CompUSA • Movies produced by Universal Studios 	<ul style="list-style-type: none"> • L. L. Bean sending individual items by mail order • Special promotion of new products by Walmart 	<ul style="list-style-type: none"> • Assembly of individual aircrafts at Boeing • Construction of ships at Litton Industries
Process Costing Used	<ul style="list-style-type: none"> • Bank-check clearing at Bank of America • Postal delivery (standard items) by U.S. Postal Service 	<ul style="list-style-type: none"> • Grain dealing by Arthur Daniel Midlands • Lumber dealing by Weyerhaeuser 	<ul style="list-style-type: none"> • Oil refining by Shell Oil • Beverage production by PepsiCo

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Costing Approaches

ACTUAL COSTING – allocates indirect costs based on the **actual indirect cost rates times the actual quantities** of the cost allocation base.

NORMAL COSTING – allocates indirect costs based on the **budgeted indirect cost rates times the actual quantities** of the cost allocation base.

Both methods allocate direct costs to a cost object the same way – by using actual direct cost rates times actual consumption.

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Costing Approaches Summarized

	Actual Costing	Normal Costing
Direct Costs = the same in both ways costing because we know our actual direct cost rates	Actual direct-cost rates x actual quantities of <u>direct-cost inputs</u>	Actual direct-cost rates x actual quantities of <u>direct-cost inputs</u>
Indirect Costs	Actual indirect-cost rates x actual quantities of <u>cost-allocation bases</u>	Budgeted indirect-cost rates x actual quantities of <u>cost-allocation bases</u>

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Indirect Costs – Normal Costing

Manufacturing overhead is applied to jobs that are in process. An **allocation base**, such as **direct labor hours, direct labor dollars, or machine hours**, is used to assign manufacturing overhead to individual jobs.

We use an allocation base because:

1. It is impossible or **difficult to trace** overhead costs to particular jobs.
2. Manufacturing overhead consists of **many different items ranging** from the grease used in machines to production manager's salary.
3. **Many types of manufacturing overhead costs are fixed even though output fluctuates during the period.**

2-9

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FOR:

Indirect Costs – Normal Costing

Budgeted manufacturing overhead rate (BOHR) used to apply overhead to jobs is determined before the period begins.

Niels: inventor of the first model for allocations

$$\text{BOHR} = \frac{\text{Budgeted total manufacturing overhead cost for the coming period}}{\text{Budgeted total units in the allocation base for the coming period}}$$

Ideally, the allocation base is a cost driver that causes overhead.

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Indirect Costs – Normal Costing

Based on and determined before the period begins.

$$\text{Overhead applied} = \text{BOHR} \times \text{Actual activity}$$

Actual amount of the allocation based upon the actual level of activity.



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Quick Check ✓

Job WR53 at NW Fab, Inc. required \$200 of direct materials and 10 direct labor hours at \$15 per hour. Estimated total overhead for the year was \$760,000 and estimated direct labor hours were 20,000. What would be recorded as the cost of job WR53?

- a. \$200.
- b. \$350.
- c. \$380.
- d. \$730.

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Quick Check ✓



Job WR53 at NW Fab, Inc. required \$200 of direct materials and 10 direct labor hours at \$15 per hour. Estimated total overhead for the year was \$760,000 and estimated direct labor hours were 20,000. What would be recorded as the cost of job WR53?

- a. \$200.
- b. \$350.
- c. \$380.
- d. \$730.

Pred. ovhd. rate	\$760,000/20,000hours	\$38
Direct materials		\$200
Direct labor	\$15 x 10 hours	\$150
Manufacturing overhead	\$38 x 10 hours	\$380
Total cost		\$730

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Seven-step Job Costing (1 of 3)

How to establish the job costing policy

1. Identify the job that is the chosen cost object. Could be unit A, unit B, unit C,...
2. Identify the direct costs of the job. (Direct materials and labour)
3. Select the cost-allocation base(s) to use for allocating indirect costs to the job.
4. Identify the indirect costs associated with each cost-allocation base. (Determine the appropriate cost pools that are necessary.)

Seven-step Job Costing (2 of 3)

5. Compute the Rate per Unit of each cost-allocation base used to allocate indirect costs to the job (normal costing so use budgeted values)

$$\text{Budgeted Manufacturing Overhead Rate} = \frac{\text{Budgeted Manufacturing Overhead Costs}}{\text{Budgeted Total Quantity of Cost-Allocation Base}}$$

6. Compute the indirect costs allocated to the job:

$$\text{Budgeted Allocation Rate} \times \text{Actual Base Activity For the Job}$$

Seven-step Job Costing (3 of 3)

7. Compute total job costs by adding all direct and indirect costs together.

Direct Manufacturing Costs		
Direct Materials	xxxx	
Direct Labor	xxxx	xxxx
Manufacturing Overhead		
Indirect Costs	xxxx	
Total Mfg Costs of Job XYZ		xxxx

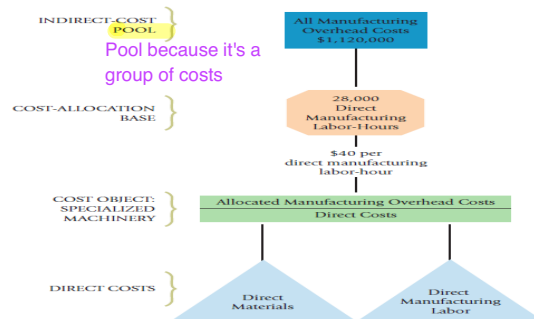
Contrasting Actual Costing

Both actual costing and normal costing trace direct costs to jobs in the same way because source documents identify the actual quantities and actual rates of direct materials and direct manufacturing labor for a job as the work is being done.

The only difference between costing a job with normal costing and actual costing is that normal costing uses BUDGETED indirect-cost rates where actual costing uses ACTUAL indirect-cost rates calculated annually at the end of the year.

Job Costing Overview

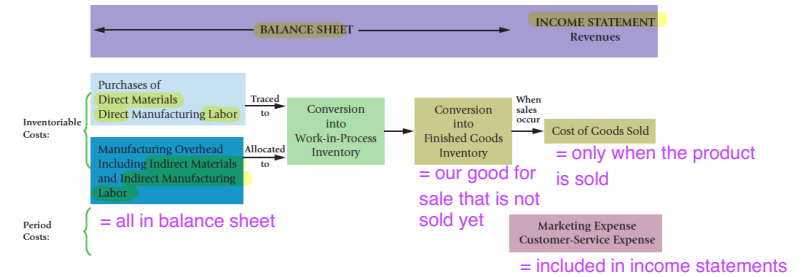
EXHIBIT 4.4 Job-Costing Overview for Determining Manufacturing Costs of Jobs at Robinson Company



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Flow of Costs in Job Costing

EXHIBIT 4.6 Flow of Cost in Job Costing
2 different statements



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Journal Entries (1 of 10)

- Journal entries are made at each step of the production process.
- The purpose is to have the accounting system closely reflect the actual state of the business, its inventories, and its production process.

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Journal Entries (2 of 10)

- All product costs are accumulated in the work-in-process control account.
 - Direct materials used
 - Direct labor incurred
 - Factory overhead allocated (or applied)
- Actual indirect costs (overhead) are accumulated in the manufacturing overhead control account. = balance sheet

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Assets = materials = finished goods, cash
 Liabilities = accounts payable, accumulated depreciation

If you receive something (receiving materials from supplier, materials = asset = a plus but you don't pay yet so it is an increase of debt = debit materials and credit account payable
 If you receive something = rise in credit and decrease on debit

Journal Entries (3 of 10)

Assets = liability + equity

1. Purchase of materials (direct & indirect) on credit:

Materials Control XX
 Accounts Payable Control XX

2. Usage of direct and indirect (OH) materials into production:

Work-in-Process Control XX
 Materials Control XX

Manufacturing Overhead Control XX
 Materials Control XX

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Journal Entries (4 of 10)

3. Manufacturing Payroll (direct & indirect)

Work-in-Process Control (direct) XX

Manufacturing Overhead Control XX
 (indirect)

Cash Control XX

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Journal Entries (5 of 10)

4. Other manufacturing overhead costs incurred during the period: For example supervisor managers

Manufacturing Overhead Control XX
 Cash Control XX
 Accumulated Depreciation Control XX

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Journal Entries (6 of 10)

5. Allocation (or application) of indirect costs (overhead) to the work-in-process account is based on a predetermined overhead rate.

Work-In-Process Control XX
 Manufacturing Overhead Allocated XX

Note: actual overhead costs are never posted directly into work-in-process.

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Journal Entries (7 of 10)

6. Products are completed and transferred out of production (Work-in-Process) to Finished Goods in preparation for being sold.

Finished Goods Control	XX
Work-In-Process Control	XX

Journal Entries (8 of 10)

7. When goods are sold, the associated costs are transferred to an expense (cost) account.

Cost of Goods Sold	XX
Finished Goods Control	XX
= - because it's assets	

Note: The difference between the sales and cost of goods sold amounts represents the gross margin (profit) on this particular transaction.

Journal Entries (9 of 10)

8. When marketing or customer-service costs are incurred, the appropriate expense account is increased and Cash Control is decreased (or Accounts payable Control would be increased, if the items/services are purchased on account)

Marketing Expense	XX
Customer-Service Expense	XX
Cash Control	XX

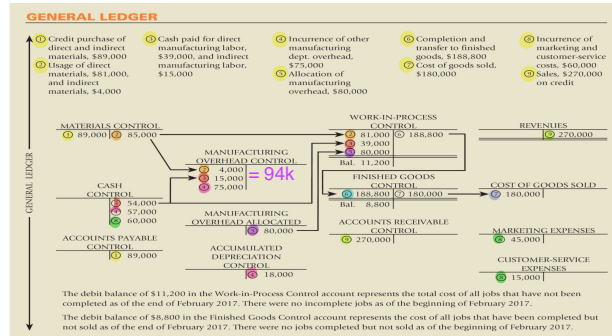
Journal Entries (10 of 10)

9. Products are sold to customers on credit

Accounts Receivable Control	XX
Sales	XX

Illustrated General Ledger in a Job Cost Environment

EXHIBIT 4.7 Manufacturing Job-Costing System Using Normal Costing: Diagram of General ledger Relationships for February 2017



Contribution margin =
270 - 180 = 90 ≠ profit
because we have
marketing and customer
service

Profit = 90 - 45 - 15 = 30

Sum of the manufacturing overhead control = 94, but we allocated only 80 (in work in process) because we used budgeting data. This gives a difference of 14 (more than we expected = over allocated) = real expenses > should be put in the cost of goods sold and thus decrease our profit
So this example in the book is wrong: profit = 270 - (180 + 14) - 45 - 15 = 16

Accounting for Overhead (1 of 3)

Recall that **two different overhead accounts** were used in the preceding journal entries:

- **Manufacturing overhead control** was **debited** for the actual overhead costs incurred.
- **Manufacturing overhead allocated** was **credited** for estimated (budgeted) overhead applied to production through the work-in-process account.

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Illustrated Subsidiary Ledger in a Job Cost Environment

EXHIBIT 4.8 Subsidiary Ledgers for Materials, Labor, and Manufacturing Department Overhead

PANEL A: Materials Records by Type of Materials

Metal Brackets Part No. MB-468-A				
Received	Issued	Balance		
Date	Req. No.	Qty.	Rate	Am't
2-6-2017	198	8	\$14	\$112

↑

Copies of invoices or receiving reports

Total cost of all types of materials received in February, \$89,000

PANEL B: Labor Records by Employee

G. L. Cook Emp. No. 551-87-3076				
Week	Job No.	Hours Worked	Rate	Am't
2-12	WTP	25	\$18	\$450
	H. 256	12	18	216
	Mintnce.	3	18	54
				\$720

↑

Copies of labor time sheets

Total cost of all direct and indirect manufacturing labor incurred in February, \$54,000 (\$39,000 + \$15,000)

PANEL C: Manufacturing Department Overhead Records by Month

February 1917				
Indir. Mat.	Indir. Labor	Superv. & Insp.	Plant Utilities	Plant Depn.
\$4,000	\$13,000	\$44,000	\$13,000	\$18,000

↑ ↑ ↑ ↑ ↑

Copies of material requisitions Manuf. labor time and payroll analysis Payroll analysis invoices, special authorizations

Other manufacturing overhead costs incurred in February, \$75,000

¹The arrows show how the supporting documentation (for example, copies of materials requisition records) results in the journal entry number shown in circles (for example, journal entry number 2) that corresponds to the entries in Exhibit 4-7.

