

Prof. Dr. Timo Vogelsang

MANAGERIAL ACCOUNTING (WINTER 2023)



MANAGERIAL ACCOUNTING

INTRODUCTION

INTRODUCTION

PROF. DR. TIMO VOGELSANG

- PhD at University of Cologne
- 2015-2020: University of Cologne, University of Chicago, Frankfurt School of Finance and Management
- 2020: Assistant Professor of Managerial Accounting & Controlling
- Research Focus: Management Control Systems in Organizations

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2) <https://sites.google.com/site/vogelsangtimo/home>

INTRODUCTION

FIRST THINGS FIRST.

*Studying Cost Accounting
is one of the best business investments
a student can make.*

Horngren et al. 2015, p. 15

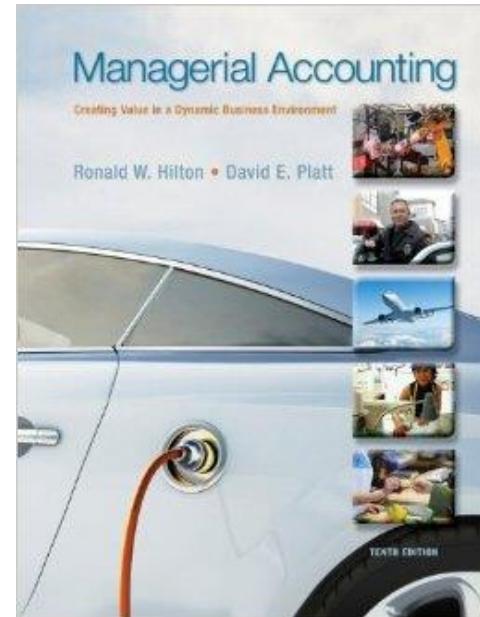
INTRODUCTION

REQUIRED TEXTBOOK

Ronald W. Hilton and David E. Platt, 10th edition

MANAGERIAL ACCOUNTING

- Modern didactic approach
- Easily understandable writing style
- Many real-world company examples
- Less technical details
- More managerial emphasis (decision-making)



REQUIRED TEXTBOOK

- Printed versions in the library
- Your local or any on-line bookstore
- If you want to save money, you can also buy older editions on ebay or elsewhere – the content is sufficiently similar

HELP SESSIONS

TUTORIALS

- 2 sessions per group
- Close to the exam (details to follow)
- Tutors have an excellent knowledge of the subject matter and will be a fruitful resource for you during the semester.

CLASS GUIDELINES

- Lectures cover key points but possibly not everything you will be tested on
- Exercises & problems are key to your success (also the ones not discussed in class but suggested)
- Participation: be engaged, ask questions, offer answers
- Be prepared & on time
- Feel free to contact me in case of questions!

INTRODUCTION

COURSE TOPICS

Session	Topic	Hilton / Platt
1	The Changing Role of Managerial Accounting	Chapter 1
	Basic Cost Management Concepts	Chapter 2
2	Product / Job Costing	Chapter 3
	Transfer Pricing	Chapter 13
3	Cost-Volume-Profit Analysis	Chapter 7
	Inventory Costing (Absorption vs. Variable Costing)	Chapter 8
4	Decision-Making: Relevant Costs and Benefits	Chapter 14
	Responsibility Center, Performance Measures & Controls	(Chapter 12/13)
5	Activity-Based Costing	Chapter 5
6	Activity Analysis, Cost Behavior, and Cost Estimation	Chapter 6
	Budgets – Financial Planning and Analysis	Chapter 9
7	Standard Costing and Direct Cost Variances	Chapter 10
8	Signaling Effects of Incentives	
	Sustainability and Controlling	

COURSE TOPICS

BUSINESS GAME WITH PROF. JÜRGEN STROHHECKER

- Introduction to Business Game
- Simulation Game

PRACTITIONER LECTURES (DETAILS TO FOLLOW)

- 13.09., 18:15h-19:35h, Sree Kurdikar, Head of Corporate Controlling, Bayer AG
- 20.09., 18:15h-19:35h, Pascal Ruhland, CFO, mBank
- Practitioners lectures will be online and held in English
- Relevant for the exam

GRADING

EXAM (ONLINE, CLOSED BOOK)

- Knowledge and transfer tasks
- As long as topics are not explicitly exclude everything that is covered in class is relevant for the exam
- Similar to the exercises and assignments covered in class

BUSINESS GAME

- Will be handled by Prof. Jürgen Strohhecker (j.strohhecker@fs.de)

Type of examination	Points
Exam	90
Business game	30
Total	120

INTRODUCTION

COURSE OVERVIEW

Session	Topic	Hilton / Platt
1	The Changing Role of Managerial Accounting	Chapter 1
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	Sustainability and Controlling	

CHAPTER 1

THE CHANGING ROLE OF MANAGERIAL ACCOUNTING IN A DYNAMIC BUSINESS ENVIRONMENT

ROLE OF MANAGERIAL ACCOUNTING

ABOUT INFORMATION ...

Information is a source of learning. But unless it is organized, processed, and available to the right people in a format for decision making, it is a burden, not a benefit.

William Pollard

PICTUREQUOTES . com

DEFINE MANAGERIAL ACCOUNTING!

MANAGERIAL ACCOUNTING IS THE PROCESS OF ...

- Identifying
- Measuring
- Analyzing
- Interpreting
- Communicating

... INFORMATION.

TYPES OF ORGANIZATIONS

- Manufacturers
- Retailers
- Service providers
- Agribusinesses
- Nonprofit firms

DECISION-MAKING

- Think of some of the decisions for the Business School
- Should we add another section to this course?
- Should we admit more students?

ROLE OF MANAGERIAL ACCOUNTING

EXAMPLE

- The Dean's office is trying to decide whether to allow one more student into the Business School. Assume tuition is \$12,000 per year. The costs are as follows:

Number of Students	Total Costs
200	\$3,000,000
205	\$3,030,000
210	\$3,060,000
215	\$3,090,000

- The current enrollment is 210 students.
- The cost per student is: $\$3,060,000 / 210 \text{ students} = \$14,571 \text{ per student.}$

What should the Dean do?

ROLE OF MANAGERIAL ACCOUNTING

SOLUTION

- What does that one extra student cost?

$$(\$3,090,000 - \$3,060,000) / (215-210) = \$6,000$$

- How much revenue does that student bring in?

\$12,000

- What other factors should the administration consider?

INFORMATION & DECISION-MAKING

- Managers running a company / division / department engage in an organized set of activities to achieve the company's goals.

- Day-to-day work comprises four primary activities
 - Decision-making
 - Planning
 - Directing operational activities
 - Controlling

ROLE OF MANAGERIAL ACCOUNTING

HOW MANAGERIAL ACCOUNTING BENEFITS AN ORGANIZATION

"By capitalizing on big data using business analytics tools, the role of the CFO is moving beyond optimizing the finance function to transforming the enterprise."

(Carlos Passi, IBM)



"Gut feeling has little impact on how decisions are made [at Google!]. In some meetings, people reportedly are not allowed to say 'I think...' but instead must say 'the data suggest....'"

(cited from Bauer & Erdogan)

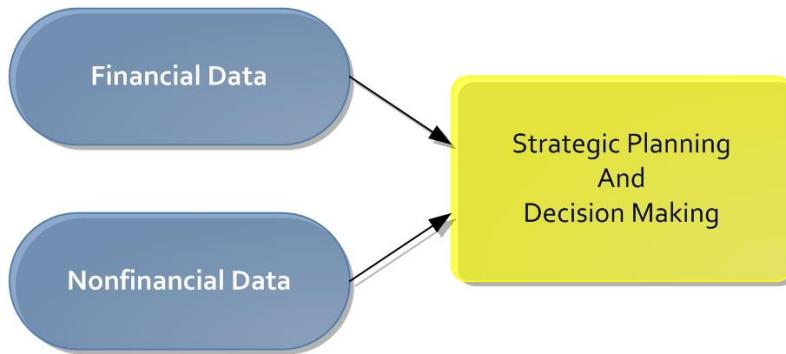
ROLE OF MANAGERIAL ACCOUNTING

HOW MANAGERIAL ACCOUNTING BENEFITS AN ORGANIZATION

1. Providing information for decision-making and planning.
2. Assisting managers in directing and controlling activities.
3. Motivating managers and other employees towards organization's goals.
4. Measuring performance of subunits, activities, managers, and other employees.
5. Assessing the organization's competitive position.

HOW MANAGERIAL ACCOUNTING BENEFITS AN ORGANIZATION

1. PROVIDING INFORMATION FOR DECISION MAKING AND PLANNING.



Example:

The decision to establish a new facility would be influenced by estimates of the costs of building and maintaining it. Managers also would rely on managerial accounting data in formulating plans for the facility's operations, e.g., budgets.

HOW MANAGERIAL ACCOUNTING BENEFITS AN ORGANIZATION

2. ASSISTING MANAGERS IN DIRECTING AND CONTROLLING ACTIVITIES.



Example:

If electricity costs in the new facility significantly exceed the budget, the data about this fact does not explain the reasons, but directs the manager's attention to the situation and helps framing the decision problem.

HOW MANAGERIAL ACCOUNTING BENEFITS AN ORGANIZATION

3. MOTIVATING MANAGERS AND OTHER EMPLOYEES TOWARDS ORGANIZATION'S GOALS.

- The goals of individuals are diverse and do not always match those of the firm.
- Motivation is achieved by communicating plans, measuring plan achievement, and prompting explanations for deviations.



Example: Employee empowerment

= the concept of encouraging and authorizing workers to improve operations, reduce costs, and improve product quality and customer service.

HOW MANAGERIAL ACCOUNTING BENEFITS AN ORGANIZATION

4. MEASURING PERFORMANCE OF SUBUNITS, ACTIVITIES, MANAGERS, AND OTHER EMPLOYEES.

Performance measurement can be used ...

- ... as the basis for rewarding performance
(one means of motivating people)
- ... to evaluate investments / product lines / markets / etc.



Example:

Most large corporations compensate their executives in part on the basis of the profits achieved by the subunits they manage.

HOW MANAGERIAL ACCOUNTING BENEFITS AN ORGANIZATION

5. ASSESSING THE ORGANIZATION'S COMPETITIVE POSITION WITH RESPECT TO ...

- internal operations and business processes
- its customers
- innovation, learning, and continuously improving operations
- financial performance

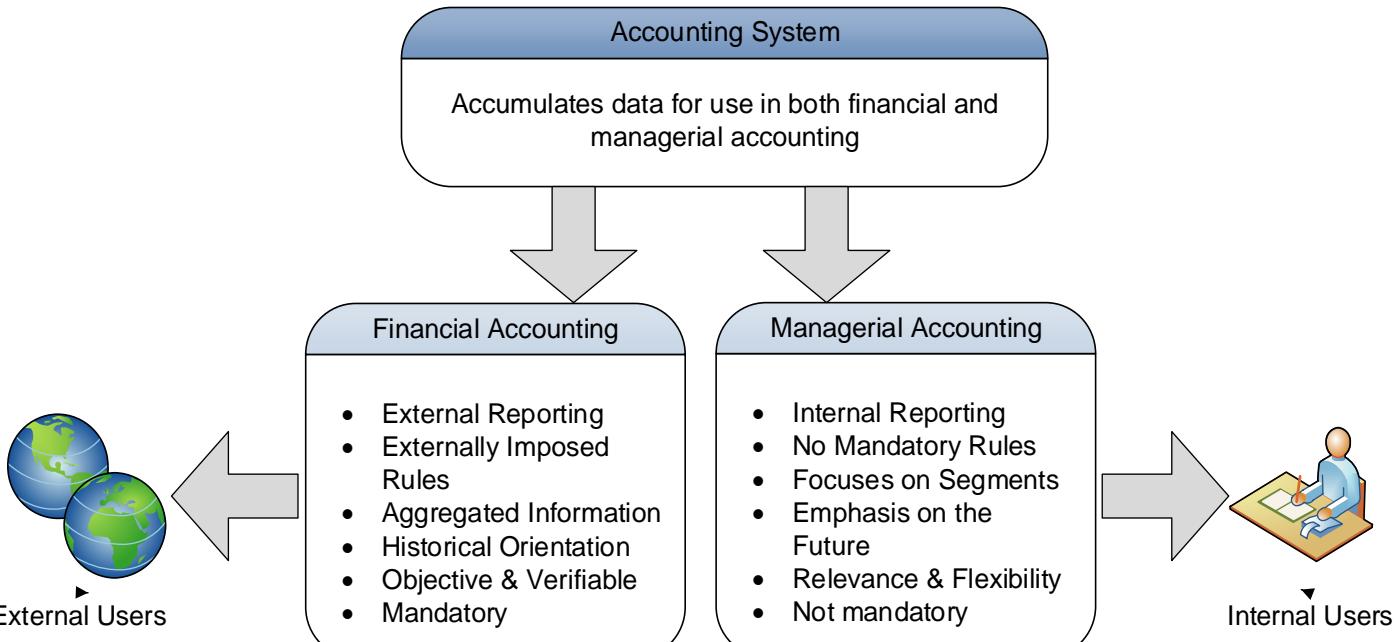


Example: Balanced Scorecard

= a model of business performance evaluation that balances measures of financial performance, internal operations, innovation / learning, and customer satisfaction.

ROLE OF MANAGERIAL ACCOUNTING

FINANCIAL VS. MANAGERIAL ACCOUNTING



FINANCIAL VS. MANAGERIAL ACCOUNTING

INFORMATION TYPE

- Financial: financial measurements
- Managerial: financial & nonfinancial measurements on processes, technologies, suppliers, customers, and competitors

QUALITATIVE CHARACTERISTICS OF INFORMATION

- Financial: historical, regular, auditable, reliable
- Managerial: past-, present- & future-oriented, need-based intervals, not subject to audit, could be more subjective

BREADTH

- Financial: highly aggregated; report on entire organization
- Managerial: disaggregated; informs local decisions and actions

CHAPTER 2

BASIC COST MANAGEMENT CONCEPTS

BASIC COST MANAGEMENT CONCEPTS

CHAPTER 2

WHAT IS A COST?

MANUFACTURING COSTS

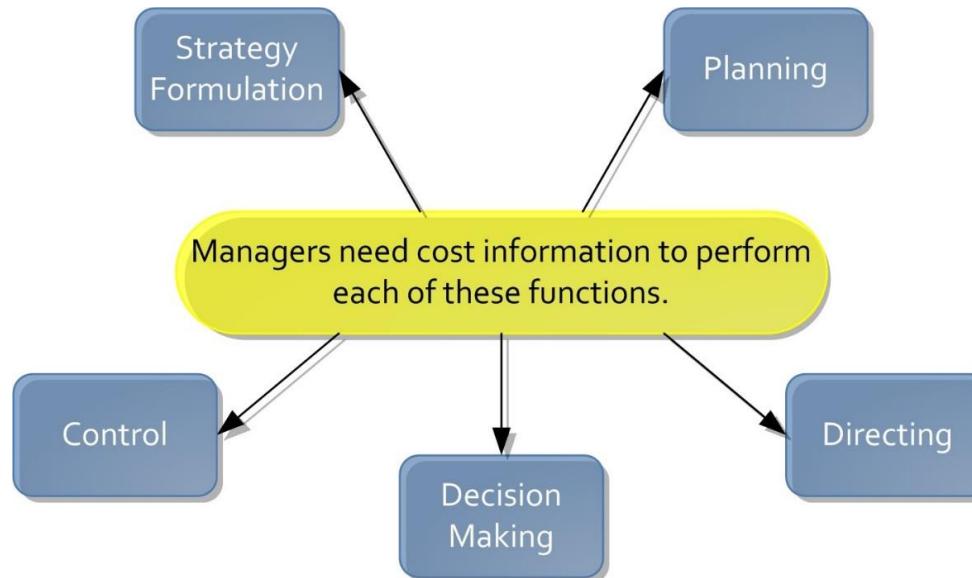
BASIC COST MANAGEMENT CONCEPTS AND COST CLASSIFICATIONS

COSTS AND DECISION MAKING

BASIC COST MANAGEMENT CONCEPTS

COSTS AND THE MANAGEMENT PROCESS

- A cost is the sacrifice made (resource given up) to achieve a particular purpose.