Indirect materials = cleaning liquid

Indirect labour = salary of the supervisor, quality control

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Accounting for Overhead (2 of 3)

Actual costs will almost never equal budgeted costs.

Accordingly, an imbalance situation exists between the two overhead accounts.

- If **Overhead Control > Overhead Allocated**, this is called **UNDERALLOCATED** overhead
- If **Overhead Control < Overhead Allocated**, this is called **OVERALLOCATED** overhead.
= means we have minus: we included more than we spend

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Accounting for Overhead (3 of 3)

The difference between the overhead accounts will be eliminated in the end-of-period adjusting entry process, using one of three possible methods.

1. Adjusted allocation rate approach *We will not go so deep*
2. Proration approach
3. Write-off approach

We'll take a closer look at these approaches on the next slide.

Skip

Choosing Among Approaches

When management is deciding among approaches, they should consider the following:

1. The purpose of the adjustment
2. The total amount of under-allocation or overallocation
3. Whether the variance was over- or under-allocated

The choice of method should be based on such issues as materiality, consistency, and industry practice.

Skip

Three Methods for Adjusting Over/Underapplied Overhead

1. Adjusted allocation rate approach – all allocations are recalculated with the actual, exact allocation rate.
2. Proration approach – the difference is allocated between cost of goods sold, work-in-process, and finished goods based on their relative sizes.
3. Write-off approach – the difference is simply written off to cost of goods sold.

Job Costing in the Service Sector

- Job costing is often associated with the manufacturing sector but it is also very useful in service organizations such as auto repair shops, advertising agencies, hospitals and accounting firms.
- In an accounting firm, for example, management may wish to determine the cost for each audit. In that case, each audit would be a job and costs would be traced or properly allocated to it.

JOB costing

12.2022_job costing 1:18:00

The Company produces sails for yachts according to individual orders. The budget for next year provides for the following expenses:

- Direct labor expenses	6000 hours
- Direct manufacturing labor	30000 \$
- Indirect manufacturing labor	9000 \$.
- Depreciation of equipment and spaces	3000 \$
- Factory building rent	5000 \$
- Lighting, heating	2000 \$
- Machine hours	2000 hours
- Direct materials	3000 \$
- Indirect materials	500 \$.
- Indirect materials others	200 \$

The company received an order for the producing a set of sails.

Predetermined calculation:

15 hours of direct labor costs 5 \$,

7 hours of machine labor;

direct materials -30 \$

Calculate the total unit cost of manufacturing if the overhead cost allocates:

1) labor;

2) machine hours;

3) materials.

Overhead=9000 + 3000 + 5000 + 2000 + 500 + 200 = 19700 y.e.

Labor = 30000/6000=5 \$ per hour

1. Labor

Rate = 19700/6000=3.28

Direct material = 30\$

Direct labor =15*5 =75

Overhead = 15 hours*3.28 = 49.2

Total 154.2

2. machine hours

19700/2000= 9.85

Direct material = 30\$

Direct labor =15*5 =75

Overhead = 68,95

Total 173,95

3. Materials

19700/3000=6.57

Direct material = 30\$

Direct labor =15*5 =75

Overhead 197,1 y.e.

Total 302,1 y.e.

ABC calculation

Total Manufacturing Overhead 712.000 \$.

Cost-allocation base – machine hours. The Company produces two units: Unit A and Unit B.

	A	B
Direct materials	20	60
Direct labor	50	40
Machine hours	3 hours	4 hours
Annual output	6 000 units	40 000 units

Calculate the total unit cost of manufacturing Unit A and Unit B

Total MH = 6000*3 +40000* 4=178000

Rate = 712000/178000=4

Cost per Unit A = 20+50+4*3=20+50+12=82

Cost per Unit B = 60+40 +4*4 = 116

The company determined the following information for implement ABC costing:

	Machine hours for unit	Annual output	Total Machine hours	Number of Line settings	Number of purchase orders
A	3	6 000	18 000	16	52
B	4	40 000	160 000	30	100
Total		46 000	178 000	46	152

Cost Pools

	Amount	Cost driver
Expenses of Machines and equipment	178 000	Machine hours
Expenses of Line settings	230 000	Number of Line settings
Expenses of purchase orders	304 000	Number of purchase orders
Total	712 000	

Calculate the total unit cost of manufacturing A and B according to ABC

Pool 1 Expenses of Machines and equipment

Rate = 178 000/178 000=1

Unit A = 18000*1=18000\$

Unit B =160000*1= 160000\$

Unit B = 100*2000=200000

Total OH for A = 18000+80000+84000= 202000

Total OH for A =160000+150000+200000 = 510000

Pool 2 Expenses of Line settings

Rate = 230 000/46 = 5000\$

Unit A = 16*5000 = 80000 \$

Unit B = 30*5000 = 150 000\$

OH per Unit A = 202000/6000= 33.67

OH per Unit B = 510000/40000= 12.75

ABC

Cost per Unit A = 20+50+33.67= 103.67

Cost per Unit B = 60+40 +12.75 = 112.75

Pool 3 Expenses of purchase orders

Rate = 304 000/152 = 2000

Unit A = 52*2000=84000

Simple method

Cost per Unit A = 20+50+4*3=20+50+12=82

Cost per Unit B = 60+40 +4*4 = 116

Things to do

- Work on the Problem for Self-Study on Page 155 of your book.
- Work on the Exercise Batch III

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Good to Know

“Accounting has become the most intellectually challenging area in the field of management, and the most turbulent one.”

Accounting is the primary discipline attempting to answer questions ... “few executives yet know how to ask: What information do I need to do my job? When do I need it? And from whom should I be getting it?”



Drucker, Peter E., "Be Data Literate—Know What to Know," *The Wall Street Journal*, December 1, 1992, p. A16.

Accounting for Manager

ABC and ABM

= updated version of job costing

Visiting professor, Dr. Ruslana Kuzina

Faculty of Economics and Business

Learning Objectives (1 of 2)

- 5.1 Explain how broad averaging undercosts and overcosts products or services
- 5.2 Present three guidelines for refining a costing system
- 5.3 Distinguish between simple and activity-based costing systems
- 5.4 Describe a four-part cost hierarchy
- 5.5 Cost products or services using activity-based costing

Learning Objectives (2 of 2)

- 5.6 Evaluate the benefits and costs of implementing activity-based costing systems
- 5.7 Explain how managers use activity-based costing systems in activity-based management
- 5.8 Compare activity-based costing systems and department costing systems

Background

Recall that **plant overhead** is applied to production in a rational systematic manner, **using some type of averaging**. There are a **variety of methods** to accomplish this goal.

These methods often involve **trade-offs between simplicity and realism**.

Simple Methods	↔	Complex Methods
Can be Inaccurate		Usually more accurate

Plantwide & Department Overhead Calculations

Plantwide Overhead Rate:

$\text{Total Estimated Overhead}^{**} / \text{Total Estimated Base}^{***}$

** Obtain total of all overhead costs to be allocated.

*** Determine the best “base” – direct labor hours, machine hours, etc.

This rate is **used to allocate overhead costs to all products**

Department Overhead Rate:

Similar concept except overhead cost pools and selected base are **obtained by department rather than plantwide**.

Example Of Plantwide & Department Overhead Calculations (1 of 2)

For our example, let's say we have two departments, A and B with overhead costs of \$300,000 and \$450,000, respectively.

The best base (the most likely cost driver) in Department A is Direct Labor Hours and

Machine Hours in Department B.

Example of Plantwide & Department Overhead Calculations (2 of 2)

	Dept A	Dept B	Plantwide
Overhead	\$300,000	\$450,000	\$750,000
Direct Labor Hrs	8,000	7,000	15,000
Machine Hours	750	1,200	1,950
Allocation Rate-DLH	\$37.50 <small>= 300k/8k</small>	n/a	\$50.00 = 750/15
Allocation Rate-MH	n/a	\$375.00 <small>= 450k/1,2k</small>	\$384.62 = 750/1,95

Broad Averaging

- Historically, firms produced a limited variety of goods and at the same time, their indirect costs were relatively small.
- Allocating overhead costs was simple: use broad averages to allocate costs uniformly regardless of how they are actually incurred.
 - Generally known as “Peanut-butter costing” (perhaps because it is spread evenly??)
- The end-result:
 - Products using fewer resources are overcosted and products using more resources are undercosted.

Over And Undercosting - Defined

- OVERCOSTING** occurs when a product consumes a low level of resources but is allocated high costs per unit.
- UNDERCOSTING** occurs when a product consumes a high level of resources but is allocated low costs per unit.

Product Cost Cross-Subsidization (1 of 4)

- If a company undercosts one of its products, it will overcost at least one of its other products.
- The overcosted product absorbs too much cost, making it seem less profitable than it really is.
- The undercosted product is left with too little cost, making it seem more profitable than it really is.

Product Cost Cross-Subsidization (2 of 4)

CONSIDER THIS:

- If you were using cost to determine price, what effect would this have?
- If you were looking at product profitability to determine marketing focus, what result?
- Managers use product costs everyday to make decisions. If the cost is wrong, so will be the decision.

Product Cost Cross-subsidization (3 of 4)

Let's look again at our example:

- Dept A has \$300,000 Overhead and uses DLH (8,000)
- Dept B has \$450,000 Overhead and uses MH (1,200)
- Job 457 incurs 1,000 DLH in Dept A and 1,000 DLH in Dept B; 50 MH in Dept A and 75 MH in Dept B

Product Cost Cross-subsidization (4 of 4)

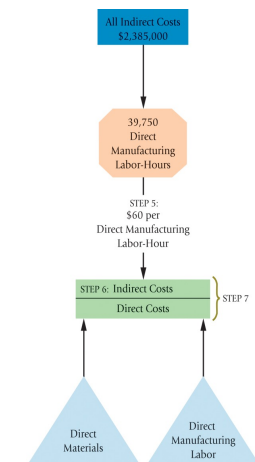
Explanation	Dept A	Dept B	Total	Plantwide
1000*\$37.50	\$37,500.00	n/a	n/a	n/a
75*\$375.00	n/a	\$28,125.00	n/a	n/a
Total Dept	n/a	n/a	\$65,625	n/a
PW/DLH 2,000*\$50	n/a	n/a	n/a	\$100,000.00
PW/MH 125*\$384.62	n/a	n/a	n/a	\$48,077.50

How would this information affect your decisions regarding Job 457?

An Example: Plastim

EXHIBIT 5.1 Overview of
Plastim's Simple Costing
System

- Simple costing = only one rate is used
1. Direct cost: material and labour
 2. Estimate overhead
 3. Use a base and estimate rate
 4. Allocate between different products



Plastim And Simple Costing

EXHIBIT 5.2 Plastim's Product Costs Using the Simple Costing System

	A	B	C	D	E	F	G
1		60,000			15,000		
2		Simple Lenses (S3)			Complex Lenses (C5)		
3		Total	per Unit		Total	per Unit	Total
4		(1)	(2) = (1) ÷ 60,000		(3)	(4) = (3) ÷ 15,000	(5) = (1) + (3)
5	Direct materials	\$1,125,000	\$18.75		\$ 675,000	\$45.00	\$1,800,000
6	Direct manufacturing labor	600,000	10.00		195,000	13.00	795,000
7	Total direct costs (Step 2)	1,725,000	28.75		870,000	58.00	2,595,000
8	Indirect costs allocated (Step 6)	1,800,000	30.00		585,000	39.00	2,385,000
9	Total costs (Step 7)	\$3,525,000	\$58.75		\$1,455,000	\$97.00	\$4,980,000

Using The 5-step Decision Making Process

1. **Identify the Problems** & Uncertainties. (Possible loss of Giovanni business)
2. **Obtain Information.** (Analyze and evaluate the design, manufacturing, and distribution operations for the S3 lens.)
3. Make **Predictions about the future.** (Obtain a better cost estimate for the S3)
4. **Make Decisions** by Choosing among alternatives (Should they bid and if yes, at what price)
5. **Implement the Decision,** Evaluate Performance and Learn.

Reasons For Refining A Costing System

Three principal reasons have accelerated the demand for refinements to the costing system.

1. Increase in product diversity
2. Increase in indirect costs with different cost drivers
3. Competition in product markets
So it's important to know exactly how much your product costs

Guidelines For Refining A Costing System

There are three main guidelines for refining a costing system:

1. Direct-cost tracing Identify as many direct costs as economically feasible
2. Indirect-cost pools We should divide more so the cost are homogenous
3. Cost-allocation bases
If its possible use the cost driver as the cost allocation base for each of the indirect cost pools
Driver = what is close to our pool (and how they create this cost, for manufacturing = machine hours, quality = labour hours, ... = different drivers for different pools = a lot of work)

Cost Hierarchies (1 of 2)

A cost hierarchy categorizes various activity cost pools on the basis of the different types of cost drivers, cost-allocation bases, or different degrees of difficulty in determining cause-and-effect relationships.

ABC systems commonly use a cost hierarchy with four levels to identify cost-allocation bases that are cost drivers of the activity cost pools.

Cost Hierarchies (2 of 2)

The four levels in the cost hierarchy are:

- **Output unit-level costs** (related to the individual units of a product or service)
- **Batch-level costs** (related to a group of units)
- **Product (or service)-sustaining costs** (related to support a particular product or service without regard to the number of units or batches)
- **Facility-sustaining costs** (related to costs of activities that cannot be traced to individual products or services)


Cost Hierarchies – Examples

Unit Level

This activity is performed for each unit of product produced and sold.

Examples

- Cost of raw materials
- Cost of inserting a component
- Utilities cost of operating equipment
- Some costs of packaging
- Sales commissions




Cost Hierarchies – Examples

Batch Level

Examples

- Cost of processing sales order
- Cost of issuing and tracking work order
- Cost of equipment setup
- Cost of moving batch between workstations
- Cost of inspection

This activity is performed for each batch of product produced or sold.



Cost Hierarchies – Examples

Product Level

- Examples**
- Cost of product development
 - Cost of product marketing, such as advertising
 - Cost of specialized equipment
 - Cost of maintaining specialized equipment

This activity is performed to support each different product that can be produced.



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Cost Hierarchies – Examples

Facility Level

Examples

- Cost of maintaining general facilities
- Cost of nonspecialized equipment
- Cost of maintaining nonspecialized equipment
- Cost of real property taxes
- Cost of general advertising
- Cost of general administration

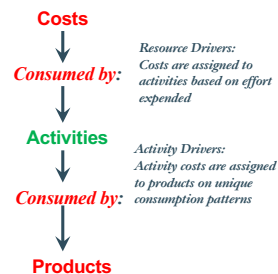
This activity is performed to maintain general manufacturing capabilities.



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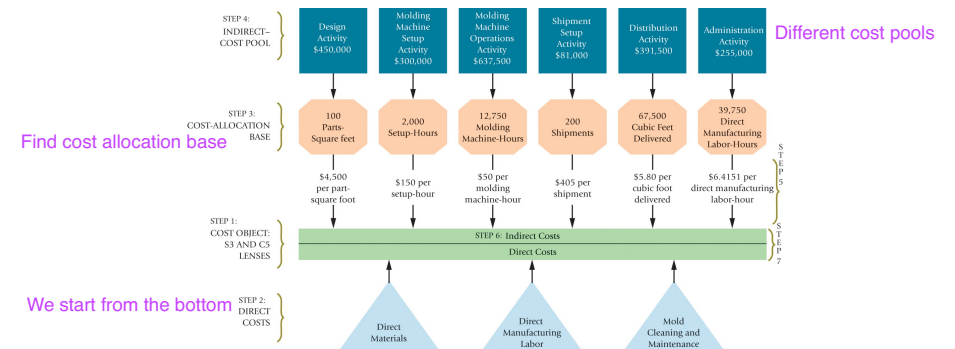
ABC Theory

ABC focusses on activities and the costing process



Plastim and ABC Illustrated

EXHIBIT 5.3 Overview of Plastim's Activity-Based Costing System



1. ABC focuses on activities in the costing process.
2. Costs are traced from activities to products, based on the product's demand for these activities during the production process.
3. ABC theory contends that, virtually all of a company's activities exists to support production and delivery of services, they should all be included as product costs.

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Plastim And ABC Rate Calculation

EXHIBIT 5.4 Activity-Cost Rates for Indirect-Cost Pools

	A	B	C	D	E	F	G	H
1			(Step 4)	(Step 3)	(Step 5)			
2	Activity	Cost Hierarchy Category	Total Budgeted Indirect Costs	Budgeted Quantity of Cost-Allocation Base	Budgeted Indirect Cost Rate	Cause-and-Effect Relationship Between Allocation Base and Activity Cost		
3	(1)	(2)	(3)	(4)	(5) = (3) ÷ (4)	(6)		
4	Design	Product-sustaining	\$450,000	100 parts-square feet	\$ 4,500 per part-square foot	Design Department indirect costs increase with more complex molds (more parts, larger surface area).		
5	Molding machine setup	Batch-level	\$300,000	2,000 setup-hours	\$ 150 per setup-hour	Indirect setup costs increase with setup-hours.		
6	Machine operations	Output unit-level	\$637,500	12,750 molding machine-hours	\$ 50 per molding machine-hour	Indirect costs of operating molding machines increase with molding machine-hours.		
7	Shipment setup	Batch-level	\$ 81,000	1,500 shipment setup-hours	\$ 54 per shipment setup-hour	Shipping costs incurred to prepare batches for shipment increase with the number of shipment setup-hours.		
8	Distribution	Output-unit-level	\$391,500	67,500 cubic feet delivered	\$ 5.80 per cubic foot delivered	Distribution costs increase with the cubic feet of packages delivered.		
9	Administration	Facility sustaining	\$255,000	39,750 direct manuf. labor-hours	\$ 6.4151 per direct manuf. labor-hour	The demand for administrative resources increases with direct manufacturing labor-hours.		

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Plastim and ABC Product Costs

EXHIBIT 5.5 Plastim's Product Costs Using Activity-Based Costing System

	A	B	C	D	E	F	G
1		60,000			15,000		
2		Simple Lenses (S3)			Complex Lenses (CL5)		
3		Total	per Unit		Total	per Unit	Total
4	Cost Description	(1)	(2) = (1) ÷ 60,000		(3)	(4) = (3) ÷ 15,000	(5) = (1) ÷ (3)
5	Direct costs						
6	Direct materials	\$1,125,000	\$18.75		\$ 675,000	\$ 45.00	\$1,800,000
7	Direct manufacturing labor	600,000	10.00		195,000	13.00	795,000
8	Direct mold cleaning and maintenance costs	120,000	2.00		150,000	10.00	270,000
9	Total direct costs (Step 2)	1,845,000	30.75		1,020,000	68.00	2,865,000
10	Indirect Costs of Activities						
11	Design						
12	S3, 30 parts-sq. ft. x \$4,500			135,000	2.25		
13	CL5, 70 parts-sq. ft. x \$4,500					315,000	21.00
14	Setup of molding machines						
15	S3, 500 setup-hours x \$150			75,000	1.25		
16	CL5, 1,500 setup-hours x \$150					225,000	15.00
17	Machine operations						
18	S3, 9,000 molding machine-hours x \$50			450,000	7.50		
19	CL5, 3,750 molding machine-hours x \$50					187,500	12.50
20	Shipment setup						
21	S3, 100 shipments x \$405			40,500	0.67		
22	CL5, 100 shipments x \$405					40,500	2.70
23	Distribution						
24	S3, 45,000 cubic feet delivered x \$5.80			261,000	4.35		
25	CL5, 22,500 cubic feet delivered x \$5.80					130,500	8.70
26	Administration						
27	S3, 30,000 dir. manuf. labor-hours x \$6.4151			192,453	3.21		
28	CL5, 9,750 dir. manuf. labor-hours x \$6.4151					62,547	4.17
29	Total indirect costs allocated (Step 6)	1,153,953	19.23			961,047	64.07
30	Total Costs (Step 7)	\$2,998,953	\$49.98			\$1,981,047	\$132.07
31							\$4,980,000

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Plastim: Simple and ABC Compared

Simple: only one driver = another digit = we receive losses, ABC is much more accurate

EXHIBIT 5.6 Comparing Alternative Costing Systems

	Simple Costing System Using a Single Indirect-Cost Pool (1)	ABC System (2)	Difference (3) = (2) - (1)
Direct-cost categories	2	3	1
Direct materials	Direct materials	Direct materials	
Direct manufacturing labor	Direct manufacturing labor	Direct manufacturing labor	
Total direct costs	\$2,595,000	Direct mold cleaning and maintenance labor \$2,865,000	\$270,000
Indirect-cost pools	1	6	5
	Single indirect-cost pool allocated using direct manufacturing labor-hours	Design (parts-square feet) ¹ Molding machine setup (setup-hours) Machine operations (molding machine-hours) Shipment setup (shipment setup-hours) Distribution (cubic feet delivered) Administration (direct manufacturing labor-hours)	
Total indirect costs	\$2,385,000	\$2,115,000	(\$270,000)
Total costs assigned to simple (S3) lens	\$3,525,000	\$2,998,953	(\$526,047)
Cost per unit of simple (S3) lens	\$58.75	\$49.98	(\$8.77)
Total costs assigned to complex (C5) lens	\$1,455,000	\$1,981,047	\$526,047
Cost per unit of complex (C5) lens	\$97.00	\$132.07	\$35.07

¹Cost drivers for the various indirect-cost pools are shown in parentheses.

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ABC Vs. Simple Costing (1 of 2)

- ABC is generally perceived to produce superior costing figures due to the use of multiple drivers across multiple levels.
- ABC is only as good as the drivers selected, and their actual relationship to costs. Poorly chosen drivers will produce inaccurate costs, even with ABC.
- Using ABC does not guarantee more accurate costs!

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ABC Vs. Simple Costing (2 of 2)

- ABC is an alternate way to allocate costs. It is generally considered to be more accurate and more costly to implement.
- A company should consider refining their cost system when evidence begins to suggest that their existing system is flawed. For Plastim, that occurred when they were in danger of losing business due to their higher price.
- Because a number of critical decisions, such as pricing, whether or not one product should be “pushed” over another, whether or not a product should be dropped, etc. will be made using cost information, best efforts should be used to arrive at a cost that is fair and reasonable for each product. The goal isn't to attain a cost that serves the current purposes.
- This is an imprecise science and differences of opinion are likely to occur.

Signals that suggest that ABC Implementation could help a Firm: (1 of 2)

1. Significant amounts of indirect costs are allocated using only one or two cost pools.
2. All or most indirect costs are identified as output unit-level costs.
3. Products make diverse demands on resources because of volume, process steps, batch size or complexity.

Signals that suggest that ABC Implementation could help a Firm: (2 of 2)

4. Products that a company is well-suited to make show small profits whereas products that a company is less suited to make show large profits.
5. Operations staff has substantial disagreement with the reported costs of manufacturing and marketing products or services

Behavioral Issues in Implementing ABC

- Gain the support of top management and create a sense of urgency.
- Create a guiding coalition of managers throughout the value chain for the ABC effort.
- Educate and train employees in ABC as a basis for employee empowerment
- Seek small short-run success as proof that the ABC implementation is yielding results.
- Recognize that ABC is not perfect. (better costs but complex system)

Activity-based Management

A method of management decision-making that uses ABC information to improve customer satisfaction and profitability.

We define ABM broadly to include decisions about pricing and product mix, cost reduction, process improvement and product and process design.