COSTS AND THE MANAGEMENT PROCESS

- A cost is the sacrifice made (resource given up) to achieve a particular purpose.



- You can have it cheaper, but it also comes with a cost!

COST TERMS

- An expense is the cost incurred when an asset is used up or sold for the purpose of generating revenue.

PRODUCT (INVENTORIABLE) COSTS

- the costs of goods manufactured or the cost of goods purchased for resale. These costs are inventoried (BS – balance sheet) until the goods are sold. Then they are expensed (IS – income statement) as costs of goods sold.

PERIOD COSTS

- all other non-product costs in an organization (e.g., selling and administrative) incurred during the relevant period. Such costs are not inventoried but are expensed as time passes.

TYPES OF PRODUCT COSTS

DIRECT COST

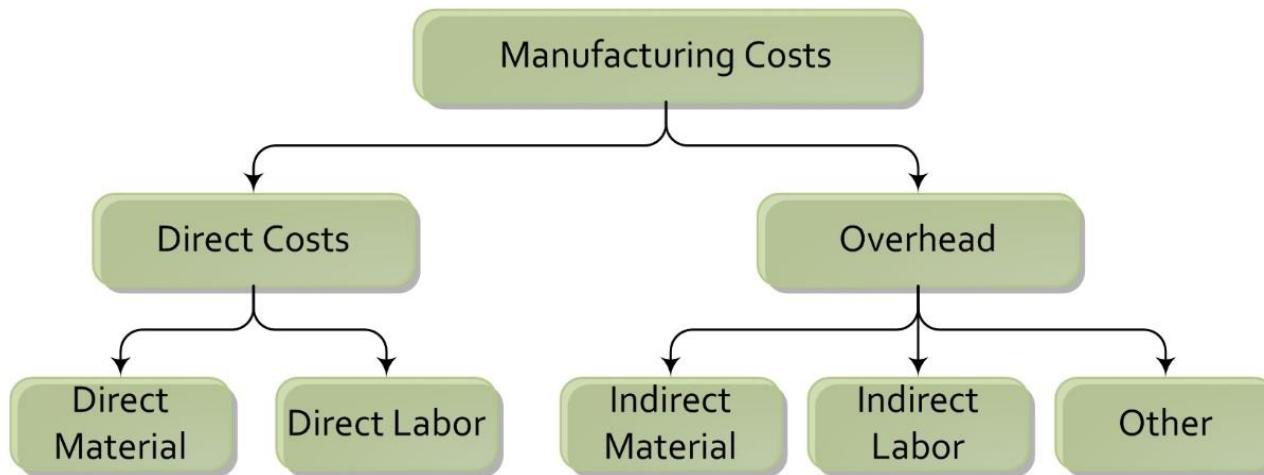
- A cost related to a particular product and can be traced to it in an economically feasible way

INDIRECT COST/OVERHEAD

- A cost related to a particular product but cannot be traced to it in an economically feasible way
- Costs that must be assigned/allocated to products

BASIC COST MANAGEMENT CONCEPTS

TYPES OF MANUFACTURING / PRODUCT COSTS



COST CLASSIFICATIONS: DIRECT COSTS

DIRECT MATERIAL

- Raw material which is consumed in the manufacturing process and physically incorporated in the finished product
- Example: Steel used to manufacture an automobile

DIRECT LABOR

- Cost of salaries, wages, and fringe benefits for personnel who work directly on manufactured products
- Example: Wages paid to automobile assembly worker

ALL OTHER COSTS OF MANUFACTURING ARE CLASSIFIED AS OVERHEAD

COST CLASSIFICATIONS: INDIRECT COSTS (MANUFACTURING OH)

INDIRECT MATERIAL

- used to support the production process but not part of the finished product
- part of the finished product but insignificant in cost
- Example: work equipment that wears out (drill bits), glue

INDIRECT LABOR

- Personnel who do not work directly on the product, but whose services are necessary for the manufacturing process.
- Example: Maintenance workers, security guards, supervisors

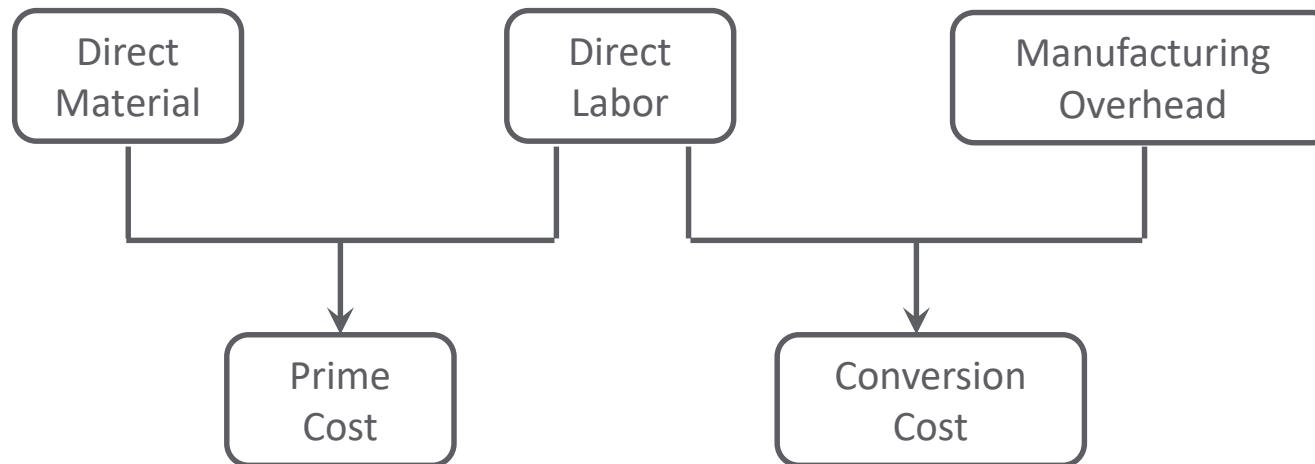
OTHER MANUFACTURING COSTS

- Other manufacturing costs not easily traceable to a finished good
- Example: insurance, depreciation, property taxes, cleaning supplies, overtime, idle time

BASIC COST MANAGEMENT CONCEPTS

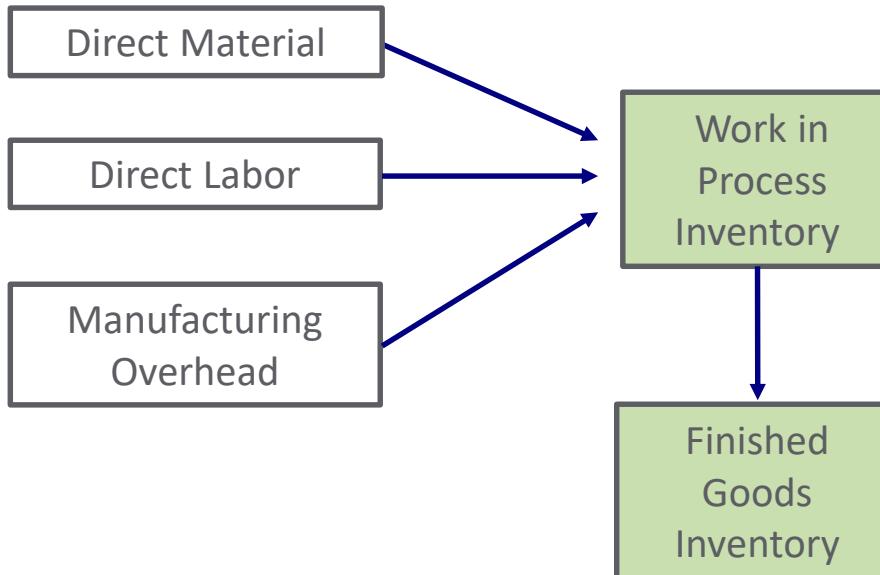
CLASSIFICATION OF MANUFACTURING COSTS

- Manufacturing/product costs are often also classified as follows:



BASIC COST MANAGEMENT CONCEPTS

MANUFACTURING COST FLOWS



SCHEDULE OF COST OF GOODS MANUFACTURED

Comet Computer Corporation	
Schedule of Cost of Goods Manufactured	
Raw material used	\$ 134,980
Direct labor	50,000
Total manufacturing overhead	230,000
Total manufacturing costs	\$ 414,980
Add: Work-in-process inventory, January 1	120
Subtotal	\$ 415,100
Deduct: Work-in-process inventory, December 31	100
Cost of goods manufactured	\$ 415,000

SCHEDULE OF COST OF GOODS MANUFACTURED

Comet Computer Corporation	
Schedule of Cost of Goods Manufactured	
Raw material used	\$ 134,980
Direct labor	50,000
Total manufacturing overhead	230,000
Computation of Cost of Raw Material Used	
Raw-material inventory, January 1	\$ 6,000
Add: Purchases of raw materials	134,000
Raw material available for use	140,000
Deduct: Raw material inventory, December 31	5,020
Raw material used	\$ 134,980
COST OF goods manufactured	
January 1	120
January, December 31	100
	\$ 415,000

SCHEDULE OF COST OF GOODS MANUFACTURED

Includes all direct labor costs incurred during the current period.

Merger Corporation	
Cost of Goods Manufactured	
Raw material used	\$ 134,980
Direct labor	50,000
Total manufacturing overhead	230,000
Total manufacturing costs	\$ 414,980
Add: Work-in-process inventory, January 1	120
Subtotal	\$ 415,100
Deduct: Work-in-process inventory, December 31	100
Cost of goods manufactured	\$ 415,000

SCHEDULE OF COST OF GOODS MANUFACTURED

Comet Computer Corporation	
Schedule of Cost of Goods Manufactured	
Raw material used	\$ 134,980
Direct labor	50,000
Total manufacturing overhead	\$ 230,000
Computation of Total Manufacturing Overhead	
Indirect material	\$ 10,000
Indirect labor	40,000
Depreciation on factory	90,000
Depreciation on equipment	70,000
Utilities	15,000
Insurance	5,000
Total manufacturing overhead	\$ 230,000
January 1	120
December 31	100
	\$ 415,000

SCHEDULE OF COST OF GOODS MANUFACTURED

Comet Computer Corporation	
Schedule of Cost of Goods Manufactured	
Raw material used	\$ 134,980
Direct labor	50,000
Beginning work-in-process inventory is carried over from the prior period.	230,000
	\$ 414,980
Add: Work-in-process inventory, January 1	120
Subtotal	\$ 415,100
Deduct: Work-in-process inventory, December 31	100
Cost of goods manufactured	\$ 415,000

SCHEDULE OF COST OF GOODS MANUFACTURED

Comet Computer Corporation	
Schedule of Cost of Goods Manufactured	
Raw material used	\$ 134,980
Direct labor	50,000
Ending work-in-process inventory contains the cost of unfinished goods, and is reported in the current assets section of the balance sheet.	230,000
	\$ 414,980
1	120
	\$ 415,100
Deduct: Work-in-process inventory, December 31	100
Cost of goods manufactured	\$ 415,000

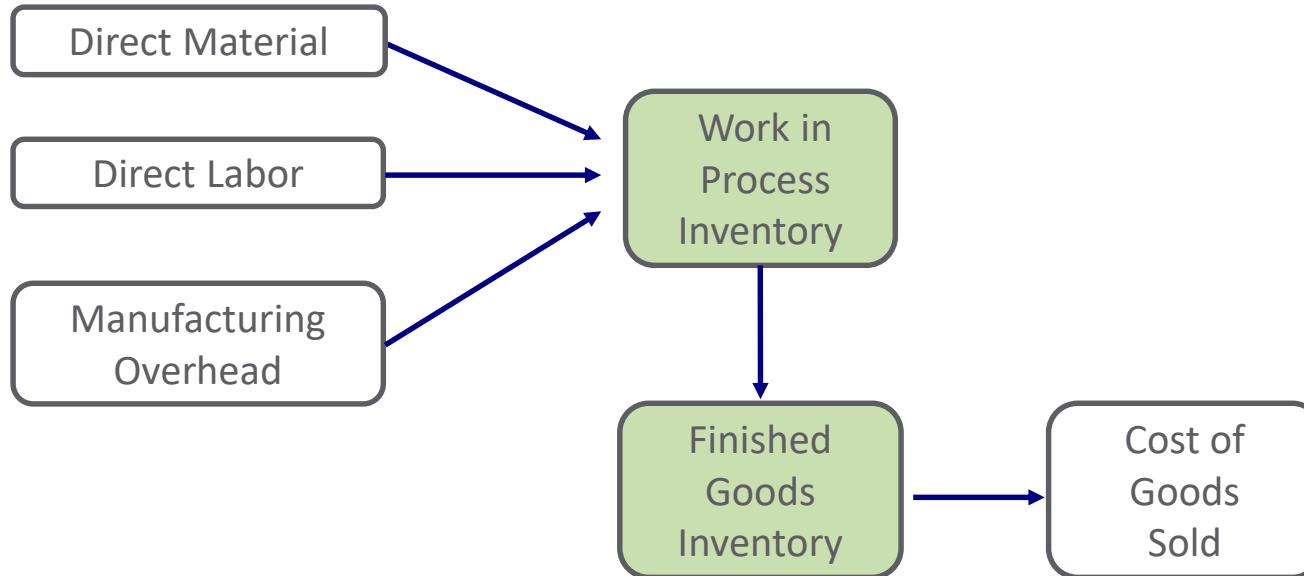
BASIC COST MANAGEMENT CONCEPTS

COST OF GOODS MANUFACTURED (COGM)

$$\text{COGM} = \begin{array}{c} \text{Beginning Inventory Work in Process} \\ + \\ \text{Direct Material Used} \\ + \\ \text{Direct Labor} \\ + \\ \text{Total Manufacturing Overhead} \\ - \\ \text{Ending Inventory Work in Process} \end{array}$$

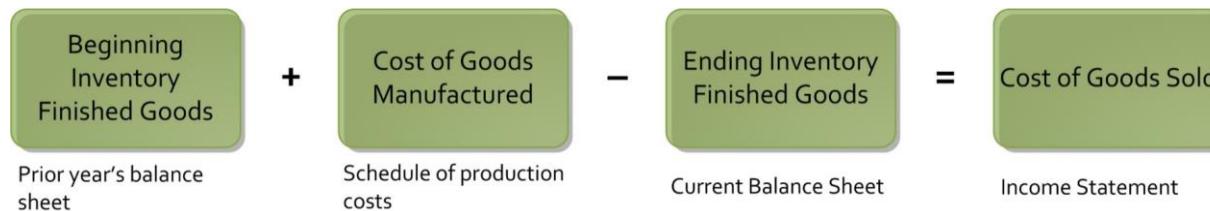
BASIC COST MANAGEMENT CONCEPTS

MANUFACTURING COST FLOWS



BASIC COST MANAGEMENT CONCEPTS

COST OF GOODS SOLD (COGS)

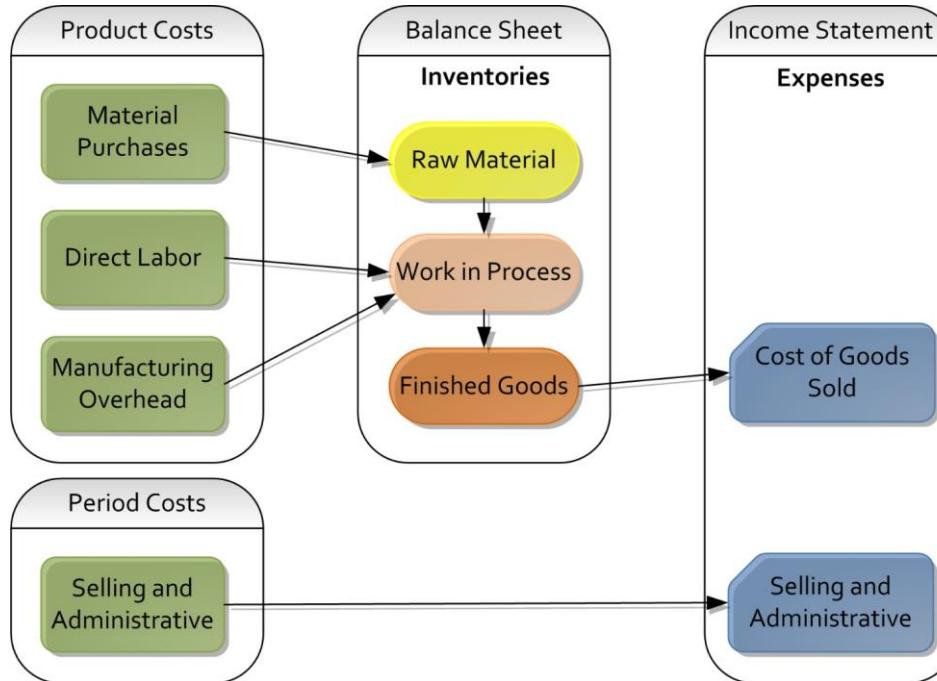


Comet Computer Corporation
Schedule of Cost of Goods Sold
For the Year Ended December 31, 20X2

Finished-goods inventory, Jan. 1	\$ 200
Add: Cost of goods manufactured	415,000
Cost of goods available for sale	415,200
Deduct Finished-goods inventory, Dec. 31	190
Cost of goods sold	\$ 415,010

BASIC COST MANAGEMENT CONCEPTS

MANUFACTURING COST FLOWS



BASIC COST MANAGEMENT CONCEPTS

EXAMPLE

	2015	2016
	€ million	€ million
Net sales	46,085	46,769
Cost of goods sold	(21,040)	(20,295)
Gross profit	25,045	26,474
Selling expenses	(12,272)	(12,474)
Research and development expenses	(4,274)	(4,666)
General administration expenses	(2,092)	(2,256)
Other operating income	1,109	898
Other operating expenses	(1,275)	(934)
EBIT¹	6,241	7,042
Financial result	(1,005)	(1,155)
Income before income taxes	5,236	5,887
Income taxes	(1,223)	(1,329)
Income from continuing operations after income taxes	4,013	4,558
Income from discontinued operations after income taxes	85	268
Income after income taxes	4,098	4,826

Consolidated Financial Statements

Bayer Group Consolidated Income Statements

Source: <http://www.annualreport2016.bayer.com/financial-statements/bayer-group-consolidated-income-statements.html>

BASIC COST MANAGEMENT CONCEPTS

E2-25 – FILL OUT THE BLANKS

	Case 1	Case 2	Case 3
Beginning inventory of FG	?	\$ 18,000	\$ 3,500
Cost of goods manufactured	\$104,750	\$ 142,500	?
Ending inventory of FG	\$ 24,500	\$ 12,000	\$ 10,500
Cost of goods sold	\$ 101,250	?	\$ 152,000

BASIC COST MANAGEMENT CONCEPTS

- One of the most important cost classifications is the way in which costs change in relation to changes in organizational activities.

COST DRIVERS

VARIABLE AND FIXED COSTS

CONTROLLABLE AND UNCONTROLLABLE COSTS

COST CLASSIFICATIONS: COST DRIVERS

COST DRIVER

- A cost driver is a characteristic of an activity or event that causes costs to be incurred.

- Understanding cost drivers helps us understand how costs are generated and where the best control points may be.
- Identifying cost drivers is critical: Correlation between cost and driver is key – the higher the better.
- Cost-benefit trade-off: accuracy vs. cost of identifying & measuring cost drivers.

BASIC COST MANAGEMENT CONCEPTS

COST CLASSIFICATIONS: EXAMPLES OF COST DRIVERS

Activity	Cost Driver
Machine Maintenance	Machine hours
Machine Setup	# of production runs
Inspection	Pieces inspected
Purchasing	Purchase orders

COST CLASSIFICATIONS: VARIABLE / FIXED

YOUR MONTHLY TELEPHONE BILL

- National calls (\$20 / month): Fixed or variable?
- International calls (5 cents / minute): Fixed or variable?



BASIC COST MANAGEMENT CONCEPTS

COST CLASSIFICATIONS: VARIABLE / FIXED

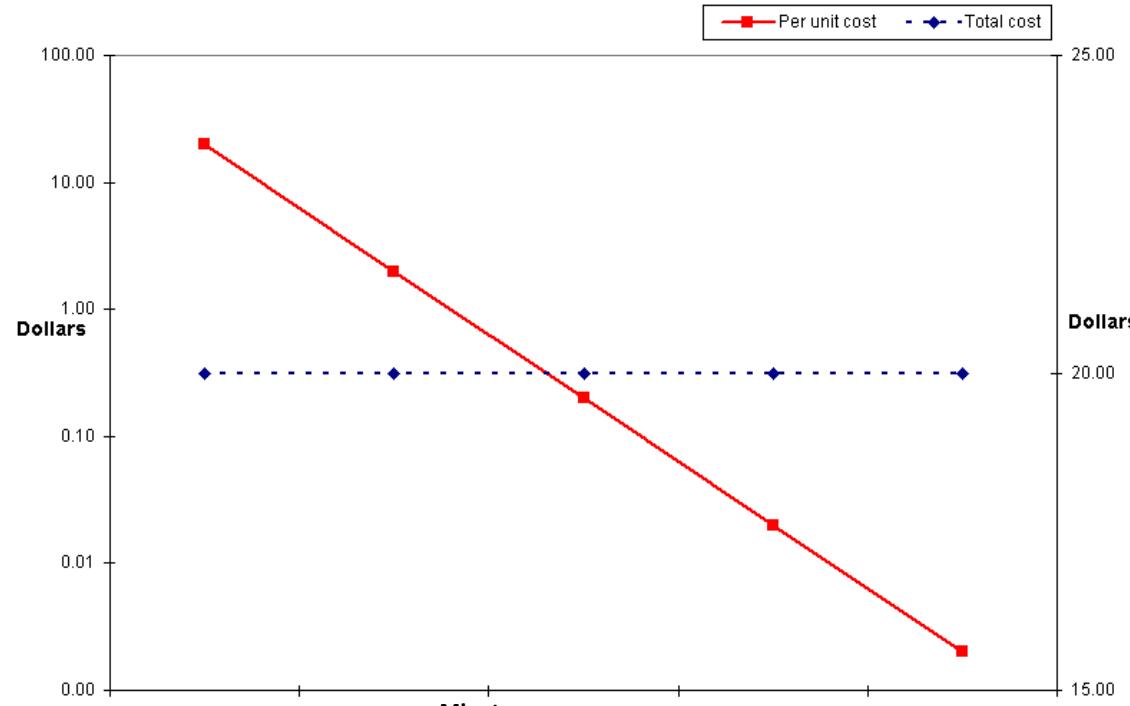
NATIONAL CALLS

National call minutes	Total monthly bill	Rate per minute
1	\$20.00	\$20.00
10	\$20.00	\$2.00
100	\$20.00	\$.20
1,000	\$20.00	\$.02
10,000	\$20.00	Tiny

BASIC COST MANAGEMENT CONCEPTS

COST CLASSIFICATIONS: VARIABLE / FIXED

NATIONAL CALLS



BASIC COST MANAGEMENT CONCEPTS

COST CLASSIFICATIONS: VARIABLE / FIXED

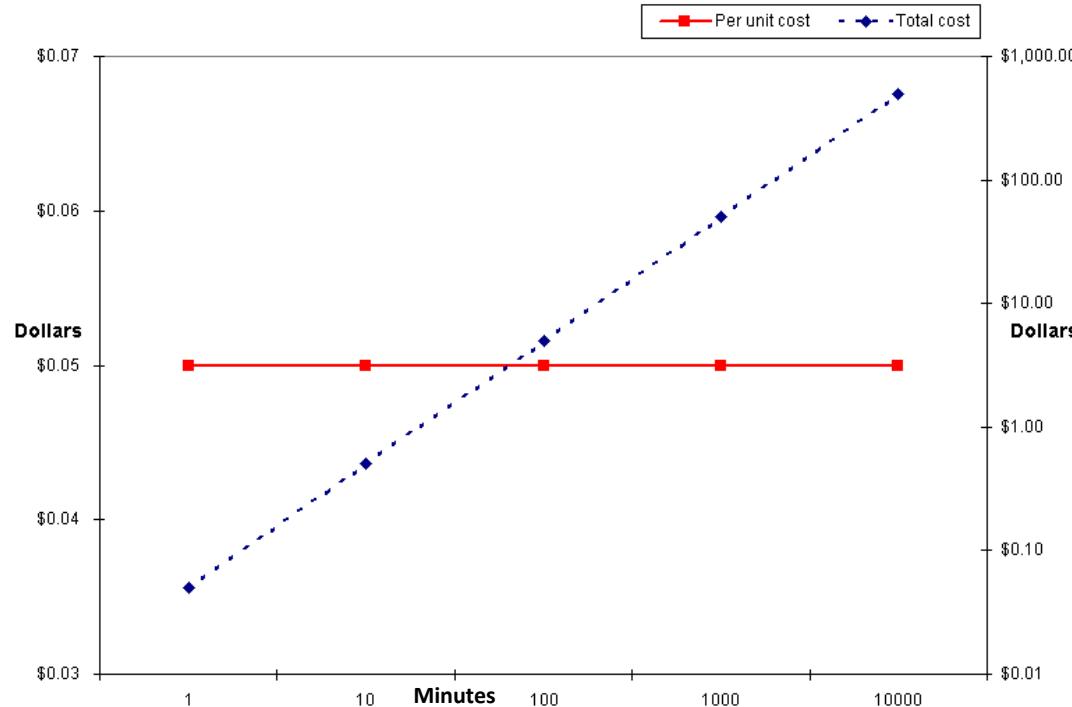
INTERNATIONAL
CALLS

Long distance minutes	Rate per minute	Total monthly bill
1	\$.05	\$.05
10	\$.05	\$.50
100	\$.05	\$5.00
1,000	\$.05	\$50.00
10,000	\$.05	\$500.00

BASIC COST MANAGEMENT CONCEPTS

COST CLASSIFICATIONS: VARIABLE / FIXED

INTERNATIONAL
CALLS



COST CLASSIFICATIONS: VARIABLE / FIXED

SUMMARY OF VARIABLE & FIXED COST BEHAVIOUR

Cost	in total	per unit
Variable	Total variable cost changes as activity level changes.	Variable cost per unit remains the same over wide ranges of activity.
Fixed	Total fixed cost remains constant when the activity level changes.	Fixed cost per unit decreases as activity level increases.

BASIC COST MANAGEMENT CONCEPTS

COST CLASSIFICATIONS: VARIABLE / FIXED

Are “direct costs = variable costs” and are “indirect = fixed costs”?

Variable & direct:

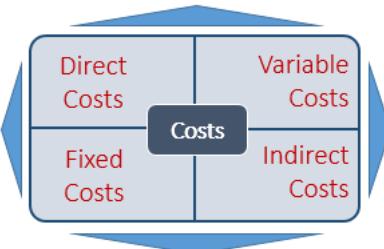
e.g., iPhone components

- *Direct:* we know which screen an iPhone needs and what it costs
- *Variable:* making one more iPhone requires one more screen

Direct & fixed:

e.g., Supervisor production of Samsung Galaxy S

- *Direct:* production of Galaxy S, not of Galaxy Note
- *Fixed:* spending is pre-committed, doesn't change with # phones



Variable & indirect:

e.g., machine power of plant that makes several car types

- *Indirect:* electricity costs are metered to plant, not to product line
- *Variable:* producing one car less leads to less power usage

Fixed & indirect:

e.g., insurance of plant for Samsung production

- *Fixed:* insurance spending is pre-committed, doesn't change with # phones
- *Indirect:* Insurance benefits several Samsung models

E2-24 COST TYPES (PRODUCT/PERIOD, DM/DL/OH, VARIABLE/FIXED)

DETERMINE THE COST TYPE!

- Advertising costs of Nike
- Straight line depreciation on factory equipment of Airbus
- Wages of assembly line personnel
- Delivery costs on customer shipments of ice cream
- Newsprint consumed in printing newspapers
- Production plant insurance costs
- Glass cost in production of light bulbs
- Tire costs by car company
- Sales commissions to own salespeople
- Glue used in manufacturing of furniture
- Hourly wages of security guards at refinery
- Salary of the VP of finance

COST CLASSIFICATIONS

CONTROLLABLE AND UNCONTROLLABLE COSTS

- A cost that can be significantly influenced by a manager is a controllable cost.

WHAT ABOUT ...

- Cost of national advertising for a manager at a McDonald's restaurant?
- Cost of a consulting project for a manager at a consulting firm?

COSTS AND DECISION-MAKING

OPPORTUNITY COSTS

OUT-OF-POCKET COSTS

SUNK COSTS

DIFFERENTIAL COSTS

MARGINAL COSTS

AVERAGE COSTS

COSTS AND DECISION-MAKING

OPPORTUNITY COSTS

- The potential benefit that is given up when one alternative is selected over another.
 - Taking an extra table waiting shift vs. renovating the apartment
 - Going to the movies vs. learning for the exam

OUT-OF-POCKET COSTS

- A cost that requires a cash outlay
 - Upfront advertising costs
 - Costs associated with a special order

*Equivalent from an
economic perspective*

COSTS AND DECISION-MAKING

OPPORTUNITY AND OUT-OF-POCKET COSTS

- A firm producing basketballs receives a special order for footballs. Due to capacity constraints, accepting the special order implies that less basketballs will be produced.

Special Order Footballs	
Revenue	10,000
Costs	8,000
Profit	2,000

Out-of-pocket costs

Foregone Profit Basketballs	
Revenue	10,000
Costs	7,500
Profit	2,500

Opportunity costs

BASIC COST MANAGEMENT CONCEPTS

COSTS AND DECISION-MAKING

OPPORTUNITY AND OUT-OF-POCKET COSTS

- Both costs need to be considered in the decision to accept or reject the special order:

$$\$10,000 - 8,000 - 2,500 = -500$$

Special Order Footballs	
Revenue	10,000
Costs	8,000
Profit	2,000

Out-of-pocket costs

Foregone Profit Basketballs	
Revenue	10,000
Costs	7,500
Profit	2,500

Opportunity costs

COSTS AND DECISION-MAKING

OPPORTUNITY AND OUT-OF-POCKET COSTS

- In making decisions which involve alternatives, you ...
 - ... must know your out-of-pocket costs for each alternative
 - ... must know your opportunity costs for each alternative
 - ... need to combine the two to make a fully informed decision

COSTS AND DECISION-MAKING

SUNK COSTS

- All costs incurred in the past that cannot be changed by any decision made now or in the future.
- Sunk costs should not be considered in decisions.
 - Purchased equipment for \$50,000
 - Change in production process which does not use machine any longer

COSTS AND DECISION-MAKING

DIFFERENTIAL COSTS

- The net difference in cost between two alternative courses of action.
- Example: You can earn \$1,500 per month in your hometown or \$2,000 per month in a nearby city. Your commuting costs are \$50 per month in your hometown and \$300 per month to the city.

What is your differential cost?

$$\$300 - \$50 = \$250$$

COSTS AND DECISION-MAKING

MARGINAL COST

- The additional cost needed to produce an additional product – not simply variable costs
- 100 units: \$200; 101 units: \$205
- Marginal cost: \$5 (increase entails variable costs and potentially new fixed costs, marginal costs typically differ across different ranges of production quantities)

AVERAGE COST

- Cost per unit: Total cost divided by total units

BASIC COST MANAGEMENT CONCEPTS

COSTS AND BENEFITS



- (Managerial) Accountants' task is to weigh the benefits of providing information against the costs of generating, communicating, and using that information.
- The goal is to use information effectively and avoid information overload.

CLASSIFY THE COST!

1. The management of a high-rise office building uses 3,000 square feet of space in the building for its own administrative functions. This space could be rented for \$30,000. What economic term describes this \$30,000 of lost rental revenue?
2. The cost of building an automated assembly line in a factory is \$700,000; a manually operated assembly line would cost \$450,000. What economic term is used to describe the \$250,000 difference between these two amounts?
3. What economic term is used to describe the \$700,000 cost of building the assembly line?