ABC and Service/Merchandising Firms

ABC implementation is widespread in a variety of applications outside manufacturing, including:

- Health Care
- Banking
- Telecommunications
- Retailing
- Transportation

Terms to Learn (1 of 2)

TERMS TO LEARN	PAGE NUMBER REFERENCE
Activity	178
Activity Based Costing (ABC)	178
Activity Based Management (ABM)	189
Batch-level costs	181
Cost Hierarchy	181
Facility-Sustaining Costs	181
Output Unit-Level Costs	181
Product-Cost Cross-Subsidization	172
Product overcosting	172
Product-sustaining costs	181
Product undercosting	172

Terms to Learn (2 of 2)

TERMS TO LEARN	PAGE NUMBER REFERENCE
Refined Costing System	177
Service-Sustaining Costs	181

Things to do

- Work on the Problem for Self-Study on Page 155 of your book.
- Work on the Exercise Batch III

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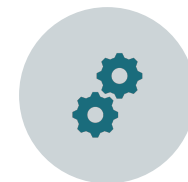
Learning Objectives

- 6.1** Describe the master budget and explain its benefits
- 6.2** Describe the advantages of budgets
- 6.3** Prepare the operating budget and its supporting schedules
- 6.4** Use computer-based financial planning models for sensitivity analysis
- 6.5** Describe responsibility centers and responsibility accounting
- 6.6** Recognize the human aspects of budgeting
- 6.7** Appreciate the special challenges of budgeting in multinational companies

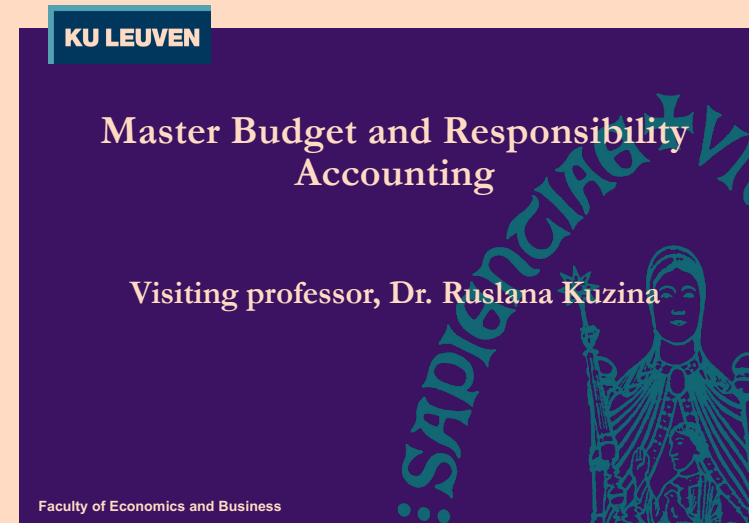
Background Information



STRATEGY



MANAGEMENT
CONTROL SYSTEM



Background Information

- Strategy
- Management Control System



Strategy

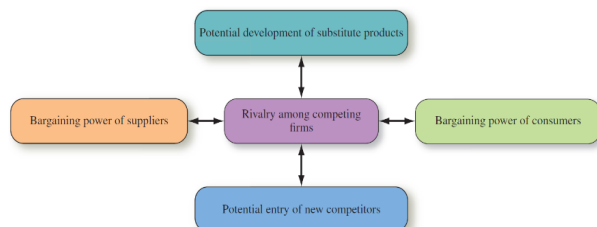


- Strategy specifies how an organization matches its own capabilities with the opportunities in the marketplace to accomplish its objectives.
- Strategy describes how an organization can create value for its customers while differentiating itself from its competitors.

Industry Analysis Focuses on Five Forces

PORTER'S
That move your strategy

1. Number and strength of competitors
2. Potential entrants to the market
3. Availability of equivalent products
4. Bargaining power of customers
5. Bargaining power of input suppliers



Two Basic Business Strategies

1. Product differentiation is an organization's ability to offer products or services perceived by its customers to be superior and unique relative to the products or services of its competitors.
 - Competitive advantage: brand loyalty and the willingness of customers to pay high prices.
2. Cost leadership is an organization's ability to achieve lower costs relative to competitors through productivity and efficiency improvements, elimination of waste, and tight cost control.
 - Competitive advantage: lower selling prices.

Background Information



- Strategy
- Management Control System

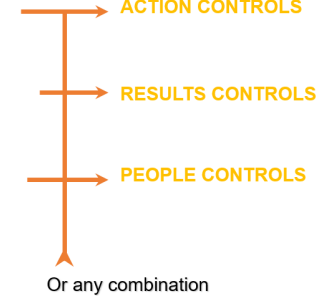
Management Control Systems

- A management control system is a means of gathering and using information to aid and coordinate the planning and control decisions throughout an organization and to guide the behavior of its managers and other employees.

3 types of controls (yellow):

Controls can focus on:

- the actions taken
- the results produced
- the types of people employed and their shared values and norms

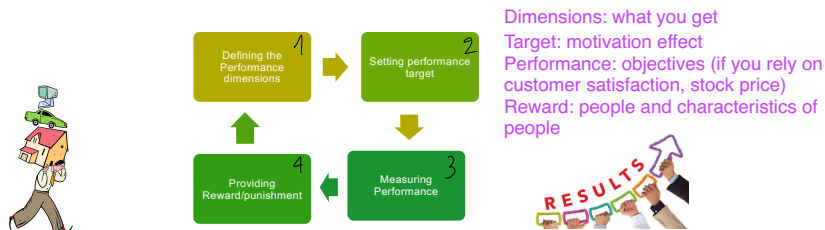


We also have formal and informal control system

- we have formal procedures: rules
- informal management control: shared values, mutual commitments

Results controls

- Involves rewarding individuals for generating good results (or punishing them for poor results)
 - Results accountability
- It influences actions because it causes employees to be concerned about the consequences of the actions they take
- The key results controls elements are as follows:



Action controls

- Ensure that employees perform (or do not perform) certain actions known to be beneficial (or harmful) to the organization. -

Prevention/detection

Example: Separation of duties, policies and procedures etc.

Personnel/cultural controls

- “People controls” (for short) ensure that employees:
 - Will control **their own** behaviors
 - Personnel control/Self-monitoring
 - Will control **each other**
 - Cultural controls/Mutual monitoring

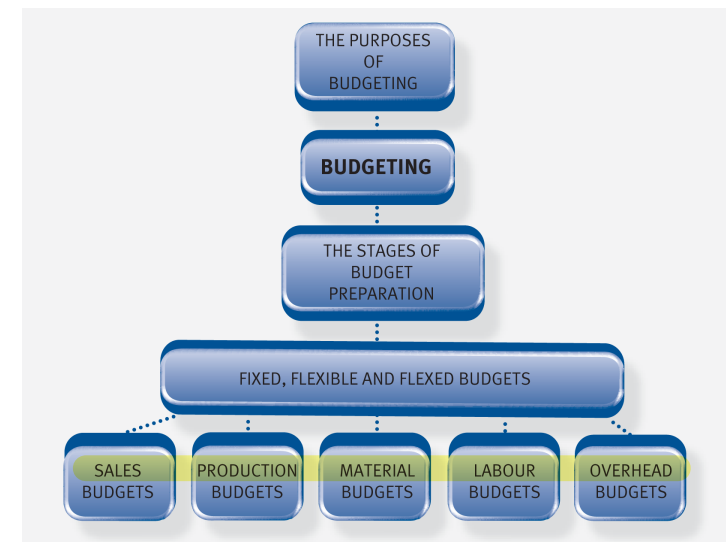
Master Budget and Responsibility Accounting

Budget Defined

- A **budget** is the **quantitative expression of a proposed plan of action** by management for a specified period.
- A budget is an **aid to coordinating what needs to be done** to implement that plan.
- Budgets Help Managers....



Return to strategy > set up processes > budget process > different stages > different types of budgets



Master budget = about statements

Budget theory



Most organisations prepare budgets for the business as a whole. The following budgets may also be prepared by organisations:

- Departmental budgets.
- Functional budgets (for sales, production, expenditure and so on).
- Income statements (in order to determine the expected future profits).
- Cash budgets (in order to determine future cash flows).

How are budgets prepared?



• **Budget committee is formed** The budget committee is responsible for communicating policy guidelines to the people who prepare the budgets and for setting and approving budgets.



Budget manual is produced - gives details of the responsibilities of those involved in the budgeting process, including an organisation chart and a list of budget holders.



Limiting factor is identified – in budgeting, the limiting factor is known as the principal budget factor.

Purposes of budgeting

1. Planning for the future
4. Controlling costs If you don't have a profit: you should control your cost
2. Coordination
3. Communication We all work with budget: information provided by different people
6. Motivation If you have good result: provide motivation
5. Evaluation Performance of managers
- Authorisation Budgets is a form of authorisation

How are budgets prepared?

Final steps in the budget.

- Final steps in the budget. The final stages are as follows.

1. Initial budgets are prepared. Budget managers may sometimes try to build in an element of budget slack – this is a deliberate overestimation of costs or underestimation of revenues which can make it easier for managers to achieve their targets.
2. Initial budgets are reviewed and integrated into the complete budget system.
3. After any necessary adjustments are made to initial budgets, they are accepted and the master budget is prepared.
4. Budgets are reviewed regularly.

Budgeting Cycle:

1. Before the start of a fiscal year, managers at all levels take into account past performance, market feedback, and anticipated future changes to initiate plans for the next period.
2. Senior managers give subordinate managers a frame of reference, a set of specific financial or nonfinancial expectations, against which they will compare actual results.
3. Managers and management accountants investigate any deviations from the plan

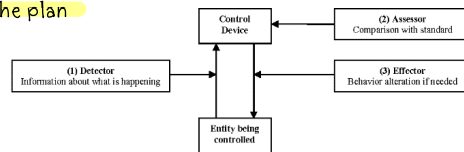


Figure 3. The cybernetic cycle (Anthony/Govindarajan 2007, p.3)

Working Document: Master Budget



The master budget is at the core of the budgeting process. It expresses management's operating and financial plans for a specified period:

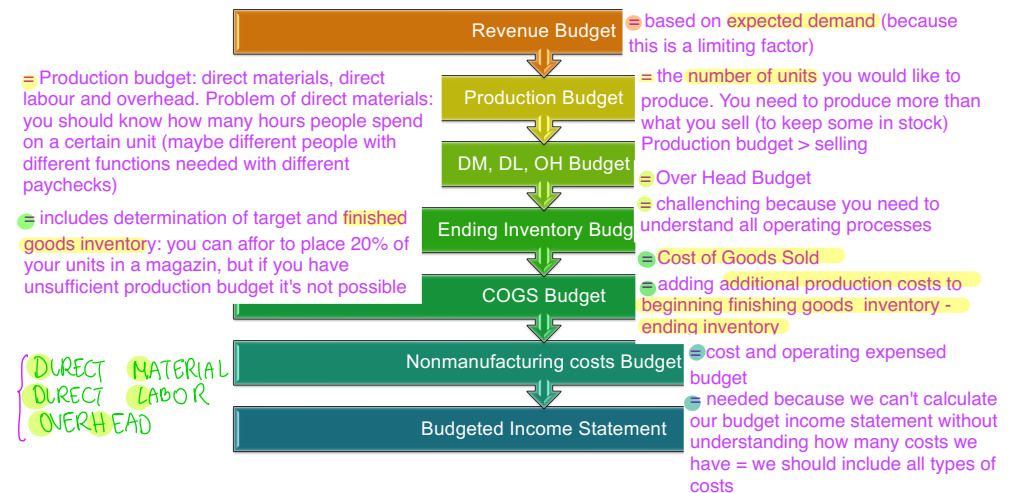
- Operating decisions
- Financial decisions

Operating Budget and Financial Budget

- The operating budget begins with the **Revenues budget**, includes multiple schedules and concludes with the **Budgeted Income Statement**.
- The financial budget is made up of the Capital Expenditure budget, the Cash budget, the Budgeted Balance Sheet, and the Budgeted Statement of Cash Flows.



Basic Operating Budget Steps



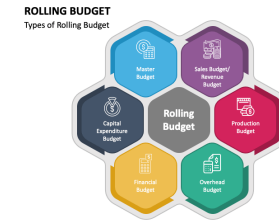
Basic Financial Budget Steps

Based on the **operating budgets**:

1. Prepare the **capital expenditures budget**.
2. Prepare the **cash budget**.
3. Prepare the **budgeted balance sheet**.
4. Prepare the **budgeted statement of cash flows**.

Continuous budget

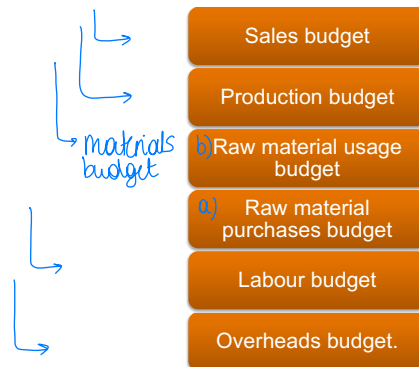
Continuous budget – this type of budget is prepared a year (or budget period) ahead and is updated regularly by adding a further accounting period (month, quarter) when the first accounting period has expired.



Continuous budgets are also known as **rolling budgets**.

Budget preparation – functional budgets

Deze onderwerpen worden straks verder besproken



WILL BE DISCUSSED NOW

Sales budgets

A company makes two products – PS and TG. Sales for next year are budgeted to be 5,000 units of PS and 1,000 units of TG. Planned selling prices are \$95 and \$130 per unit respectively.

Required:

Prepare the sales budget for the next year.

	Total	PS	TG
Sales units	6000	5000	1000
Selling price per unit		95	130
Sales value	605 000	+ 475 000 = 5k.95	+ 130 000 = 1k.130

↳ our sales budget

Sales value = #. \$/#
 PG = 5000 . \$95 = \$475k
 TG = 1000 . \$130 = \$130k

Production budgets

A company makes two products, PS and TG. Forecast sales for the coming year are 5,000 and 1,000 units respectively. The company has the following opening and required closing inventory levels.