CLASSIFY THE COST!

4. The costs of producing one more unit of a product.
5. The cost of feeding 300 children in a public school cafeteria is \$450 per day, or \$1.50 per child per day. What economic term describes this \$1.50 cost?
6. The cost of including one extra child in a day-care center.
7. The cost of merchandise inventory purchased five years ago. The goods are now obsolete.

Prof. Dr. Timo Vogelsang

MANAGERIAL ACCOUNTING (WINTER 2023)



COURSE OVERVIEW

Session	Topic	Hilton / Platt
1	The Changing Role of Managerial Accounting	Chapter 1
	Basic Cost Management Concepts	Chapter 2
2	Product / Job Costing	Chapter 3
	Transfer Pricing	Chapter 13
3	Cost-Volume-Profit Analysis	Chapter 7
	Inventory Costing (Absorption vs. Variable Costing)	Chapter 8
4	Decision-Making: Relevant Costs and Benefits	Chapter 14
	Responsibility Center, Performance Measures & Controls	(Chapter 12/13)
5	Activity-Based Costing	Chapter 5
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8	Signaling Effects of Incentives	
	Sustainability and Controlling	

CHAPTER 3

PRODUCT COSTING

OUTLINE

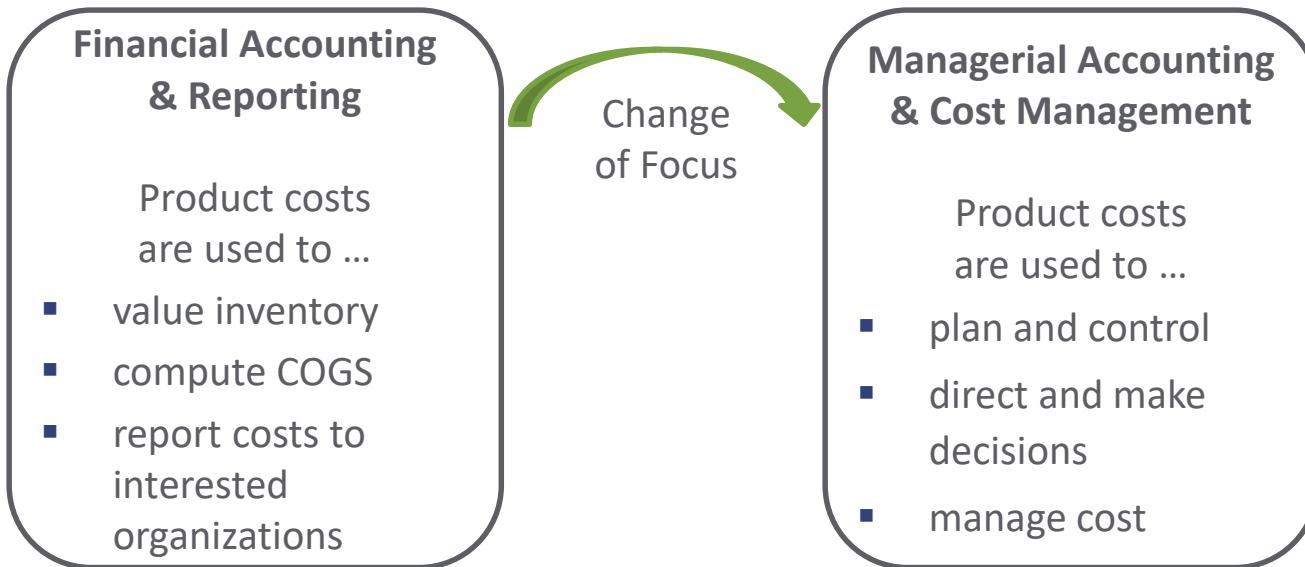
PRODUCT & SERVICE COSTING

PRODUCT COSTING BY JOB ORDER / BATCH COSTING

APPLIED OVERHEAD

PRODUCT & SERVICE COSTING

- A product costing system accumulates the costs incurred in a production process and assigns those costs to the organization's final products



PRODUCT COSTING IN NONMANUFACTURING COMPANIES

- Merchandising companies must know transportation costs in/out
- Professional service firms must know their cost of delivering the services
- Transportation firms must know their full costs to move products, etc.

PRODUCT COSTING SYSTEMS: OVERVIEW

JOB-ORDER COSTING

- Products made individually (or in small batches)
- Each product/batch is clearly distinguishable
- Examples:
 - Manufacturing – Custom homebuilding
 - Services – Audits, airline flight, research projects

PROCESS COSTING (NOT COVERED)

- Employed for mass production of like units (chemical or gasoline production, microchips)

PRODUCT COSTING SYSTEMS

JOB-ORDER COSTING

- Used for production of large, unique, high-cost items.
- Built to order rather than mass produced.
- Many costs can be directly traced to each job.
- Each distinct batch of production is called a job or job order.

TWO TYPES:

- Job-shop operations - Products manufactured in very low volumes or one at a time (e.g., film production, aircraft manufacture, custom house).
- Batch-production operations - Multiple products in batches of relatively small quantity (e.g., furniture manufacture, pleasure boat production).

PRODUCT COSTING SYSTEMS

PROCESS COSTING

- Used for production of small, identical, low cost items.
- Mass produced in automated continuous production process.
- Costs cannot be directly traced to each unit of product.
- Production costs are accumulated for a large number of units of output and then averaged over all of the units.
- Typical process cost applications: Petrochemical refinery, Paint manufacturer, Beer brewery
- **Process Costing will not be covered in class!**

E3-23: JOB ORDER OR PROCESS COSTING SYSTEM?

1. Manufacturing of household cleaning solutions
2. Manufacturing of custom hot tubs and spas
3. Architectural firm
4. Manufacturing of ceramic tiles
5. Producer of yogurt
6. Manufacturing of custom backyard tool sheds
7. Manufacturing of paper clips
8. Engineering consulting firm
9. Manufacturing of balloons
10. Manufacturing of custom sailboats

PRODUCT COSTING

JOB COSTING

Service Sector	Merchandising Sector	Manufacturing Sector
<ul style="list-style-type: none">• Audit engagements done by Price Waterhouse Coopers• Consulting engagements done by McKinsey & Co.• Advertising-agency campaigns run by Ogilvy and Mather• Individual 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 Wal-Mart	<ul style="list-style-type: none">• Assembly of individual aircrafts at Boeing• Construction of ships at Litton Industries



JOB COST RECORD

- A Job Cost Record is used to accumulate the actual direct materials, actual direct labor, and applied manufacturing overhead costs for each job.
- Source Documents
 - Material requisition forms: transfer direct materials
 - Time records: gather the amount of labor
 - Applied (i.e., estimated) manufacturing overhead: a heterogeneous pool of indirect production costs, such as indirect material, indirect labor, utility costs, and depreciation
- Often a source for customer billing when cost plus is a component of pricing

PRODUCT COSTING

JOB COST RECORD

JOB-COST RECORD				
Job Number	F16			
Date Started	Nov. 1, 20x1			
Description	80 deluxe alum. fishing boats			
Date Completed	Nov. 22, 20x1			
Number of Units Completed	80			
Direct Material				
Date	Requisition Number	Quantity	Unit Price	Cost
Direct Labor				
Date	Requisition Number	Quantity	Unit Price	Cost
Manufacturing Overhead				
Date	Requisition Number	Quantity	Unit Price	Cost
Cost Summary				
Cost Item	Amount			
Total direct material				
Total direct labor				
Total manufacturing overhead				
Total cost				
Unit cost				
Shipping Summary				
Date	Units Shipped	Units Remaining in Inventory	Cost Balance	

A Materials requisition form authorizes the use of materials on a job

Time records (time ticket) help accumulate direct labor costs

PRODUCT COSTING

JOB COST RECORD

JOB-COST RECORD				
Job Number	F16	Description	80 deluxe alum. fishing boats	
Date Started	Nov. 1, 20x1	Date Completed	Nov. 22, 20x1	
		Number of Units Completed	80	
Direct Material				
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Direct Labor				
Date	Requisition Number	Quantity	Unit Price	Cost
Manufacturing Overhead				
Date	Requisition Number	Quantity	Unit Price	Cost
Cost Summary				
Cost Item		Amount		
Total direct material				
Total direct labor				
Total manufacturing overhead				
Total cost				
Unit cost				
Shipping Summary				
Date	Units Shipped	Units Remaining in Inventory	Cost Balance	

A Materials requisition form authorizes the use of materials on a job

Time records (time ticket) help accumulate direct labor costs

Applied overhead using a predetermined overhead rate

OVERHEAD ALLOCATION: STEPS

- Purpose of predetermined overhead rates: quicker estimation of total job costs
1. Setting a predetermined overhead rate (standard cost)
 - Done at the beginning of the period
 2. Total budgeted (estimated) overhead divided by estimated cost-driver units
 - Allocate overheads
 - Actual number of cost-driver units times estimated overhead rate

APPLIED MANUFACTURING OVERHEAD

1. Predetermined Overhead Rate (POHR)

$$\text{POHR} = \frac{\text{Budgeted manufacturing overhead cost}}{\text{Budgeted amount of cost driver (or activity base)}}$$

2. Allocating/Applying overhead

$$\text{Overhead applied} = \text{POHR} \times \text{Actual activity}$$

➤ Based on estimates
(determined before the period begins)

➤ Based on actual, such as direct labor hours (incurred during the period)

OVERHEAD APPLICATION: EXAMPLE

- Budgeted manufacturing OH costs: \$ 360,000
- Budgeted Cost Driver: 40,000 machine hours
- Actual Machine hours: 3,200

What is POHR?

How much OH do we apply?

OVERHEAD APPLICATION: EXAMPLE

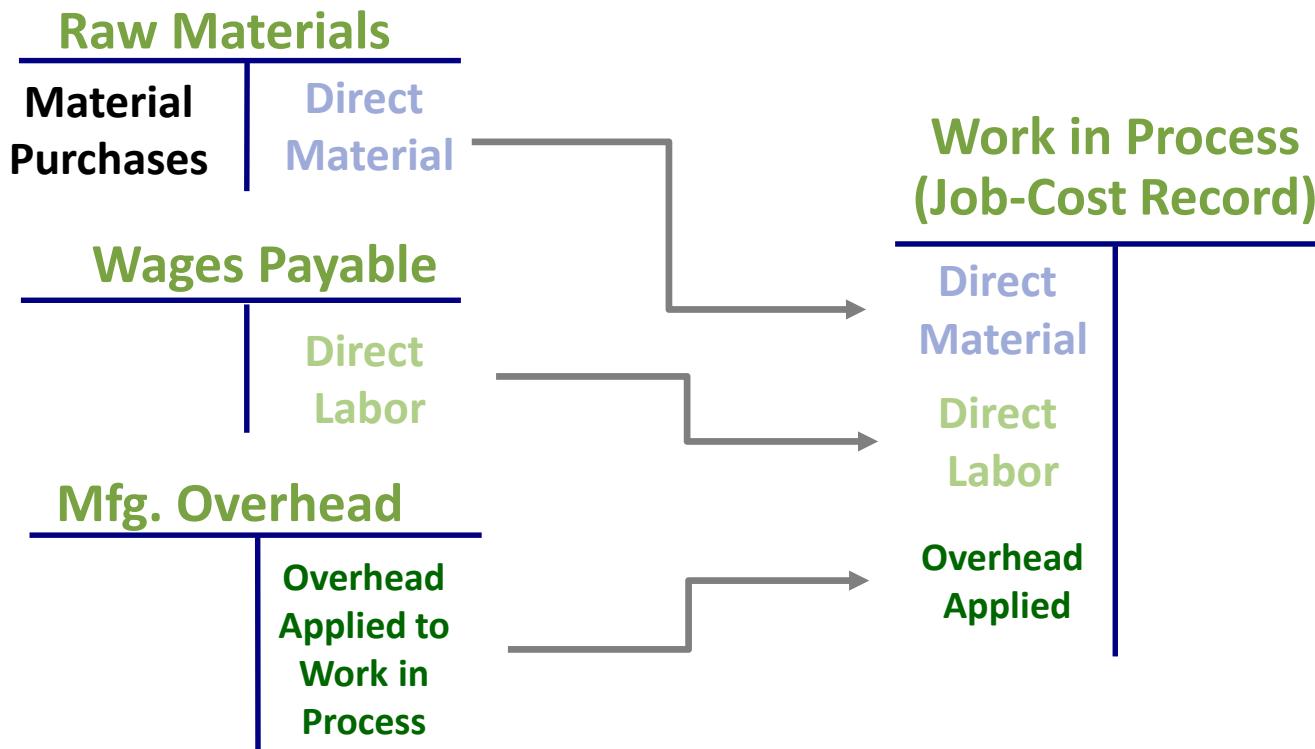
- Budgeted manufacturing OH costs: \$ 360,000
- Budgeted Cost Driver: 40,000 machine hours
- Actual Machine hours: 3,200

POHR: $\$ 360,000 / 40,000 = \$ 9$ per machine hour

OH Applied: $3,200 * \$ 9 = \$ 28,800$

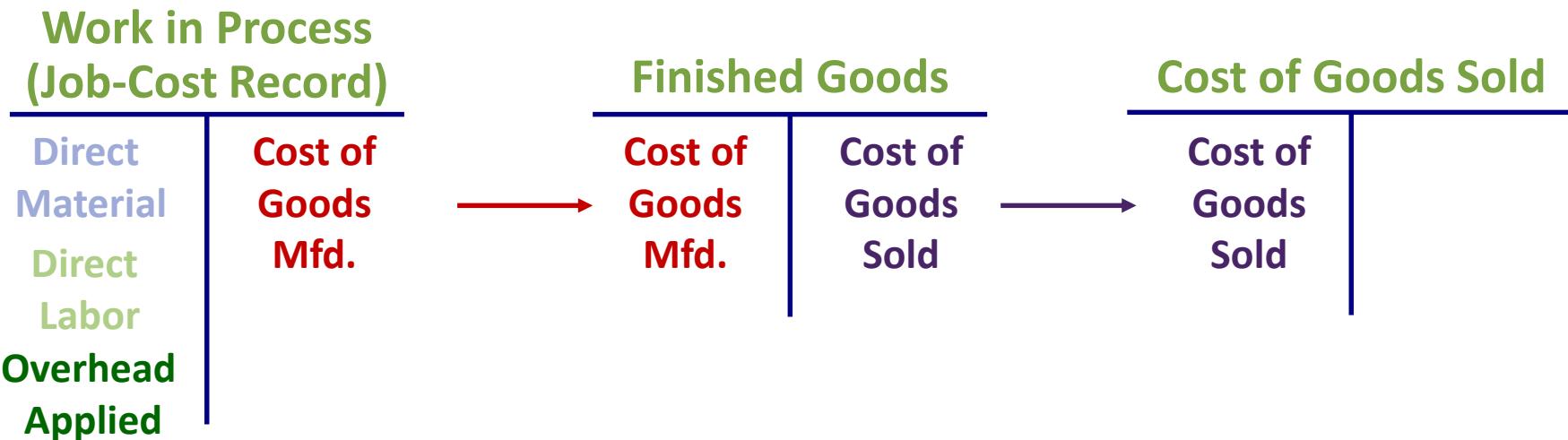
PRODUCT COSTING

JOB-ORDER SYSTEM COST FLOWS



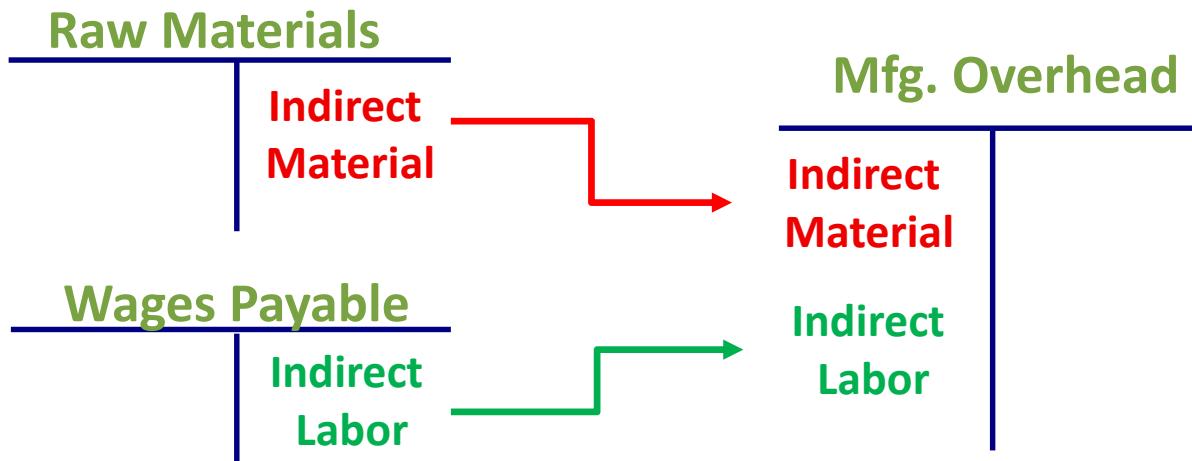
PRODUCT COSTING

JOB-ORDER SYSTEM COST FLOWS



ACTUAL MANUFACTURING OVERHEAD

- At the end of the period, all ACTUAL overhead costs have been incurred.



ACTUAL VS. APPLIED MANUFACTURING OVERHEAD

- At the end of the period: compare applied overhead with actual overhead

Mfg. Overhead	
Indirect Material	Overhead Applied to Work in Process
Indirect Labor	

Actual OH > applied OH: underapplied
Actual OH < applied OH: overapplied

OVERHEAD APPLICATION: EXAMPLE

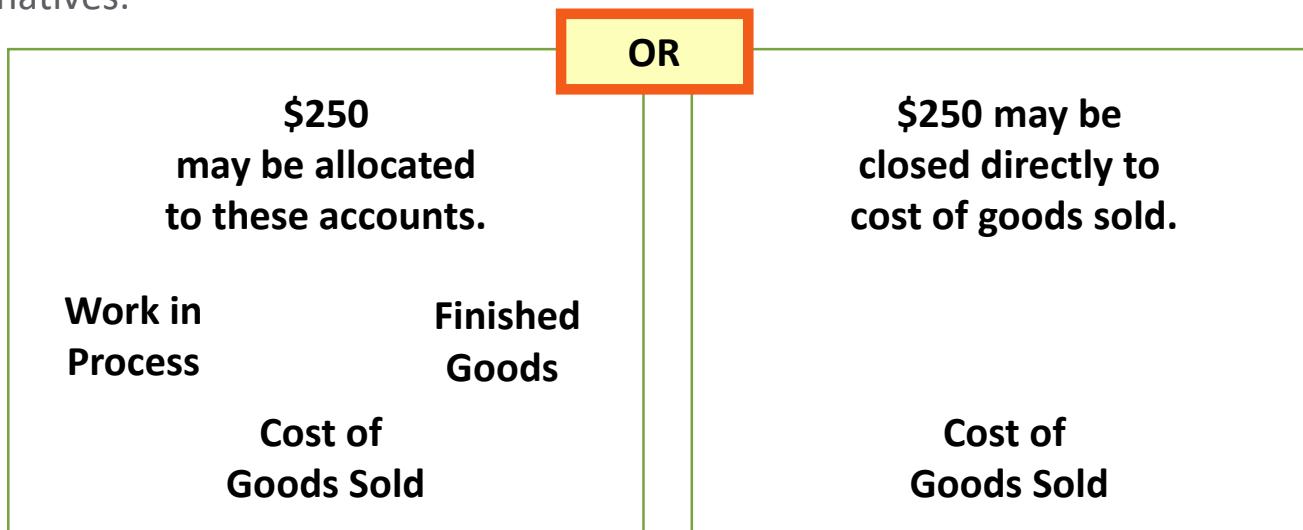
- Applied Overhead: \$ 28,800
- Actual Overhead: \$ 29,050

Actual OH exceeds applied OH by \$250.
This difference is called underapplied overhead.

ACTUAL VS. APPLIED MANUFACTURING OVERHEAD

WHAT DO WE DO ABOUT UNDERAPPLIED OVERHEAD?

- Recall: Actual OH exceed applied OH by \$ 250
- Two Alternatives:



PRODUCT COSTING

ACTUAL VS. APPLIED MANUFACTURING OVERHEAD

- Closed to COGS example (OH underapplied by \$ 250)

Cost of Goods Sold for the year		Mfg. Overhead for the year	
Unadjusted Balance		Actual overhead \$29,050	Applied Overhead \$28,800
\$250			\$250
Adjusted Balance			

A red arrow points from the \$250 Applied Overhead cell in the Mfg. Overhead for the year table to the \$250 Unadjusted Balance cell in the Cost of Goods Sold for the year table.

ACTUAL VS. APPLIED MANUFACTURING OVERHEAD

ACCOUNTING ENTRIES: CLOSED TO COGS

- Overapplied

• Dr.	Manufacturing overhead	250
• Cr.	COGS	250

- Underapplied

• Dr.	COGS	250
• Cr.	Manufacturing overhead	250

ACTUAL VS. APPLIED MANUFACTURING OVERHEAD

- Schedule of Cost of Goods Sold

Schedule of Cost of Goods Sold		
Finished goods inventory, beginning		\$xxx
Add: Cost of goods manufactured*		<u>xxx</u>
Cost of goods available for sale		\$xxx
Deduct: Finished goods inventory, ending		<u>xxx</u>
Cost of goods sold		\$xxx
Add: Underapplied overhead		
or Deduct: Overapplied overhead		<u>xxx</u>
Cost of goods sold (adjusted)		<u>\$xxx</u>
* From Cost of Goods Manufactured Schedule		

OVER- / UNDERAPPLIED OVERHEAD: SUMMARY

If manufacturing overhead is ...	Alternative 1: Allocation	Alternative 2: Close to Cost of Goods Sold
UNDERAPPLIED (Applied overhead is smaller than actual overhead)	INCREASE ➤ Work in Process ➤ Finished Goods ➤ Cost of Goods Sold	INCREASE ➤ Cost of Goods Sold
OVERAPPLIED (Applied overhead is larger than actual overhead)	DECREASE ➤ Work in Process ➤ Finished Goods ➤ Cost of Goods Sold	DECREASE ➤ Cost of Goods Sold

P3-54

- Biloxi Billiards Company uses normal costing. Manufacturing OH is applied based on machine hours.
 - Total budgeted manufacturing overhead: \$306,000
 - Total budgeted machine hours: 51,000 h
- During January, the firm began production jobs.
 - M07: 1,200 machine hours
 - T28: 3,000 machine hours
 - B19: 1,800 machine hours
- There is no beginning inventory for WIP. Actual manufacturing OH incurred in January: \$38,000.
 1. POHR?
 2. OH applied in January?
 3. Over- or underapplied?
 4. Close into COGS

PRODUCT COSTING

E3-33

- Aquarius Hotel Supply Co. for year ended:

Budgeted sales revenue	\$945,000
Budgeted mfg. O/H	\$650,000
Budgeted mach. Hours	20,000
Budgeted DL hours	25,000
Budgeted DL rate per hour	\$13
Actual mfg. O/H	\$690,000
Actual machine hours	22,000
Actual DL hours	26,000
Actual DL rate per hour	\$14

\$ 350,000 supervisor salaries
\$ 200,000 machine depreciation
\$ 100,000 factory cleaning

1. Compute POHR using machine hours, DL hours, DL dollars.
2. Compute over/underapplied OH for each cost driver.
3. Generally, what is the cause of over-/underapplied overhead?

DETERMINING THE ALLOCATION BASE

PLANT-WIDE OVERHEAD RATE

- Direct labor (either hours or dollars) or machine hours generally used as the overhead allocation base

DEPARTMENTAL OVERHEAD RATES

- Different production departments have different cost drivers – labor hours, machine hours, units produced, etc.
- Key is what makes the most sense for that department (see “activity-based costing”)
- Two-stage allocation process – pools and products

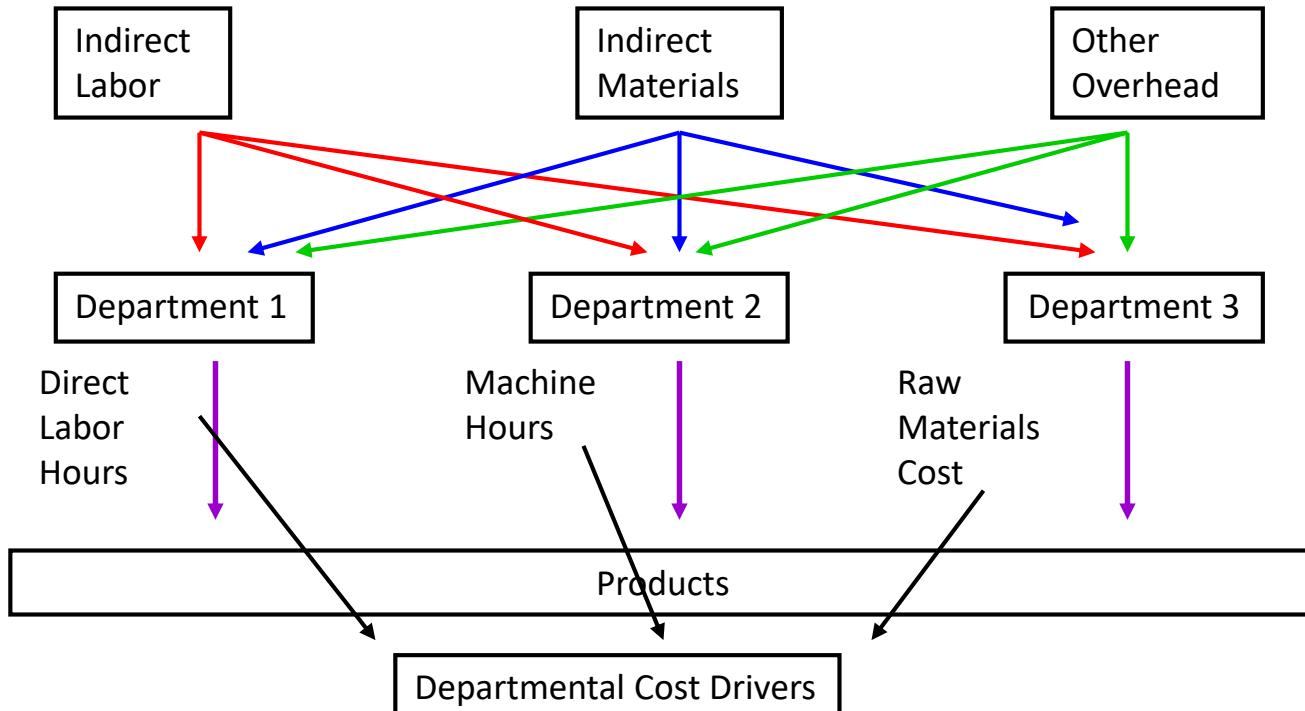
PRODUCT COSTING

TWO-STAGE ALLOCATION PROCESS: OVERHEAD

Stage One:
Costs assigned
to pools

Cost pools

Stage Two:
Costs applied
to products



MC-QUESTIONS – EXAMPLE QUESTION

- Aquarius Hotel Supply Co. for year ended:
 - Budgeted mfg. O/H \$650,000
 - Budgeted mach. Hours 20,000
 - Actual mfg. O/H \$690,000
 - Actual machine hours 22,000
- What is POHR based on machine hours? (1 point)
A) 32,5 B) 29,55 C) 31,36 D) 34,5

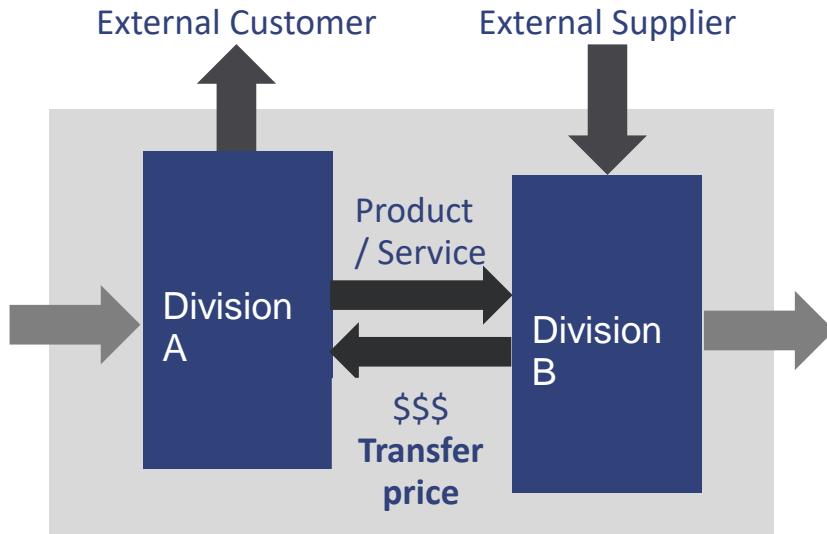
CHAPTER 13

TRANSFER PRICING

TRANSFER PRICING

GENERAL COMMENT

- Transfer price: a price charged between divisions
- In large corporations, divisions of the organization transfer goods and services to each other.



What is the effect of a transfer price, assuming the transfer takes place, on divisional profit and company profit?

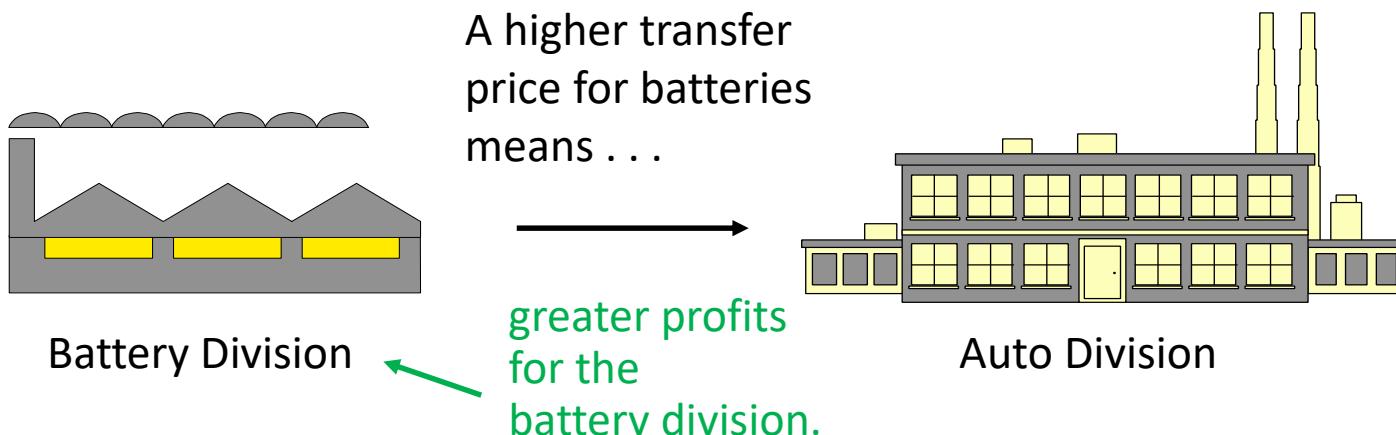
FOUR CRITERIA FOR A GOOD SOLUTION TO TRANSFER-PRICING PROBLEMS

1. Motivates managers to do what is best for the firm (Goal congruence)
2. Motivate units to save costs and to use resources efficiently
3. Help top managers to evaluate the performance of individual subunits
4. Preserve autonomy of subunits (Decentralisation)

TRANSFER PRICING

PROFIT EFFECT

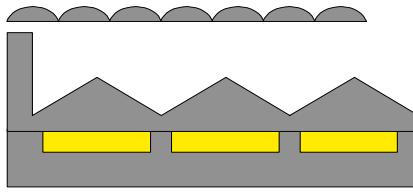
- A transfer price affects profits of both the selling and the buying divisions.