Required:

Prepare the production budget for the coming year

	PS units	TG units
Opening inventory	100	50
Required closing inventory	1100	500

Production budgets

Budgeted production levels can be calculated as follows:

Budgeted production = Forecast sales + Closing inventory of finished goods – Opening inventory of finished goods

Production budgets

	PS units	TG units
Sales forecast	5000	1000
+ Closing inventory	1100	500
- Opening inventory	100	50
	6000	1450

Material budgets

There are **two types of material budget** that you need to be able to calculate, the usage budget and the purchases budget.

- The material usage budget** is simply the **budgeted production for each product multiplied by the quantity** (e.g. kg) required to produce one unit of the product.
- The material purchases budget** is made up of the following elements.

Material purchases budget = Material usage budget + Closing inventory – Opening inventory

Newton Ltd manufactures three products. The expected production levels for each product and three types of material are used in varying amounts in the manufacture of the three products are shown below.

Material prices are expected to be 10% higher than this year

3 products

	P 1	P 2	P 3
Budgeted production in units	2,700	4,100	2,800
Material M1	2 kg	3 kg	4 kg
Material M2	3 kg	3 kg	4 kg
Material M3	6 kg	2 kg	4 kg

3 types of materials

	Opening Inventory,	Closing inventory,	Price.
Material M1	4300	2200	1.1
Material M2	3700	1300	3.0
Material M3	4400	2000	2.5

Required: Complete the following.

1.

1.1. The quantity of material M1 to be used is 2.2700 kg = 5400

1.2. The quantity of material M2 to be used is 3.2700 kg = 8100

1.3. The quantity of material M3 to be used is 6.2700 kg = 16200

2.

2.1. The quantity of material M1 to be purchased is 3 kg

These purchases have a value of \$ 12300 kg

2.2. The quantity of material M2 to be purchased is 3 kg

These purchases have a value of \$ 12300 kg

2.3. The quantity of material M3 to be purchased is 2 kg

These purchases have a value of \$ 8800 kg

Answer

Usage	M 1	M 2	M 3
P 1 usage			
P 2 usage			
P 3 usage			
Total			

Answer

	M 1	M 2	M 3
Material usage			
+ Closing inventory			
-Opening inventory			
Material purchase budget (units)			
Material price			
Material purchase budget , value			

Task

A company produces Products PS and TG and has budgeted to produce 6,000 units of Product PS and 1,000 units of Product TG in the coming year.

The data about the labour hours required to produce Products PS and TG is given as follows.

Finished products:

	PS per unit	TG per unit
Direct labour hours	8	12
Standard rate for direct labour = \$5.20 per hour		

Required:

Prepare the labour budget for the coming year = $8 \times 5.2 \times 6000$ units + $12 \times 5.2 \times 1000 = 249600 + 62400 = 312600$.

Labour budgets

Labour budgets are simply the number of hours multiplied by the labour rate per hour as the following illustration shows.

Task

A contract cleaning firm estimates that it will take 2,520 actual cleaning hours to clean an office block. Unavoidable interruptions and lost time are estimated to take 10% of the workers' time.

If the wage rate is \$8.50 per hour, the budgeted labour cost will be:

- A \$19,278
- B \$21,420
- C \$23,562
- D \$23,800

Task

A contract cleaning firm estimates that it will take 2,520 actual cleaning hours to clean an office block. Unavoidable interruptions and lost time are estimated to take 10% of the workers' time. If the wage rate is \$8.50 per hour, the budgeted labour cost will be:

A \$19,278

B \$21,420

C \$23,562

D \$23,800

Actual expected total time =
 $2520 / 0.9 = 2800$ hours

$2800 * 8.50 = 23\ 800$

Overhead budgets

A company produces Products PS and TG and has budgeted to produce 6,000 units of Product PS and 1,000 units of Product TG in the coming year. The following data about the machine hours required to produce Products PS and TG and the standard production overheads per machine hour is relevant to the coming year.

	PS per unit	TG per unit
Machine hours	8	12

Production overheads per machine hour

Variable **Costs** \$1.54 per machine hour

Fixed \$0.54 per machine hour

Required:

Calculate the overhead budget for the coming year.

Overhead budgets

= indirect costs

Products PS

$6000 \text{ units} * 8 \text{ hours} = 48\ 000 \text{ mach/hours}$

Product TG

$1000 \text{ units} * 12 \text{ hours} = 12\ 000$

Total 60 000 mach/hours

Variable costs = $60\ 000 * 1.54 = 92\ 400\$$

Fixed = $60\ 000 * 0.54 = 32\ 400\$$

Total 124 800\$

Fixed, flexible and flexed budgets:

Budgetary control cycle

At the beginning we listed the main purposes of budgeting, one of which was 'controlling costs' – by comparing the plan of the budget with the actual results and investigating any significant differences between the two' – this is known as budgetary control.

The budgetary control cycle can be illustrated as follows.



An example of a budget report is shown below

	Budget	Actual
Sales units	1,000	1,200
Production units	1,300	1,250

Fixed budgets



The simplest form of budget report compares the original budget against actual results and is known as a fixed budget.

Any differences arising between the original budget and actual results are known as variances.

Variances may be either adverse or favourable.

Adverse variances (Adv) or (A) decrease profits.

Favourable variances (Fav) or (F) increase profits.

	\$	\$	\$ Variance
Sales revenue	10,000	11,500	1,500 Fav
Labour costs	2,600	2,125	475 Fav
Materials costs	1,300	1,040	260 Fav
Overheads	1,950	2,200	250 Adv
	5,850	5,365	485 Fav
Cost of sales			
Profit	4,150	6,135	1,985 Fav

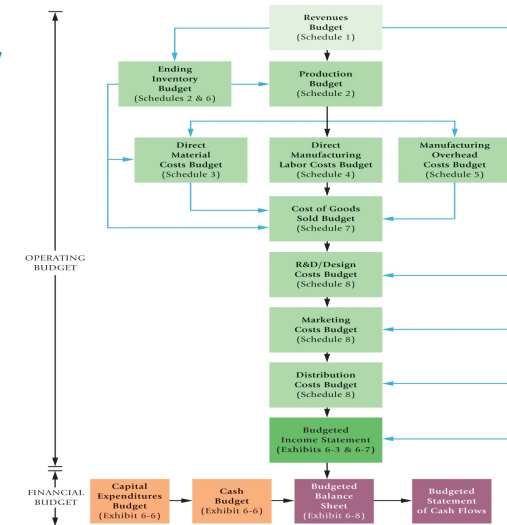
Flexed budgets

A flexed budget is a budget which recognises different cost behaviour patterns and is designed to change as the volume of activity changes.

When preparing flexed budgets it will be necessary to identify the cost behaviour of the different items in the original budget.

In some cases you may have to use the high/low method in order to determine the fixed and variable elements of semivariable costs.

Overview of the Master Budget



Financial Planning Models And Sensitivity Analysis

- Financial planning models are mathematical representations of the relationships among operating activities, financing activities and other factors that affect the master budget.
- Sensitivity analysis is a "what-if" technique that examines how a result will change if the original predicted data are not achieved or if an underlying assumption changes.

Sensitivity Analysis

- Sensitivity analysis is used to assist managers in planning and budgeting.
- Sensitivity analysis is a "what-if" technique that illustrates the impact of changes from the predicted data.
- Two scenarios are being considered for Stylistic Furniture's (the company from our textbook) budget.

	A	B	C	D	E	F	G	H	I
1	Key Assumptions								
2		Units Sold		Selling Price		Direct Material Cost		Budgeted Operating Income	
3	What-If Scenario	Casual	Deluxe	Casual	Deluxe	Red Oak	Granite	Dollars	Change from Master Budget
4	Master budget	50,000	10,000	\$600	\$800	\$7.00	\$10.00	\$4,860,000	
5	Scenario 1	50,000	10,000	582	776	\$7.00	\$10.00	3,794,100	22% decrease
6	Scenario 2	50,000	10,000	600	800	\$7.35	\$10.50	4,483,800	8% decrease

Budgeting and Responsibility Accounting

Responsibility Center

There are four types of responsibility centers.

- **Cost**—accountable for costs only
- **Revenue**—accountable for revenues only
- **Profit**—accountable for revenues and costs
- **Investment**—accountable for investments, revenues, and costs

Responsibility and Controllability

Controll + ability is the degree of influence a specific manager has over costs, revenues, or related items for which he or she is responsible.

Responsibility accounting helps managers to first focus on whom they should ask to obtain information and not on whom they should blame.

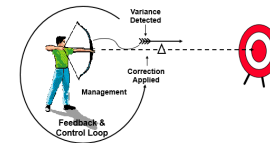
Responsibility accounting focuses on gaining information and knowledge, not only on control.

The fundamental purpose of responsibility accounting is to enable future improvement.

Budgets and Feedback

Budgets, coupled with responsibility accounting, provide feedback to top managers about the performance relative to the budget of different responsibility center managers.

Budgets offer feedback in the form of variances: actual results deviate from budgeted targets.



Human Aspects of Budgeting and Budgetary Slack

- Human Aspect of Budgeting
- Budgetary Slack

Sales budget

A company makes two products – A and B. The products are sold in the ratio 1:1. Planned selling prices are \$100 and \$200 per unit respectively. The company needs to earn \$900,000 revenue in the coming year.

Required:

Prepare the sales budget for the coming year.

$$\begin{aligned}
 900k &= \$100x + \$200y \quad \text{but } x:y = 1:1 \\
 &= \$300x \quad \quad \quad x=y \\
 \hookrightarrow x &= 3k \\
 \text{Ans } x &= 3k, \$100 = \$300k \quad \$900k \\
 y &= 3k, \$200 = \$600k
 \end{aligned}$$

Labor budget

	P 1	P 2	P 3
Budgeted production in units	2,700	4,100	2,800
Hours per unit			
Skilled labour	3	1	3
Semi-skilled labour	4	4	2

Newton Ltd manufactures three products. Two types of labour are used in producing the three products. The expected production levels for each product and standard times per unit and expected wage rates for the forthcoming year are shown below.

Skilled labour is to be paid at the rate of \$9/hour and semiskilled labour at the rate of \$6/hour.

Required:

Complete the following.

The number of hours of skilled labour required is

The cost of this labour is \$

$$\begin{aligned}
 \hookrightarrow &= 20,600.9 + 32,800.6 \\
 &= 115,4k + 196.8k = \$312,200
 \end{aligned}$$

$$\begin{aligned}
 * \text{Skilled hours} &= P_1 + P_2 + P_3 = 3 \frac{\text{hr}}{\text{unit}} \cdot 2,700 + 1 \cdot 4,100 + 3 \cdot 2,800 \\
 &= 8,100 + 4,100 + 8,400 \\
 &= 20,600 \\
 * \text{semi skilled hours} &= 4 \cdot 2,700 + 4 \cdot 4,100 + 2 \cdot 2,800 \\
 &= 10,800 + 16,400 + 5,600 = 32,800
 \end{aligned}$$

Production budget

↳ prev. lecture

Newton Ltd manufactures three products. The expected sales for each product are shown below.

	Product 1	Product 2	Product 3
Sales in units	3,000	4,500	3,000
Opening inventory is expected to be:			
Product 1	500 units		
Product 2	700 units		
Product 3	500 units		

Management have stated their desire to reduce inventory levels, and closing inventory is budgeted as:

Product 1	200 units
Product 2	300 units
Product 3	300 units

Required:

Complete the following:

- The number of units of product 1 to be produced is
- The number of units of product 2 to be produced is
- The number of units of product 3 to be produced is

Overhead budget

	P 1	P 2	P 3
Budgeted production in units	2,700	4,100	2,800
Hours per unit			
Skilled labour	3	1	3
Semi-skilled labour	4	4	2

Newton Ltd manufactures three products. Two types of labour are used in producing the three products. The expected production levels for each product and standard times per unit and expected wage rates for the forthcoming year are shown below.

Production overheads per labour hour are as follows:

Variable \$3.50 per labour hour

Fixed \$5.50 per labour hour

Required:

Calculate the overhead budget.

Terms to Learn—(1 of 2)

TERMS TO LEARN	PAGE NUMBER REFERENCE
Activity-based budgeting (ABB)	229
Budgetary slack	240
Cash budget	247
Continuous budget	222
Controllability	239
Controllable cost	239
Cost center	238
Financial budget	223
Financial planning models	235
Investment center	238
Kaizen budgeting	242

Terms to Learn—(2 of 2)

TERMS TO LEARN	PAGE NUMBER REFERENCE
Master budget	219
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Organization structure	237
Pro forma statements	219
Profit center	238
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Responsibility center	238
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Rolling forecast	222

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Accounting for Manager

Relevant costing

Visiting professor, Dr. Ruslana Kuzina

Faculty of Economics and Business

Relevant Information Terminology

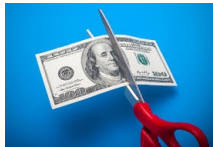
- **Relevant information** has two characteristics:
 - It **occurs in the future**
 - It **differs among the alternative courses** of action.
- A **relevant cost** is a **cost** that differs between alternatives.
- A **relevant revenue/benefit** is a **revenue/benefit** that differs between alternatives.



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Relevant Costing

- **Relevant cost** are future costs that differ among competing decision alternatives
- **Irrelevant costs** are that **DO NOT** differ among competing decision alternatives



For example, there is an alternative: buy equipment or rent it.

However, until a final decision is made, the cost of production equipment and rent are **relevant costs**. Whereas the cost of electricity consumed by the equipment will be **irrelevant costs**, since they will occur in both cases.

3

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Relevant Information Terminology

- The costs that make up the difference between alternative solutions are called **differential costs**.
- *So, differential costs are the difference between the cost of equipment and the amount of rent for the entire period of its operation.*
- **Differential cost**—the difference in total cost between two alternatives.
- **Differential revenue**—the difference in total revenue between two alternatives.

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Relevant Information Terminology

- **Explicit costs** represent any costs involved in the payment of cash or another tangible resource by a company. Rent, salary, and other operating expenses are considered explicit costs.
- An **opportunity cost** is the benefit that is foregone as a result of pursuing some course of action.

*For example, we have \$ 10,000, the question is: put it in the bank for a deposit or buy a car and rent it out. By opening a deposit, we pay a fee for opening it (**explicit costs**) and lose income from renting a car (**opportunity costs**). When purchasing a car, we spend money on its purchase (**explicit costs**) and lose income from interest on the deposit (**opportunity costs**).*

Before a decision is made, both costs are relevant, because we can influence them.

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Relevant Information Terminology

- **Incremental cost**—the additional total cost incurred for an activity.
- **Incremental revenue**—the additional total revenue from an activity.
- Past costs (historical costs) are never relevant and are also called **sunk costs**. *Because they already happened*
- Costs that have already occurred and cannot be changed are classified as sunk costs.
- **Sunk costs** are excluded because they cannot be changed by future actions.

6

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Relevant Information Terminology

- An **avoidable cost** is a cost that **can be eliminated**, in whole or in part, by choosing one alternative over another. Avoidable costs **are relevant costs**. Unavoidable costs are irrelevant costs.
- Two broad categories of costs are **NEVER** relevant in any decision. They include:
 - 1 Sunk costs.
 - 2 A future cost that does not differ between the alternatives.



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Relevant Information – Introductory Example

Identifying Relevant Costs

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Identifying Relevant Costs



Goele, a Boston student, is considering visiting her friend in New York. She can drive or take the train. By car, it is 230 miles to her friend's apartment. She is trying to decide which alternative is less expensive and has gathered the following information.

Automobile Costs (based on 10,000 miles driven per year)		
	Annual Cost of Fixed Items	Cost per Mile
1 Annual straight-line depreciation on car	\$ 2,800	\$ 0,280
2 Cost of gasoline		0,100
3 Annual cost of auto insurance and license	1,380	0,138
4 Maintenance and repairs		0,065
5 Parking fees at school	360	0,036
6 Total average cost		\$ 0,619

- Non-current (fixed) assets are gradually used up in providing goods and services over time.
- Purpose of accounting depreciation is to spread the cost of a non-current (fixed) asset over its expected useful life.
- Depreciation is a method of allocating cost.
- Achieves a **matching** of costs against the related revenues.

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Identifying Relevant Costs



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4 Maintenance and repairs		0,065
5 Parking fees at school	360	0,036
6 Total average cost		\$ 0,619

\$45 per month × 8 months

\$2.70 per gallon ÷ 27 MPG

\$24,000 cost – \$10,000 salvage value ÷ 5 years

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Identifying Relevant Costs

Automobile Costs (based on 10,000 miles driven per year)		
	Annual Cost of Fixed Items	Cost per Mile
1 Annual straight-line depreciation on car	\$ 2,800	\$ 0.280
2 Cost of gasoline		0.100
3 Annual cost of auto insurance and license	1,380	0.138
4 Maintenance and repairs		0.065
5 Parking fees at school	360	0.036
6 Total average cost		<u>\$ 0.619</u>

Not only cost per mile but also

Additional Information		
7 Reduction in resale value of car per mile of wear		\$ 0.026
8 Round-trip train fare		\$ 104
9 Benefits of relaxing on train trip		????
10 Cost of putting dog in kennel while gone		\$ 40
11 Benefit of having car in New York		????
12 Hassle of parking car in New York		????
13 Per day cost of parking car in New York		\$ 25

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Identifying Relevant Costs

Which costs and benefits are relevant in the decision?

- The cost of the car
- The annual cost of insurance
- The cost of gasoline
- The cost of maintenance and repairs
- The monthly school parking fee
- The decline in resale value due to additional miles
- The round-trip train fare
- Relaxing on the train
- The kennel cost
- The cost of parking in New York
- The benefits of having a car in New York
- The problems of finding a parking space

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Identifying Relevant Costs

Which costs and benefits are relevant in the decision?

- The cost of the car (**Irrelevant**)
- The annual cost of insurance (**Irrelevant**)
- the cost of gasoline (**Relevant**)
- The cost of maintenance and repairs (**Relevant**)
- The monthly school parking fee (**Irrelevant**)
- The decline in resale value due to additional miles (**Relevant**)
- The round-trip train fare (**Relevant**)
- Relaxing on the train (**Relevant**)
- The kennel cost (**Irrelevant**)
- The cost of parking in New York (**Relevant**)
- The benefits of having a car in New York (**Relevant**)
- The problems of finding a parking space (**Relevant**)

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Identifying Relevant Costs

From a financial standpoint, Goele would be better off taking the train to visit her friend. Some of the non-financial factors may influence her final decision.

Relevant Financial Cost of Driving	
Gasoline (460 @ \$0.100 per mile)	\$ 46.00
Maintenance (460 @ \$0.065 per mile)	29.90
Reduction in resale (460 @ \$0.026 per mile)	11.96
Parking in New York (2 days @ \$25 per day)	50.00
Total	<u>\$ 137.86</u>

Relevant Financial Cost of Taking the Train	
Round-trip ticket	<u>\$ 104.00</u>

So train is cheaper, she should choose the train

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Five-step Decision- Making Process

= you need to know this



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Five-step Decision-Making Process –Study Yourself

Exhibit 11.2 Determining Relevant Revenues and Relevant Costs for Precision Sporting Goods **Big difference between the two options**

	All Revenues and Costs		Relevant Revenues and Costs	
	Alternative 1: Do Not Reorganize	Alternative 2: Reorganize	Alternative 1: Do Not Reorganize	Alternative 2: Reorganize
Revenues ^a	\$6,250,000	\$6,250,000	—	—
Costs:				
Direct materials ^b	1,250,000	1,250,000	—	—
Manufacturing labor	640,000 ^c	480,000 ^d	\$ 640,000 ^c	\$ 480,000 ^d
Manufacturing overhead	750,000	750,000	—	—
Marketing	2,000,000	2,000,000	—	—
Reorganization costs	—	90,000	—	90,000
Total costs	4,640,000	4,570,000	640,000	570,000
Operating income	\$1,610,000	\$1,680,000	\$(640,000)	\$(570,000)
	\$70,000 Difference		\$70,000 Difference	

^a25,000 units × \$250 per unit = \$6,250,000

^b25,000 units × \$50 per unit = \$1,250,000

^c20 workers × 2,000 hours per worker × \$16 per hour = \$640,000

^d15 workers × 2,000 hours per worker × \$16 per hour = \$480,000

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Total and Differential Cost/Benefit Approaches

Total and Differential Cost/Benefit Approach

There are **many approaches** that you can use to solve the exercises. Here, we are getting to know **two approaches**.

- **Total Cost/Benefit Approach:** In this approach, we calculate all of the costs and benefits of each alternative.
- **Differential Cost/Benefit Approach**
 - In this approach, we first eliminate costs and benefits that do not differ between alternatives.
 - Then, we use the remaining costs and benefits that differ between alternatives in making the decision. The costs that remain are the differential, or avoidable, costs.



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Total and Differential Cost/Benefit Approaches – An Example

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Total and Differential Cost/Benefit Approaches – An Example

The management of a company is considering a **new labor saving machine** > we need fewer people that rents for **\$3,000 per year**. Data about the company's annual sales and costs with and without the new machine are:

	Current Situation
Sales (5,000 units @ \$40 per unit)	\$ 200.000
Less variable expenses:	
Direct materials (5,000 units @ \$14 per unit)	70.000
Direct labor (5,000 units @ \$8 and \$5 per unit)	40.000
Variable overhead (5,000 units @ \$2 per unit)	10.000
Total variable expenses	120.000
Contribution margin	80.000
Less fixed expense:	
Other	62.000
Rent on new machine	-
Total fixed expenses	62.000
Net operating income	\$ 18.000

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Total and Differential Cost/Benefit Approaches – An Example

As you can see, the only costs that differ between the alternatives are the **direct labor costs** savings and the increase in fixed rental costs.

	Current Situation	Situation With New Machine	Differential Costs and Benefits
Sales (5,000 units @ \$40 per unit)	\$ 200.000	\$ 200.000	-
Less variable expenses:			
Direct materials (5,000 units @ \$14 per unit)	70.000	70.000	-
Direct labor (5,000 units @ \$8 and \$5 per unit)	40.000	25.000	15.000
Variable overhead (5,000 units @ \$2 per unit)	10.000	10.000	-
Total variable expenses	120.000	105.000	-
Contribution margin	80.000	95.000	15.000
Less fixed expense:			
Other	62.000	62.000	-
Rent on new machine	-	3.000	(3.000)
Total fixed expenses	62.000	65.000	(3.000)
Net operating income	\$ 18.000	\$ 30.000	12.000

Total and Differential Cost/Benefit Approaches – An Example

As you can see, the only costs that differ between the alternatives are the **direct labor costs** savings and the increase in fixed rental costs.

	Current Situation	Situation With New Machine	Differential Costs and Benefits
Sales (5,000 units @ \$40 per unit)	\$ 200.000	\$ 200.000	-
Less variable expenses:			
Direct materials (5,000 units @ \$14 per unit)	70.000	70.000	-
Direct labor (5,000 units @ \$8 and \$5 per unit)	40.000	25.000	15.000
Variable overhead (5,000 units @ \$2 per unit)	10.000	10.000	-
Total variable expenses	120.000	105.000	-
Contribution margin	80.000	95.000	15.000
Less fixed expense:			
Other	62.000	62.000	-
Rent on new machine	-	3.000	(3.000)
Total fixed expenses	62.000	65.000	(3.000)
Net operating income	\$ 18.000	\$ 30.000	12.000

We can efficiently analyze the decision by looking at the different costs and revenues and arrive at the same solution.

Net Advantage to Renting the New Machine

Decrease in direct labor costs (5,000 units @ \$3 per unit)	\$ 15,000
Increase in fixed rental expenses	(3,000)
Net annual cost saving from renting the new machine	\$ 12,000

Decision Making and Relevant Information- Examples

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One Time Only Special Order

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One Time Only Special Order

One Time Only special-order decision is a decision relating to the consideration of an offer received for a **one-time sale of a product** or service at a price below normal or even below cost.

Example

Company "K" sells pumps at a price of \$6,000 per unit. Customer B offers to buy 100 units of pumps, but the offered price is \$4,800 per unit

The accountant prepared a calculation for this proposal:

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One Time Only Special Order

#	Costs	Total	Per unit
1	Direct materials	200 000	2 000
2	Direct Labor	150 000	1 500
3	Overhead (including 60% fixed)	80 000	800
4	Marketing costs (including 50% fixed)	65 000	650
	Total	495 000	4 950

It looks like you have a loss of

Losses = $(4950 - 4800) \times 100 \text{ units} = \15000

BUT!!!

Managerial accountant presented the own calculation.