TRANSFER PRICING

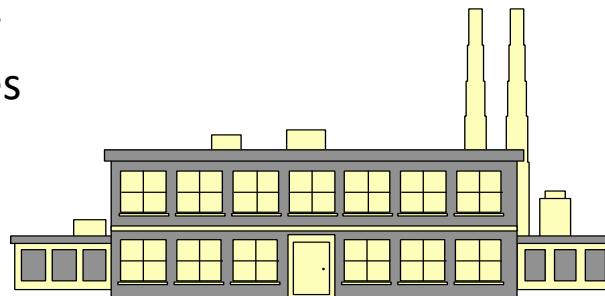
PROFIT EFFECT

- Transfer price affects profits of both the selling and the buying divisions



Battery Division

A higher transfer
price for batteries
means . . .



Auto Division

lower profits
for the
auto division.

PROFIT EFFECT

- There is no effect on the overall company profit, as the lower profit in one division is offset by a higher profit in the other division.



IMPORTANCE OF TRANSFER PRICING

- Why is transfer pricing important given that it does not directly impact company profits?
- The transfer price affects whether a transfer takes place.
- The transfer price affects the income of the divisions and therefore affects ...
 - the performance evaluations of both managers
 - the operating decisions of both managers
- If division managers maximize profit, they may not transact at some prices.

PERFECT TRANSFER PRICES

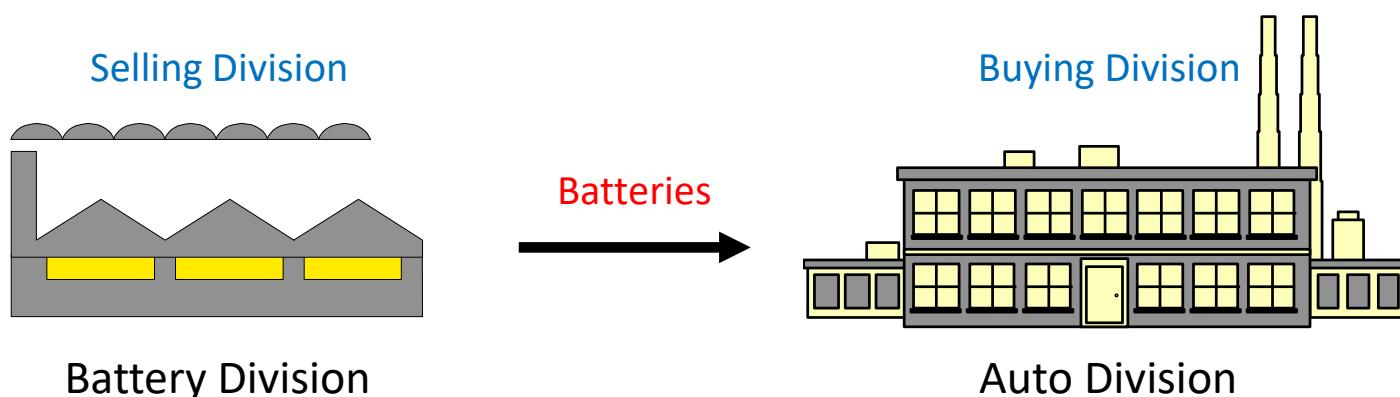
- A perfect transfer price allows each division to make decisions that maximize divisional profit and company profit.
- A perfect transfer price is the opportunity cost of a unit to the selling division.

$$\text{Transfer price} = \text{Additional outlay cost per unit incurred b/c goods are transferred (= variable cost)} + \text{Opportunity cost per unit to the selling division b/c of the transfer}$$

PRICE DEPENDENCE ON CAPACITY RESTRICTIONS

TRANSFER PRICING UNDER TWO SCENARIOS

- No excess capacity
- Excess capacity



SCENARIO I: NO EXCESS CAPACITY

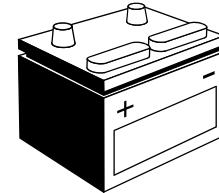
- The Battery Division produces standard 12-volt batteries.

Production capacity 300,000 units

Selling price per battery \$40 (to outsiders)

Variable costs per battery \$18

Fixed costs per battery \$7 (at 300,000 units)



- The Battery division is currently selling 300,000 batteries to outsiders at \$40.
- The Auto Division can use 100,000 of these batteries in its X-7 model.

What should the supplying division charge?

TRANSFER PRICING

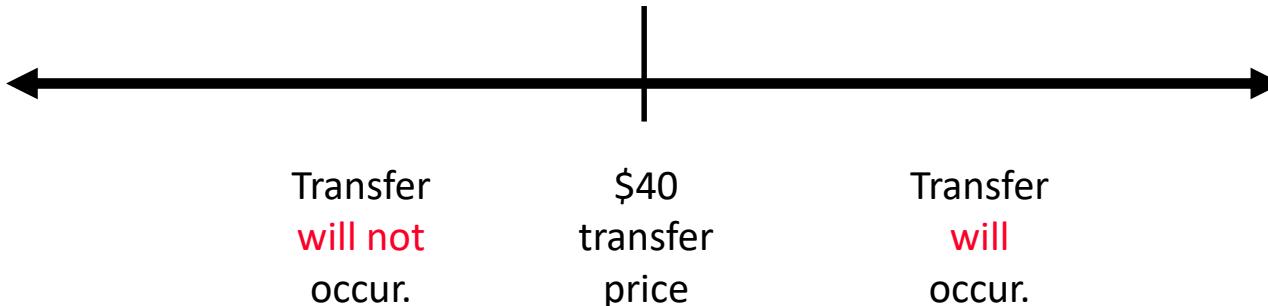
SCENARIO I: NO EXCESS CAPACITY

Transfer price	=	Additional outlay cost per unit incurred b/c goods are transferred	+	Opportunity cost per unit to the selling division b/c of the transfer
Transfer price	=	\$18 variable cost per battery	+	\$22 contribution lost if outside sales given up
Transfer price	=	\$40 per battery		

SCENARIO I: NO EXCESS CAPACITY

Auto division can purchase 100,000 batteries from an outside supplier for **less** than \$40.

Auto division can purchase 100,000 batteries from an outside supplier for **more** than \$40.



SCENARIO I: NO EXCESS CAPACITY

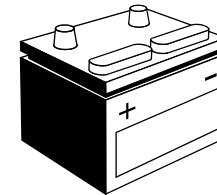
GENERAL RULE

- When the selling division is operating at capacity, the transfer price should be set at the market price.
- (Or at some slight discount to the market price if synergies to transferring goods exist within the firm)

SCENARIO II: EXCESS CAPACITY

- The Battery Division produces standard 12-volt batteries.

Production capacity	300,000 units
Selling price per battery	\$40 (to outsiders)
Variable costs per battery	\$18
Fixed costs per battery	\$7 (at 300,000 units)



- The Battery division is currently selling 150,000 batteries to outsiders at \$40.
- The Auto Division can use 100,000 batteries in its X-7 model.

What should the selling division charge?

TRANSFER PRICING

SCENARIO II: EXCESS CAPACITY

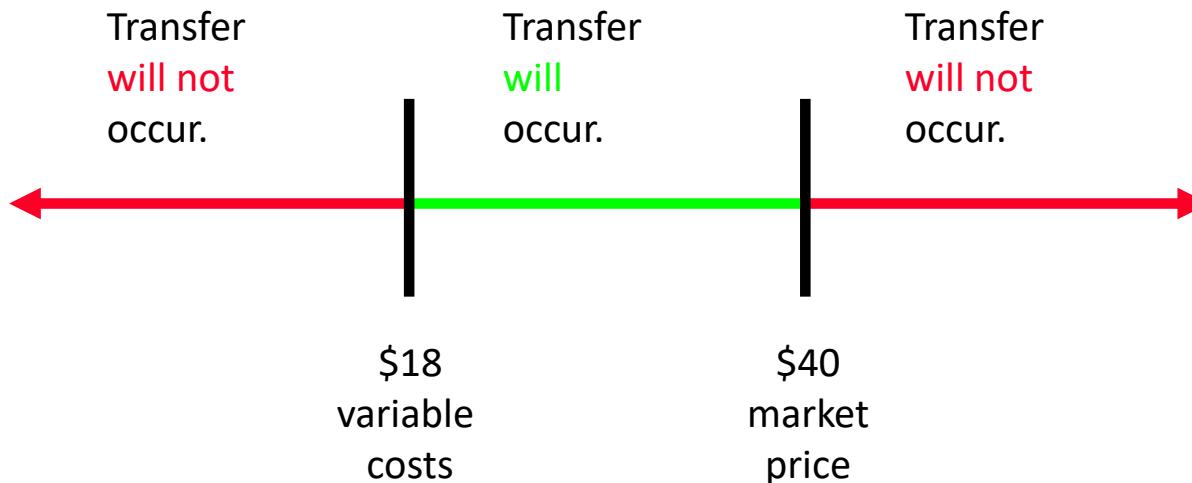
Transfer price	=	Additional outlay cost per unit incurred b/c goods are transferred	+	Opportunity cost per unit to the organization b/c of the transfer
Transfer price	=	\$18 variable cost per battery	+	\$0
Transfer price	=	\$18 per battery		

SCENARIO II: EXCESS CAPACITY

GENERAL RULE

- When the selling division is operating below capacity, the minimum transfer price is the variable cost per unit (including transfer costs).

SCENARIO II: EXCESS CAPACITY



WILL A TRANSFER TAKE PLACE?

Capacity at battery division (sell outside \$40, var. cost \$18)	Auto division can purchase battery from an external supplier at \$...	42	35	15
NO Excess				
Excess				

TRANSFER PRICING

WILL A TRANSFER TAKE PLACE?

With no excess capacity the battery devision sets the transfer price to the market price (40\$). This is cheaper than the price of batteries the auto divison needs to pay to an external supplier – both accept.

Capacity at battery division (sell outside \$40, var. cost \$18)	Auto division can purchase battery from an external supplier at \$...		
	42	35	15
NO Excess	Yes	No	No
Excess	Yes	Yes	No

With excess capacity the battery devision only needs to charge a transfer prive above var. costs. This is cheaper than the price of batteries the auto divison needs to pay to an external supplier – both accept

FOUR APPROACHES FOR CALCULATING TRANSFER PRICES

Market-based



e.g., the price the selling unit charges to outside customers; or the price the buyer would have to pay outsiders

Cost-based



e.g., full manufacturing costs

Negotiated



both business units are free to negotiate the price

Dual-pricing



e.g., buying unit pays market price, selling unit gets costs, difference paid by headquarter
(not covered in class)

MARKET-BASED TRANSFER PRICES

- Transferring products or services at market prices generally leads to optimal decisions under the following circumstances:

CONDITIONS FOR OPTIMAL MARKET-BASED TRANSFER PRICES

- There is a (perfectly) competitive external market for the transferred product.
- No additional costs or benefits to the company as a whole from buying or selling in the external market instead of transacting internally.

IMPERFECT COMPETITION

- Under imperfect competition for the intermediate good:

TRANSFER PRICING

- below the external market price ...
- ... and above the selling division's variable cost ...
- ... induces efficient transfers.

COST-BASED TRANSFER PRICES

- Top management chooses a transfer price based on the costs of producing the intermediate product

EXAMPLES

- Variable production costs
- Full costs (VC + allocated fixed overhead)
- One of the above plus some markup

COST-BASED TRANSFER PRICES

- Transfer prices will not fluctuate with the opportunity cost per unit for the selling division.
- It is hence important to set transfer prices at standard costs → otherwise, no incentive to produce efficiently for the selling division is provided.
- Often a mark-up is granted to allocate profits between divisions.
- Full costs can lead to inefficient decisions for special orders as fixed costs should be disregarded in these cases.

NEGOTIATED TRANSFER PRICES

ADVANTAGES

- Takes into account both cost and market information
- Often start with market prices and then make adjustments for internal savings, etc.

DRAWBACKS

- Can undermine spirit of cooperation
- Impacted by negotiation skills

INTERNATIONAL PERSPECTIVE

Since tax rates and import duties are different in different countries, companies have incentives to set transfer prices to ...

- Increase revenues in low-tax countries.
- Increase costs in high-tax countries.
- Reduce cost of goods transferred to high-import-duty countries.



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CHAPTER 7

COST-VOLUME-PROFIT ANALYSIS

OUTLINE

CONTRIBUTION MARGIN APPROACH

BREAK-EVEN ANALYSIS

COST-VOLUME-PROFIT (CVP) ANALYSIS

SENSITIVITY ANALYSIS

CVP WITH MULTIPLE PRODUCTS

U2 360° TOUR: THE BIGGEST ROCKSHOW EVER

- \$120 Million fixed costs
- \$750,000 expenses per day
- Loudest sound system ever





Köln

Abo



Zu wenig Karten verkauft Kölner Band Kasalla muss Europa-Tournee absagen



HOW DOES PROFIT CHANGE WITH ...

- An increase in sales?
- A decrease in cost?
- A shift in cost structure – an increase in variable costs and a decrease in fixed costs?
- A price change which increases volume but lowers profit per unit?
- Selling an additional product?

Cost-Volume-Profit Analysis:
evaluate possible outcomes for the business under differing circumstances

BASIC EQUATIONS TO ADDRESS THESE QUESTIONS

- Operating Income (OI) = Revenue – Variable Costs(VC) – Fixed Costs (FC)
 - Revenue = Price (P) *Quantity (Q)
 - VC = VC per unit (VC_u) * Q
- $OI = P*Q - VC_u*Q - FC$
- $OI = (P - VC_u)*Q - FC$



Contribution
Margin

CONTRIBUTION MARGIN

- Contribution Margin (CM) = Revenue – Variable Costs (VC)
- Unit Contribution Margin (CM_u) = Price (P) – Vc_u
- CM_u captures how much each unit “contributes” towards fixed costs
- CM_u is the amount added to operating income by selling an additional unit
- CM Ratio: CM/Sales → the % amount added to operating income per \$ in sales revenue

BREAK-EVEN POINT

- Using relation between unit sales, prices, costs, and profits in planning and decision-making
 - How much to sell to recoup all fixed expenses?
 - Also called break-even analysis
- Break-even point
 - The point where revenues equal costs
 - The point of zero profit

COMPUTING THE BREAK-EVEN POINT

UNIT CONTRIBUTION MARGIN APPROACH

- Unit Contribution Margin (CM_u) = Price (P) – Vc_u
- Captures how much each unit “contributes” towards fixed costs, i.e., how many units must we sell to cover all fixed costs (to break even)

$$FC = Q * CM_u$$



$$Q = FC / CM_u$$

COMPUTING THE BREAK-EVEN POINT

CONTRIBUTION MARGIN RATIO (% CONTRIBUTION OF SALES)

Break-even (dollars) = (Break-even units)*Sale_price

- Sometimes, management prefers break-even point in \$
- Contribution margin ratio: % contribution per \$ in sales

$$\frac{\text{Contribution margin}}{\text{Sales}} = \text{CM Ratio}$$


$$\frac{\text{Fixed costs}}{\text{CM Ratio}} = \text{Break-even point (in sales dollars)}$$

COMPUTING THE BREAK-EVEN POINT

BREAK-EVEN POINTS

- Units

$$\text{Break-even units} = \frac{\text{Fixed costs}}{\text{Unit contribution margin}}$$

- Currency Amount

$$\text{Break-even (\$, €, ...)} = \frac{\text{Fixed costs}}{\text{CM Ratio}}$$

COMPUTING THE BREAK-EVEN POINT

EXAMPLE

- Curl Inc. sells 500 surf boards for \$250,000.
- The associated fixed and variable costs are \$80,000 and \$150,000 respectively.
- Compute the break-even point in units as well as in dollars!



COMPUTING THE BREAK-EVEN POINT

COMPUTING CM_U AND CM RATIO

CM_U: For each additional surf board sold, Curl generates \$200 in contribution margin.