But the accounting manager calculated it in another way

Remember if we produce more units, our fixed cost per unit is decreasing.
If we use CVP analysis: another approach

One Time Only Special Order

Incremental revenue = 4800×100 units = \$480 000

Incremental costs

- Direct materials = $2000 \times 100 = \$200\,000$
- Direct Labor = $1500 \times 100 = \$150\,000$
- Variable overhead = $80000 \times 0,4 = \$32\,000$
= 40%
- Variable marketing costs = $65000 \times 0,5 = \$32\,500$
= 50%

TOTAL 414 500

Incremental profit = $480\,000 - 414\,500 = 65\,500$ You have additional profit

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Special Order – Example

Jet Inc.		
Contribution Income Statement		
Revenue (5,000 × \$20)		\$ 100,000
Variable costs:		
Direct materials	\$ 20,000	
Direct labor	5,000	
Manufacturing overhead	10,000	
Marketing costs	5,000	
Total variable costs		40,000
Contribution margin		60,000
Fixed costs:		
Manufacturing overhead	\$ 28,000	
Marketing costs	20,000	
Total fixed costs		48,000
Net operating income		\$ 12,000

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Special Orders – Example

Jet Inc.		
Contribution Income Statement		
Revenue (5,000 × \$20)		\$ 100,000
Variable costs:		
Direct materials	\$ 20,000	
Direct labor	5,000	
Manufacturing overhead	10,000	
Marketing costs	5,000	
Total variable costs		40,000
Contribution margin		60,000
Fixed costs:		
Manufacturing overhead	\$ 28,000	
Marketing costs	20,000	
Total fixed costs		48,000
Net operating income		\$ 12,000

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Special Orders – Example

Jet Inc.		
Contribution Income Statement		
Revenue (5,000 × \$20)		\$ 100,000
Variable costs:		
Direct materials	\$ 20,000	
Direct labor	5,000	
Increase in revenue (3,000 × \$10)		
		\$30,000
Increase in costs (3,000 × \$8 variable cost)		
		24,000
Increase in net income		
		\$ 6,000
Manufacturing overhead	\$ 28,000	
Marketing costs	20,000	
Total fixed costs		48,000
Net operating income		\$ 12,000

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Adding or Dropping Product Line or Segment

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Adding or Dropping Segment

Adding or Dropping segment is the decision to expand or drop services, products, divisions, and other segments based on a cost-benefit analysis.

The accountant of the supermarket "O" prepared a managerial report of the activities.

	Food segment	Alcohol	Cosmetics	Total
Sales	60 000	25 000	14 400	99 400
Variable costs	41 000	17 000	10 700	68 700
Contribution margin	19 000 (32%)	8 000 (32%)	3 700 (26%)	30 700 (31%)
Fixed costs:				
Per segment	8 800	4 900	2 500	16 200
Corporate	5 000	1 500	1 300	7 800
Profit	5 200	1 600	- 100	6 700

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Adding or Dropping Segment

Option 1

The dropping of the cosmetics section will not lead to a reduction in the corporate fixed costs of the store, and the area of the cosmetic section will not be used for the sale of other goods.

Decreasing of Contribution margin	3 700	If we drop cosmetic segment covered also fixed costs > before changes we had a total profit of 6700 for all departments > if we drop cosmetics: we still receive - 1200 because cosmetic doesn't cover the fixed cost
Fixed costs (Cosmetic segment)	2500	
Decreasing of Total Profit		
If we drop cosmetic segment	(1200)	

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Adding or Dropping Segment

Option 2: Let's assume that the area dropping by the cosmetics section will be used to expand the alcohol section, which will increase sales by \$12 000, and will require additional fixed costs \$1680. Since the alcohol section has a contribution margin ratio of 32%, the increase in sales by \$12 000, respectively, will provide an increase in contribution margin by \$3840.

	Before changes	Drop cosmetic section	Adding Alcohol section	After changes
Sales	99 400	14 400	12 000	97 000
Variable costs	68 700	10 700	12000-3840=8160	66 160
Contribution margin	30 700 (31%)	3 700	3840	30 840
Fixed costs:	16 200	2 500	1680	15 380
Contribution in covering corporate expenses	14 500	1 200	2 160	15 460
Corporate	7 800	-		7 800
Profit	6 700	1 200	2160	7 660

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Only dropping cosmetics doesn't work but if we replace by profitable area we can create more profit

So do we need to drop this line or not?
 > we already have equipment: even if we drop the line we still have depreciation to pay

Adding/Dropping Segments – Example

Segment Income Statement Digital Watches			
Sales			\$ 500,000
Less: variable expenses			
Variable manufacturing costs	\$ 120,000		
Variable shipping costs	5,000		
Commissions	75,000	200,000	
Contribution margin			\$ 300,000
Less: fixed expenses			
General factory overhead	\$ 60,000		
Salary of line manager	90,000		
Depreciation of equipment	50,000		
Advertising - direct	100,000		
Rent - factory space	70,000		
General admin. expenses	30,000	400,000	
Net operating loss			\$ (100,000)

Comparative Income Approach Solution			
	Keep Digital Watches	Drop Digital Watches	Difference
Sales	\$ 500,000	\$ -	\$ (500,000)
Less variable expenses:			
Manufacturing expenses	120,000	-	120,000
Shipping	5,000	-	5,000
Commissions	75,000	-	75,000
Total variable expenses	200,000	-	200,000
Contribution margin	300,000	-	(300,000)
Less fixed expenses:			
General factory overhead	60,000		
Salary of line manager	90,000		
Depreciation	50,000		
Advertising - direct	100,000		
Rent - factory space	70,000		
General admin. expenses	30,000		
Total fixed expenses	400,000		
Net operating loss	\$ (100,000)		

If the digital watch line is dropped, the company loses \$300,000 in contribution margin.

Comparative Income Approach Solution			
	Keep Digital Watches	Drop Digital Watches	Difference
Sales	\$ 500,000	\$ -	\$ (500,000)
Less variable expenses:			
Manufacturing expenses	120,000	-	120,000
Shipping	5,000	-	5,000
Commissions	75,000	-	75,000
Total variable expenses	200,000	-	200,000
Contribution margin	300,000	-	(300,000)
Less fixed expenses:			
General factory overhead	60,000	60,000	-
Salary of line manager	90,000	-	90,000
Depreciation			
Advertising - direct			
Rent - factory space			
General admin. expenses			
Total fixed expenses			
Net operating loss			

On the other hand, the general factory overhead would be the same under both alternatives, so it is irrelevant.

Comparative Income Approach Solution			
	Keep Digital Watches	Drop Digital Watches	Difference
Sales	\$ 500,000	\$ -	\$ (500,000)
Less variable expenses:			
Manufacturing expenses	120,000	-	120,000
Shipping	5,000	-	5,000
Commissions	75,000	-	75,000
Total variable expenses	200,000	-	200,000
Contribution margin	300,000	-	(300,000)
Less fixed expenses:			
General factory overhead	60,000	60,000	-
Salary of line manager	90,000	-	90,000
Depreciation	50,000		
Advertising - direct	100,000		
Rent - factory space	70,000		
General admin. expenses	30,000		
Total fixed expenses	400,000		
Net operating loss	\$ (100,000)		

The salary of the product line manager would disappear, so it is relevant to the decision.

Comparative Income Approach Solution			
	Keep Digital Watches	Drop Digital Watches	Difference
Sales	\$ 500,000	\$ -	\$ (500,000)
Less variable expenses:			
Manufacturing expenses	120,000	-	120,000
If they drop the digital watches, the expenses associated with depreciation cannot be avoided in this particular example.			
General factory overhead	60,000	60,000	-
Salary of line manager	90,000	-	90,000
Depreciation	50,000	50,000	-
Advertising - direct	100,000	-	100,000
Rent - factory space	70,000	-	70,000
General admin. expenses	30,000	-	30,000
Total fixed expenses	400,000	-	400,000
Net operating loss	\$ (100,000)	\$ -	\$ (100,000)

Comparative Income Approach Solution			
	Keep Digital Watches	Drop Digital Watches	Difference
Sales	\$ 500,000	\$ -	\$ (500,000)
Less variable expenses:			
Manufacturing expense	120,000	-	120,000
Shipping	5,000	-	5,000
Commissions	5,000	-	5,000
Total variable expenses	130,000	-	130,000
Contribution margin	370,000	-	370,000
Less fixed expenses:			
General factory overhead	-	-	-
Salary of line manager	-	-	-
Depreciation	50,000	50,000	-
Advertising - direct	100,000	-	100,000
Rent - factory space	70,000	-	70,000
General admin. expenses	30,000	30,000	-
Total fixed expenses	260,000	140,000	120,000
Net operating loss	\$ (100,000)	\$ (140,000)	\$ (40,000)

Insourcing V Outsourcing and Make-or-Buy Decisions

Make-or-Buy Decisions

The **Make-or-Buy Decisions** is a decision related to the consideration of the existing alternative: to produce independently individual components of the product (parts, components) or buy them from suppliers.

Example Company "N" produces agricultural machinery, which requires part "A". The company produces this part itself; the annual demand is 30,000 units.

The supplier offers the part at a price of \$40. Should the Company accept the offer?

Direct materials	14
Direct labor	10
Variable overheads	2
Depreciation of special equipment	4
Corporate expenses	17
Total	47

Make-or-Buy Decisions

	Costs per unit	Relevant costs		Total relevant costs	
		make	buy	make	buy
Direct materials	14	14		420 000	
Direct labor	10	10		300 000	
Variable overheads	2	2		60 000	
Depreciation	4				
Corporate expenses	17				
Price			40		
Total	47	26	40	780 000	1 200 000
Differential costs		14		420 000	

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Make-or-Buy Decisions

However, when we are making a decision, we should think about opportunity costs.

Let's assume that we can lease the free production space for \$40,000 per month (in case we stopped of the part "A" production).

Costs	make	buy
Explicit costs	780 000	1 200 000
Opportunity costs	480 000(40*12)	
Total	1 260 000	1 200 000
Differential costs		60 000

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The Make or Buy Decision - Example

Essex Company manufactures part 4A that is used in one of its products. The unit product cost of this part is:

Direct materials	\$ 9
Direct labor	5
Variable overhead	1
Supervisor's salary	2
General factory overhead	10
Unit product cost	<u>\$ 27</u>

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The Make or Buy Decision - Example

	Cost Per Unit	Cost of 20,000 Units	
		Make	Buy
Outside purchase price	\$ 25		\$ 500.000
Direct materials (20,000 units)	\$ 9	180.000	
Direct labor	5	100.000	
Variable overhead	1	20.000	
Supervisor's salary	2	40.000	
General factory overhead	10	-	
Total cost	<u>\$ 27</u>	<u>\$ 340.000</u>	<u>\$ 500.000</u>

The **avoidable costs** associated with making part 4A include direct materials, direct labor, variable overhead, and the supervisor's salary.

The Make or Buy Decision – Example

	Cost Per Unit	Cost of 20,000 Units	
		Make	Buy
Outside purchase price	\$ 25		\$ 500.000
Direct materials (20,000 units)	\$ 9	180.000	
Direct labor	5	100.000	
Variable overhead	1	20.000	
Supervisor's salary	2	40.000	
General factory overhead	10	-	
Total cost	\$ 27	\$ 340.000	\$ 500.000

Not avoidable; irrelevant. If the product is dropped, it will be reallocated to other products.

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The Make or Buy Decision – Example

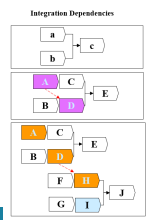
	Cost Per Unit	Cost of 20,000 Units	
		Make	Buy
Outside purchase price	\$ 25		\$ 500.000
Direct materials (20,000 units)	\$ 9	180.000	
Direct labor	5	100.000	
Variable overhead	1	20.000	
Supervisor's salary	2	40.000	
General factory overhead	10	-	
Total cost	\$ 27	\$ 340.000	\$ 500.000

Should we make or buy part 4A?

Given that the total avoidable costs are less than the cost of buying the part, Essex should continue to make the part.

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Product-Mix Decisions with Capacity Constraints



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Utilization of a Constrained Resource: An Example

Ensign Company produces two products and selected data are shown below:

	Product	
	1	2
Selling price per unit	\$ 60	\$ 50
Less variable expenses per unit	36	35
Contribution margin per unit	\$ 24	\$ 15
Current demand per week (units)	2,000	2,200
Contribution margin ratio	40%	30%
Processing time required on machine A1 per unit	1.00 min.	0.50 min.

Quick Check ✓

What generates more profit for the company, using one minute of machine A1 to process Product 1 or using one minute of machine A1 to process Product 2?

- a. Product 1
- b. Product 2
- c. They both would generate the same profit.
- d. Cannot be determined.



Quick Check ✓

What generates more profit for the company, using one minute of machine A1 to process Product 1 or using one minute of machine A1 to process Product 2?

- a. Product 1
- b. Product 2
- c. They both would generate the same profit.
- d. Cannot be determined.

With one minute of machine A1, Ensign could make 1 unit of Product 1, with a contribution margin of \$24, or 2 units of Product 2, each with a contribution margin of \$15 per unit.

$$2 \times \$15 = \$30 > \$24$$

Utilization of a Constrained Resource

The key is the contribution margin per unit of the constrained resource.

	Product	
	1	2
Contribution margin per unit	\$ 24	\$ 15
Time required to produce one unit	÷ 1.00 min.	÷ 0.50 min.
Contribution margin per minute	\$ 24	\$ 30

Ensign should emphasize **Product 2** because it generates a contribution margin of \$30 per minute of the constrained resource relative to \$24 per minute for Product 1.

Utilization of a Constrained Resource

The key is the contribution margin per unit of the constrained resource.

	Product	
	1	2
Contribution margin per unit	\$ 24	\$ 15
Time required to produce one unit	÷ 1.00 min.	÷ 0.50 min.
Contribution margin per minute	\$ 24	\$ 30

Ensign can maximize its contribution margin by first producing **Product 2** to meet customer demand and then using any remaining capacity to produce Product 1. The calculations would be performed as follows.

Utilization of a Constrained Resource

Let's see how this plan would work.

Alloting Our Constrained Resource (Machine A1)

Weekly demand for Product 2	2,200	units
Time required per unit	× 0.50	min.
Total time required to make Product 2	<u>1,100</u>	min.

IVEN

Utilization of a Constrained Resource

Let's see how this plan would work.

Alloting Our Constrained Resource (Machine A1)

Weekly demand for Product 2	2,200	units
Time required per unit	× 0.50	min.
Total time required to make Product 2	<u>1,100</u>	min.
Total time available	2,400	min.
Time used to make Product 2	<u>1,100</u>	min.
Time available for Product 1	<u>1,300</u>	min.

IVEN

Utilization of a Constrained Resource

Let's see how this plan would work.

Alloting Our Constrained Resource (Machine A1)

Weekly demand for Product 2	2,200	units
Time required per unit	× 0.50	min.
Total time required to make Product 2	<u>1,100</u>	min.

Total time available	2,400	min.
Time used to make Product 2	<u>1,100</u>	min.
Time available for Product 1	<u>1,300</u>	min.
Time required per unit	÷ 1.00	min.
Production of Product 1	<u>1,300</u>	units

IVEN

Utilization of a Constrained Resource

According to the plan, we will produce 2,200 units of Product 2 and 1,300 of Product 1. Our contribution margin looks like this.

	Product 1	Product 2
Production and sales (units)	<u>1,300</u>	<u>2,200</u>
Contribution margin per unit	\$ 24	\$ 15
Total contribution margin	<u>\$ 31,200</u>	<u>\$ 33,000</u>

The total contribution margin for Ensign is \$64,200.

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Value of a Constrained Resource

The additional machine time would be used to make more units of Product 1, which had a contribution margin per minute of \$24.

Ensign should be willing to pay up to \$24 per minute. This amount equals the contribution margin per minute of machine time that would be earned producing more units of Product 1.

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Quick Check ✓

Colonial Heritage makes reproduction colonial furniture from select hardwoods.

	<i>Chairs</i>	<i>Tables</i>
Selling price per unit	\$80	\$400
Variable cost per unit	\$30	\$200
Board feet per unit	2	10
Monthly demand	600	100

The company's supplier of hardwood will only be able to supply 2,000 board feet this month. Is this enough hardwood to satisfy demand?

- a. Yes
- b. No

Quick Check ✓

Colonial Heritage makes reproduction colonial furniture from select hardwoods.

	<i>Chairs</i>	<i>Tables</i>
Selling price per unit	\$80	\$400
Variable cost per unit	\$30	\$200
Board feet per unit	2	10
Monthly demand	600	100

The company's supplier of hardwood will only be able to supply 2,000 board feet this month. Is this enough hardwood to satisfy demand?

a. Yes

b. No

$$(2 \times 600) + (10 \times 100) = 2,200 > 2,000$$

Quick Check ✓

	<i>Chairs</i>	<i>Tables</i>
Selling price per unit	\$80	\$400
Variable cost per unit	\$30	\$200
Board feet per unit	2	10
Monthly demand	600	100

The company's supplier of hardwood will only be able to supply 2,000 board feet this month. What plan would maximize profits?

- a. 500 chairs and 100 tables
- b. 600 chairs and 80 tables
- c. 500 chairs and 80 tables
- d. 600 chairs and 100 tables

Quick Check ✓

	Chairs	Tables
Selling price per unit	\$ 80	\$ 400
Variable cost per unit	30	200
Contribution margin	\$ 50	\$ 200
Board feet per unit	2	10
CM per board foot	\$ 25	\$ 20
Production of chairs	600	
Board feet required	1,200	
Board feet remaining	800	
Board feet per table	10	
Production of tables	80	

The company's supplier can only supply 2,000 board feet this month. What plan would maximize profit?

a. 500 chairs and 100 tables
b. 600 chairs and 80 tables
c. 500 chairs and 80 tables
d. 600 chairs and 100 tables

Quick Check ✓

As before, Colonial Heritage's supplier of hardwood will only be able to supply 2,000 board feet this month. Assume the company follows the plan we have proposed. Up to how much should Colonial Heritage be willing to pay above the usual price to obtain more hardwood?

- \$40 per board foot
- \$25 per board foot
- \$20 per board foot
- Zero

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Quick Check ✓

As before, Colonial Heritage's supplier of hardwood will only be able to supply 2,000 board feet this month. Assume the company follows the plan we have proposed. The additional wood would be used to make tables. In this use, each board foot of additional wood will allow the company to earn an additional \$20 of contribution margin and profit.

- \$40 per board foot
- \$25 per board foot
- \$20 per board foot
- Zero



Managing Constraints

It is often possible for a manager to increase the capacity of a bottleneck, which is called relaxing (or elevating) the constraint, in numerous ways such as:

- Working overtime on the bottleneck.
- Subcontracting some of the processing that would be done at the bottleneck.
- Investing in additional machines at the bottleneck.
- Shifting workers from non-bottleneck processes to the bottleneck.
- Focusing business process improvement efforts on the bottleneck.
- Reducing defective units processed through the bottleneck.

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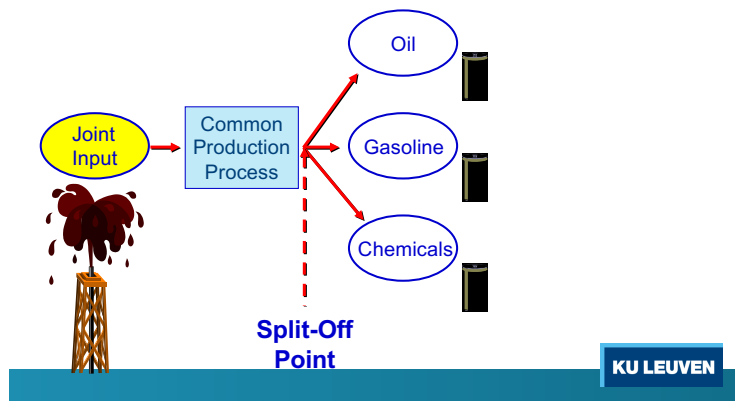
Joint Product - Selling at the Split-Off Point or Processing Further

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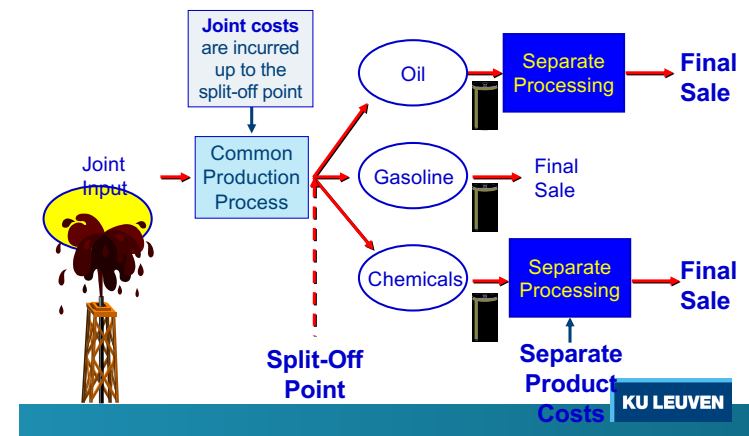
Joint Product

- In some industries, a number of end products are produced from a single raw material input.
- Two or more products produced from a common input are called **joint products**.
- The point in the manufacturing process where each joint product can be recognized as a separate product is called the **split-off point**.

Joint Products



Joint Products



Sell or Process Further - Example

- Sawmill, Inc. cuts logs from which unfinished lumber and sawdust are the immediate joint products.
- Unfinished lumber is sold “as is” or processed further into finished lumber.
- Sawdust can also be sold “as is” to gardening wholesalers or processed further into “presto-logs.”



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Sell or Process Further

Data about Sawmill's joint products includes:

	Per Log	
	Lumber	Sawdust
Sales value at the split-off point	\$ 140	\$ 40
Sales value after further processing	270	50
Allocated joint product costs	176	24
Cost of further processing	50	20



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Sell or Process Further

Analysis of Sell or Process Further			
	Per Log		
	Lumber	Sawdust	
Sales value after further processing	\$ 270	\$ 50	
Sales value at the split-off point	140	40	
Incremental revenue	130	10	
Cost of further processing	50	20	
Profit (loss) from further processing	\$ 80	\$ (10)	



The lumber should be processed further and the sawdust should be sold at the split-off point.



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Equipment-Replacement Decisions

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Equipment-Replacement Decisions - Example

	Existing <u>Machine</u>	Replacement <u>Machine</u>
Original cost	\$80,000	\$105,000
Useful life	4 years	4 years
Accumulated depreciation	\$50,000	
Book value	\$30,000	
Disposal price	\$14,000	
Annual costs	\$46,000	\$ 10,000

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Important Issues Related to Relevant Information

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Equipment-Replacement Decisions Example

- The cost savings over a 4-year period will be
- $\$36,000 \times 4 = \$144,000$.
- Investment = $\$105,000 - \$14,000 = \$91,000$
- Advantage of the replacement machine =
- $\$144,000 - \$91,000 = \$53,000$

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Potential Problems in Relevant-Cost Analysis (1 of 2)

1. Incorrect general assumptions such as that "All variable costs are relevant and all fixed costs are irrelevant."
Even in our simple example, we had irrelevant, variable marketing costs.
2. Be aware that unit-fixed-cost data can potentially mislead managers in two ways.
(See next slide for details)

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Potential Problems in Relevant-Cost Analysis (2 of 2)

- Unit-fixed-cost data can potentially mislead managers in two ways:
- Fixed unit costs might include irrelevant costs; costs that will not change whether or not the one-time only order is accepted or not.
- If using the same unit fixed costs at different output levels, managers may reach erroneous conclusions. Total fixed costs should be used.

Decisions and Performance Evaluation (1 of 2)

- Despite the quantitative nature of some aspects of decision making, not all managers will choose the best alternative for the firm.
- Managers will consider how the company will judge his or her performance after the decision is implemented.
- Many managers consider it unethical to take actions that make their own performance look good when these actions are not in the best interests of the firm.

Decisions and Performance Evaluation (2 of 2)

- The decision model analysis (step 4) can dictate one decision but in the real world, would the manager want to follow it?

Managers frequently find it difficult to resolve the conflict between the decision model and the performance-evaluation model. In theory, resolving the difficulty seems obvious: managers should design models that are consistent.

Terms to Learn – (1 of 2)

TERMS TO LEARN	PAGE NUMBER REFERENCE
Book value	471
Business function costs	450
Constraint	479
Decision model	447
Differential cost	456
Differential revenue	456
Full costs of the product	450
Incremental cost	456
Incremental revenue	456
Insourcing	454
Linear programming (LP)	479
Make-or-buy decisions	454

Terms to Learn – (2 of 2)

TERMS TO LEARN	PAGE NUMBER REFERENCE
Objective function	478
One-time-only special order	450
Opportunity cost	458
Outsourcing	454
Product-mix decisions	462
Qualitative factors	449
Quantitative factors	114
Relevant costs	447
Relevant revenues	447
Sunk costs	448
Theory of constraints (TOC)	464
Throughput margin	464

Thing(s) to do

- Please work on the exercises and quiz!