	Total	Per Unit	Percent
Sales (500 surf boards)	\$ 250,000	\$ 500	100%
Less: variable expenses	150,000	300	60%
Contribution margin	\$ 100,000	\$ 200	40%
Less: fixed expenses	80,000		
Net income	\$ 20,000		

CM ratio: 200/500
Per \$ in sales, 40% contribution

COMPUTING THE BREAK-EVEN POINT

$$\text{Break-even units} = \frac{\text{Fixed costs}}{\text{Unit CM}} = \frac{80,000}{200} = 400$$

Each unit sold contributes \$200 towards recovering fixed costs → 400 units need to be sold to break even

$$\text{Break-even sales} = \frac{\text{Fixed costs}}{\text{CM ratio}} = \frac{80,000}{0.4} = \$ 200,000$$

Each \$ in sales revenue contributes 40% towards recovering fixed costs
→ need \$200,000 in sales revenue to break even

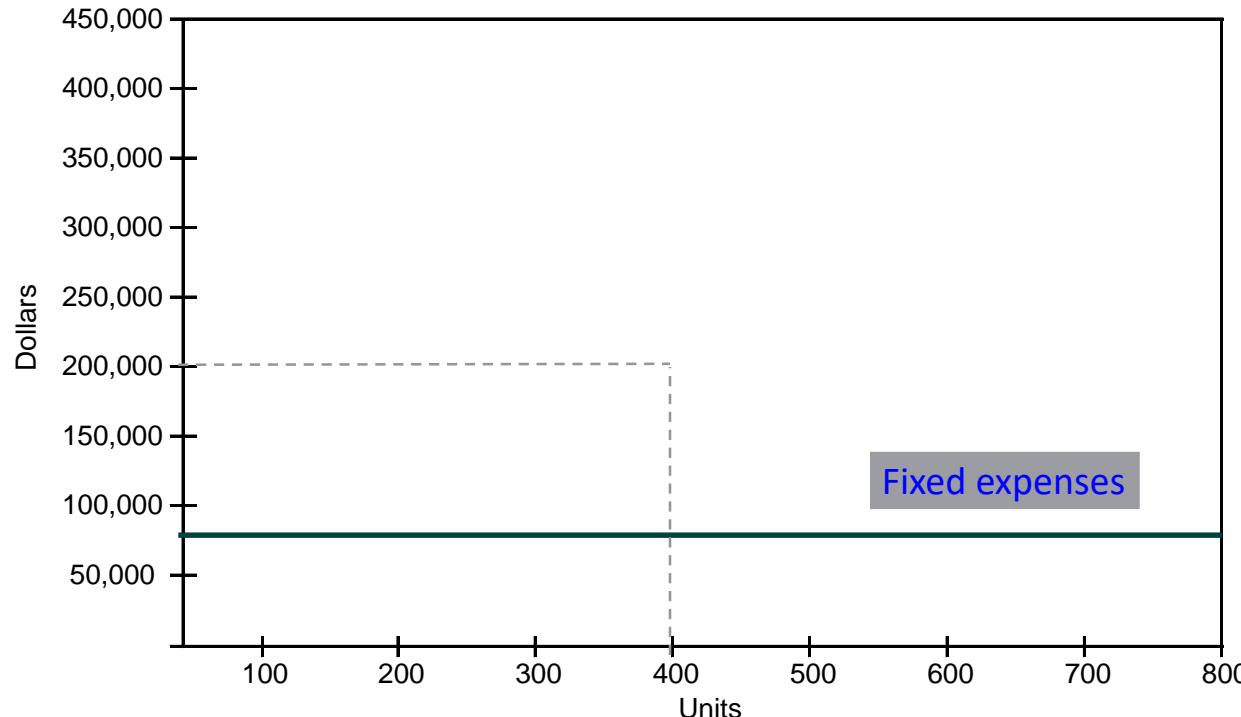
COST-VOLUME-PROFIT ANALYSIS

- Break-even does not capture how profit changes as activity changes
- CVP analysis: capture the relationship between profit and volume of activity
- Often graphically displayed

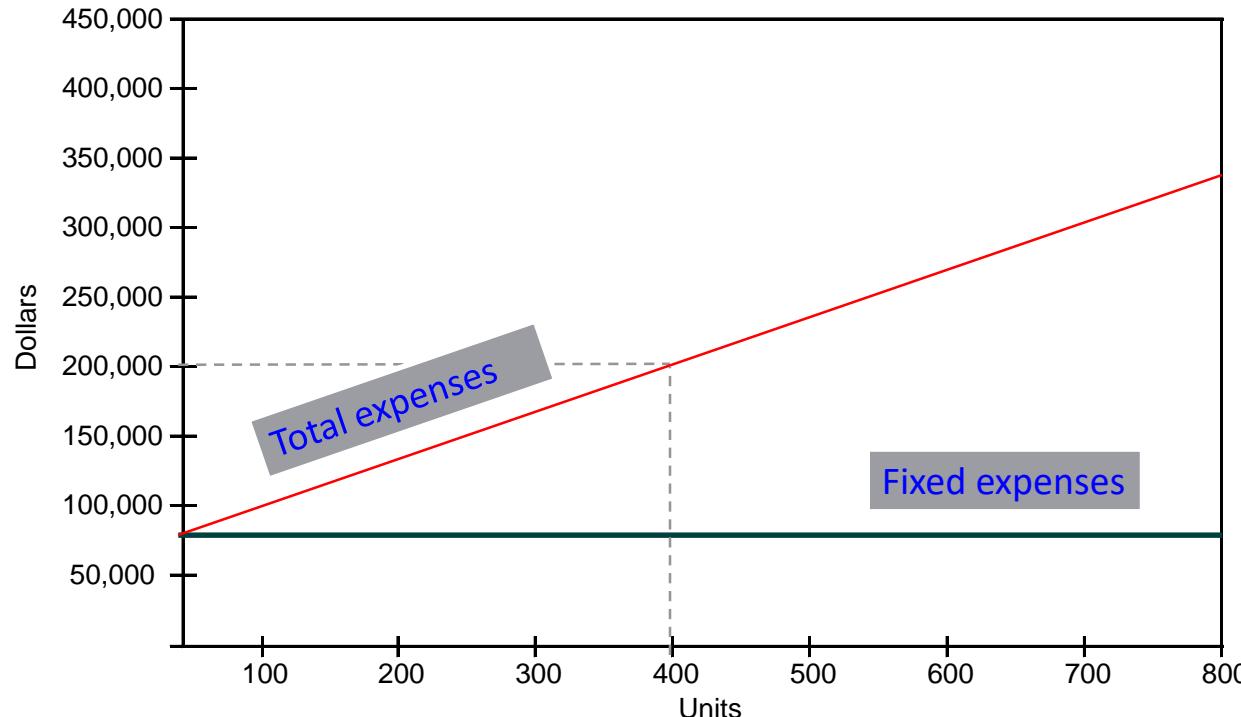
CVP: SCENARIO ANALYSIS & GRAPHS

Production	300 units	400 units	500 units
Sales	\$150,000	\$200,000	\$250,000
Variable costs	\$90,000	\$120,000	\$150,000
Total Contribution margin	\$60,000	\$80,000	\$100,000
Unit CM	\$ 200	\$ 200	\$ 200
Fixed costs	\$80,000	\$80,000	\$80,000
Profits	(\$20,000)	-	\$20,000

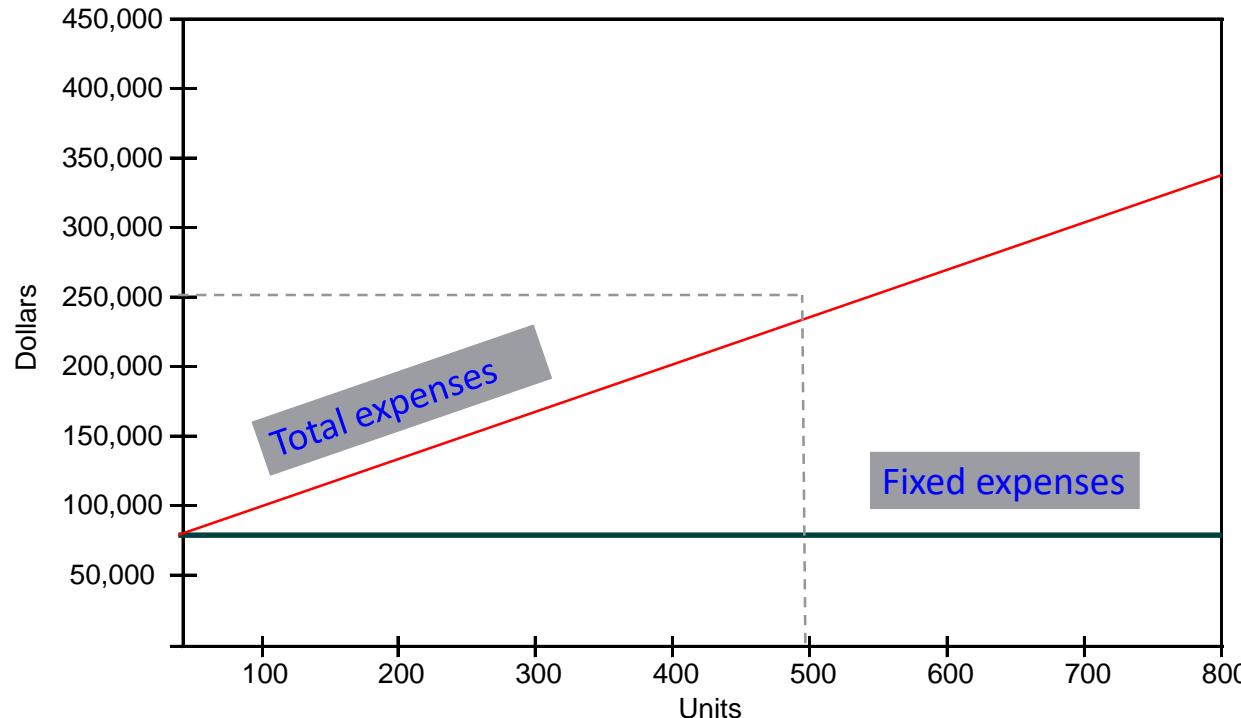
COST-VOLUME PROFIT GRAPH



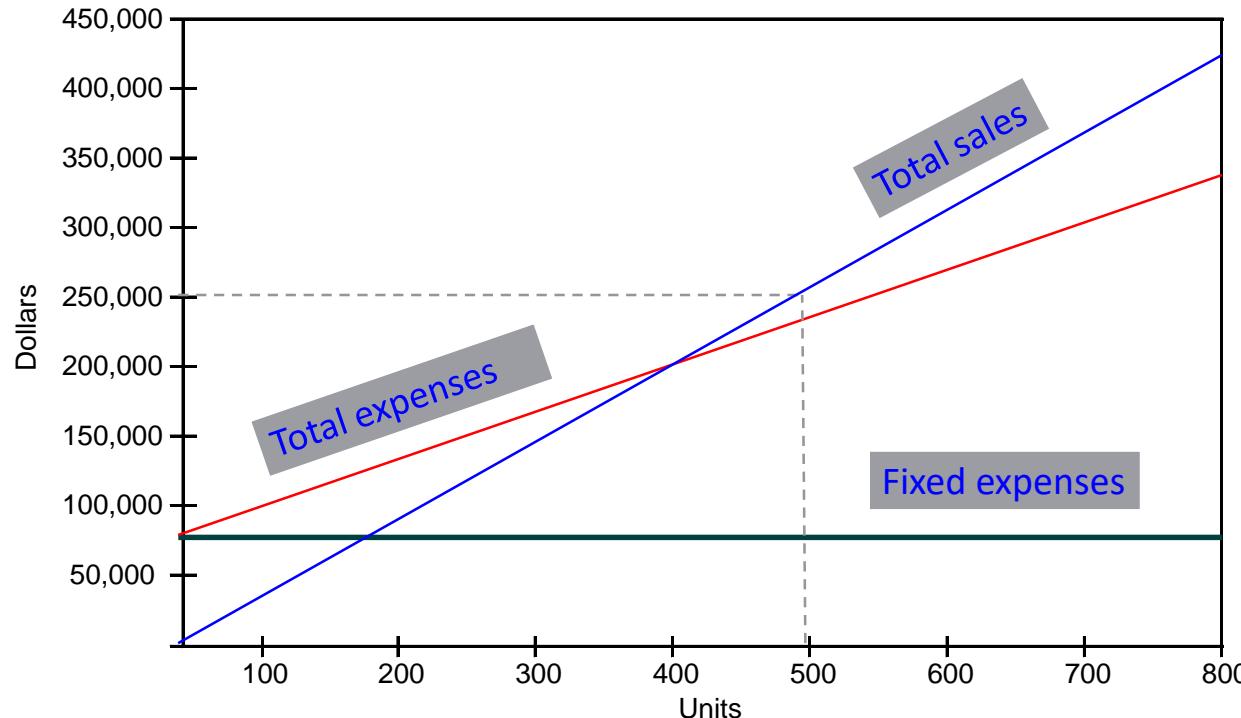
COST-VOLUME PROFIT GRAPH



COST-VOLUME PROFIT GRAPH

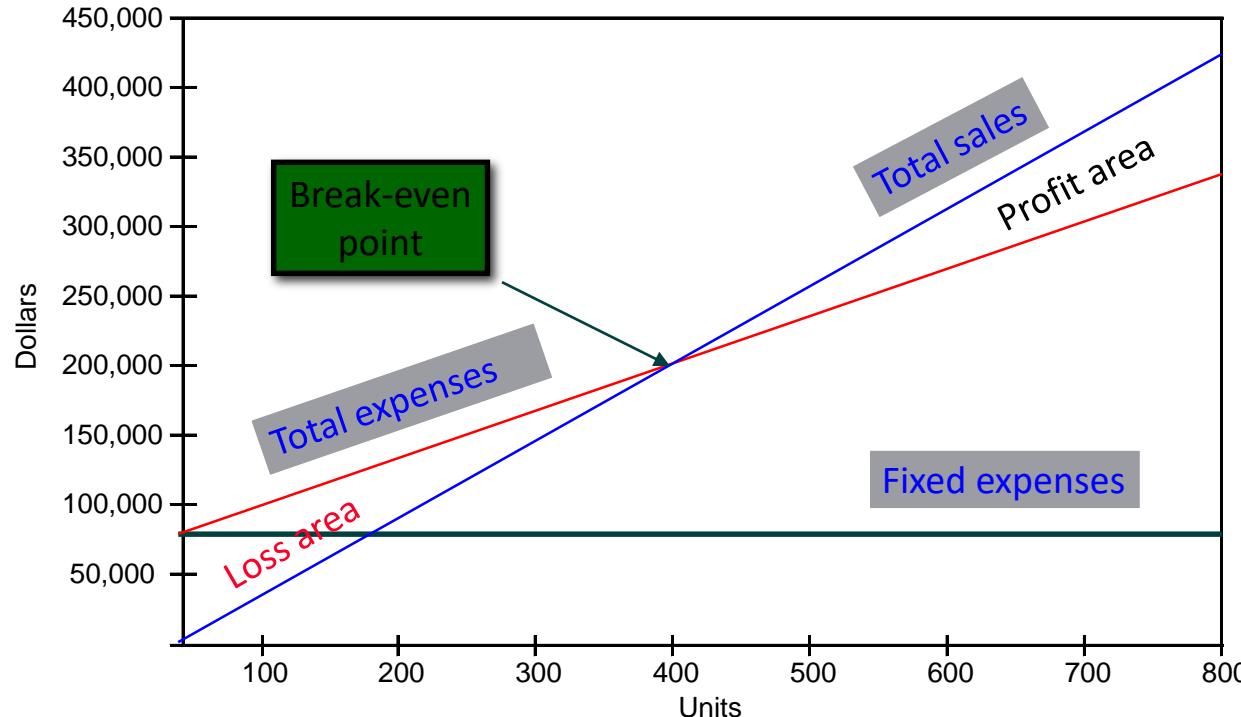


COST-VOLUME PROFIT GRAPH

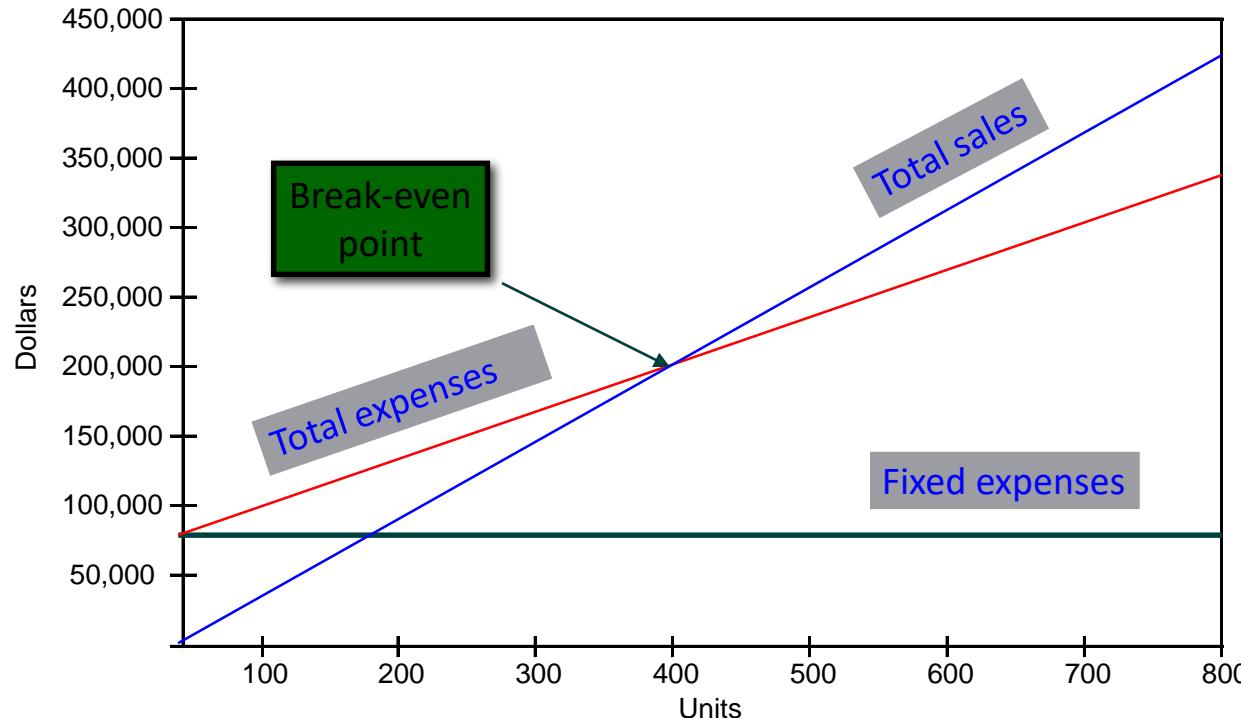


CVP ANALYSIS

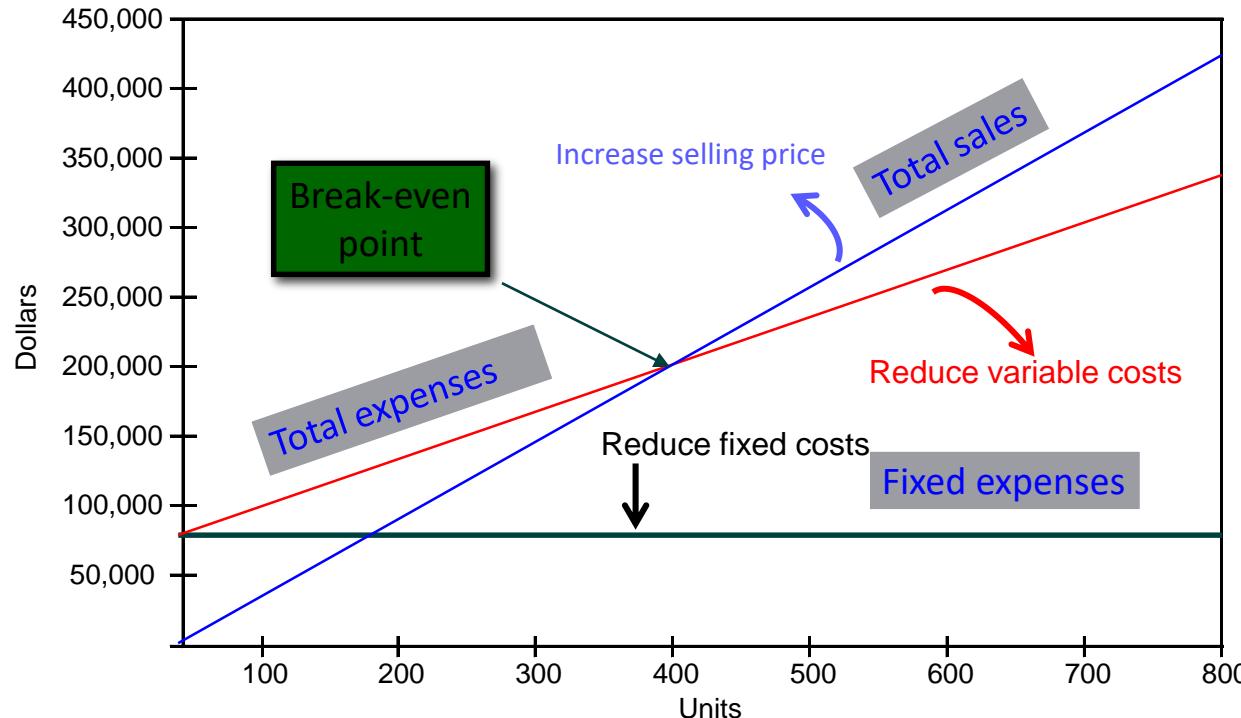
COST-VOLUME PROFIT GRAPH



HOW CAN YOU REDUCE THE BREAK-EVEN POINT?



HOW CAN YOU REDUCE THE BREAK-EVEN POINT?



TARGET PROFIT

- By simply adding target profit to fixed costs, the break-even point formula can be modified to become a profit planning tool.

Target profit **units** =

$$\frac{\text{Fixed costs} + \text{Target profit}}{\text{Unit contribution margin}}$$



Target profit **sales** =

$$\frac{\text{Fixed costs} + \text{Target profit}}{\text{CM Ratio}}$$

E7-23

- University Pizza delivers to dorms and apartments.
 - Annual fixed costs are \$54,000, the selling price is \$10 per pizza.
 - Variable costs are \$6 per pizza (production and delivery).
-
1. Using unit contribution margin, what is B/E in units?
 2. What is the contribution margin ratio?
 3. Using contribution margin ratio, B/E in sales \$?
 4. How many pizzas to sell to earn a net profit of \$60,000?

APPLYING CVP ANALYSIS

- CVP provides structure to evaluate profit under alternative scenarios
- What happens to profit if:
 - Firm changes selling price
 - Cost structure changes
- Firm should select alternative which maximizes profit.

APPLYING CVP ANALYSIS: EXAMPLE

- Curl is currently selling 500 surf boards per month.

$$FC = \$80,000, VC_u = \$300, P = \$500$$

- The owner believes that an increase of \$10,000 in the monthly advertising budget would increase board sales to 540 units.
- Should the firm authorize the increase in advertising?
- Calculate profitability under each scenario!

APPLYING CVP ANALYSIS: EXAMPLE (CONT'D)

- Calculate profitability under each scenario!
- No advertising: Profit = $(200)*500 - \$80,000 = \$20,000$
- Advertising: Profit = $(200)*540 - \$90,000 = \$18,000$
- Sales increase does not outweigh the additional costs → select no advertising

APPLYING CVP ANALYSIS: EXAMPLE (CONT'D)

- Incremental sales & costs matter
- Advertising increases sales by 40 units → affects profit in two ways
 - Increase in profit due to 40 unit increase in sales: $40 * 200 = 8,000$
 - Decrease in profit due to change in fixed costs by \$10,000
- $\$8,000 - \$10,000 < 0 \rightarrow$ advertising decreases profit

CVP ANALYSIS WITH MULTIPLE PRODUCTS

- Sales mix
 - The proportion of sales of various products
- How do you compute break-even points?
 - Different products have different costs, different sales prices and different contribution margins
 - However, fixed costs are common
- Key: Weighted average contribution margin

CVP ANALYSIS WITH MULTIPLE PRODUCTS

- $OI = CM_{u1}Q_1 + CM_{u2}Q_2 - \text{Fixed Costs}$
- Express quantity per product as a % of total quantity

$$(\%Prod_1 = Q_1 / (Q_1 + Q_2), Q_{TTL} = Q_1 + Q_2)$$

- $OI = (CM_{u1}(\%Prod_1) + CM_{u2}(\%Prod_2)) Q_{TTL} - \text{Fixed Costs}$



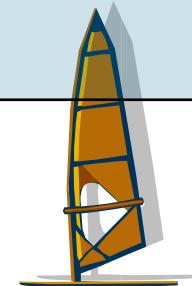
**Weighted average unit
contribution margin**

CVP ANALYSIS WITH MULTIPLE PRODUCTS: EXAMPLE (CONT'D)

- Assume that Curl sells sail boards along with surfboards as following:

	Sale price	Variable cost	Units sold
Surfboards	500	300	500
Sailboards	1,000	450	300
Fixed costs – added capacity	170,000		

- Compute the break-even points!



CVP ANALYSIS WITH MULTIPLE PRODUCTS: EXAMPLE (CONT'D)

- Unit contribution margin
 - surf boards: $CM_U = 500 - 300 = 200$
 - sail boards: $CM_U = 1,000 - 450 = 550$
- Sales mix = 500 surf, 300 sail boards (800 total)
 - 62.5% (5/8) surf boards
 - 37.5% (3/8) sail boards
- Weighted average unit contribution margin = $(0.625)*200+(0.375)*550 = 331.25$

CVP ANALYSIS WITH MULTIPLE PRODUCTS: EXAMPLE (CONT'D)

- Break-even point =
$$\frac{\text{Fixed costs}}{\text{Weighted average unit contribution margin}}$$

$$\text{Break-even point} = \frac{170,000}{331.25}$$

$$\text{Break-even point} = 514$$

- Curl Inc. has to sell 514 combined units to break-even – the mix is important!

CVP ANALYSIS WITH MULTIPLE PRODUCTS: EXAMPLE (CONT'D)

- Individual break-even points:

	Combined break-even point	Weights	Individual break-even point
Surfboards	514	0.625	321
Sailboards	514	0.375	193
Total			514

- Curl Inc. has to sell 321 surfboards and 193 sailboards to break even.

ASSUMPTIONS UNDERLYING CVP ANALYSIS

- Selling price is constant throughout the entire relevant range.
- Costs are linear over the relevant range.
- In multi-product companies, the sales mix is constant.
- In manufacturing firms, inventories do not change (units produced = units sold).

CASE 7-55

- Current situation vs. new option:

Independent Sales Agents	Own Sales Personnel
<ul style="list-style-type: none">• Currently receive a commission of 20% of sales• Demand an increase to 25%	<ul style="list-style-type: none">• 3 individuals required (annual salary of \$45,000 each)• Plus commissions of 5% of sales• 2 sales managers at fixed annual salaries of \$120,000 each

CVP ANALYSIS

CASE 7-55 (CONT'D)

- Budgeted income statement reflects independent sales agents (20%)
- Assume COGS 100% variable
- All income statement fixed costs and the variable cost percentages would remain the same under each scenario

LAKE CHAMPLAIN SPORTING GOODS COMPANY		
Budgeted Income Statement		
For the Year Ended December 31, 20x4		
Sales	\$15,000,000	
Cost of goods sold		9,000,000
Gross margin		\$ 6,000,000
Selling and administrative expenses:		
Commissions	\$3,000,000	
All other expenses (fixed)		150,000
		3,150,000
Income before taxes		\$ 2,850,000
Income tax (30%)		855,000
Net Income		<u><u>\$ 1,995,000</u></u>

CASE 7-55 (CONT'D)

1. Estimate B/E point in sales \$ based on IS for both scenarios:
 - independent sales agents, 20% commission
 - own sales personnel
2. Compute estimated \$ sales volume that yields the same net income if sales commission rises to 25%
3. Compute estimated \$ sales volume that would yield an identical net income under both scenarios
(25% commission vs. own sales personnel)

CHAPTER 8

INVENTORY COSTING: ABSORPTION VS. VARIABLE COSTING

ABSORPTION AND VARIABLE COSTING

- Inventory Costing: how is fixed manufacturing overhead allocated?

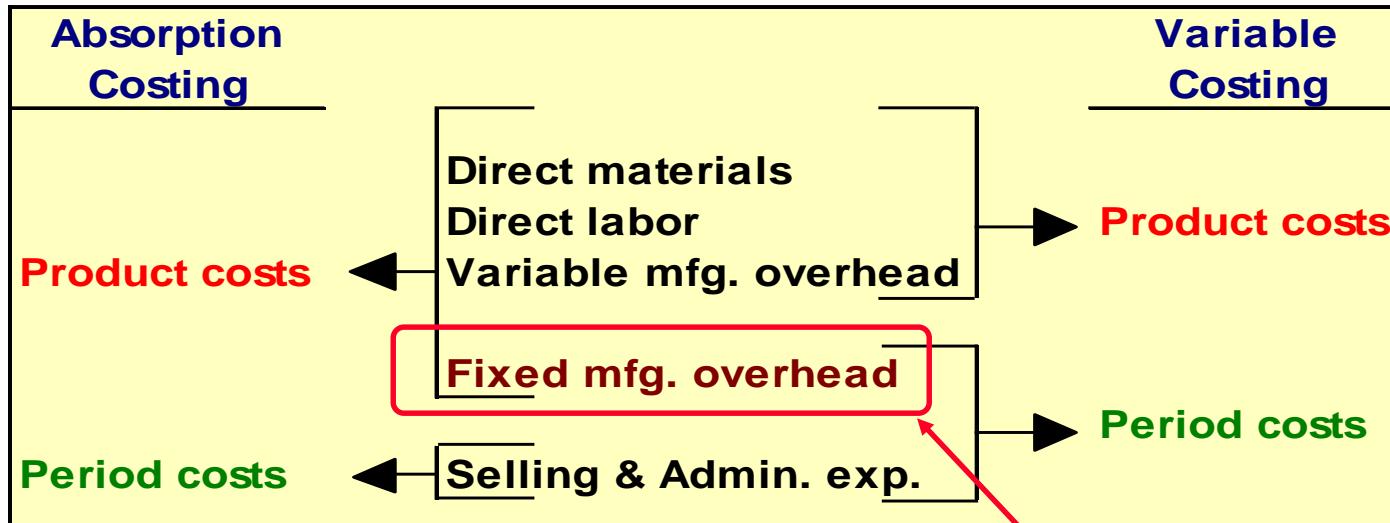
ABSORPTION (FULL) COSTING

- Both fixed and variable production costs are assigned to products.

VARIABLE COSTING

- Only variable costs are assigned to products (also called direct costing)

ABSORPTION AND VARIABLE COSTING



The difference between absorption and variable costing is the treatment of fixed manufacturing overhead.

ABSORPTION AND VARIABLE COSTING

- Mellon Co. produces a single product with the following information available:

Number of units produced annually	25,000
Variable costs per unit:	
Direct materials, direct labor and variable mfg. overhead	\$ 10
Fixed costs per year:	
Mfg. overhead	\$ 150,000
Selling & administrative expenses	\$ 160,000

ABSORPTION AND VARIABLE COSTING

- Unit product cost is determined as follows:

	Absorption Costing	Variable Costing
Direct materials, direct labor, and variable mfg. overhead	\$ 10	\$ 10
Fixed mfg. overhead (\$150,000 ÷ 25,000 units)	6	-
Unit product cost	\$ 16	\$ 10

- Selling and administrative expenses are always treated as period expenses & deducted from revenue.

ABSORPTION AND VARIABLE COSTING

100,000 Chrysler vehicles sitting on lots around metropolitan Detroit in Summer 2006

source: *Wall Street Journal*, 12/15/2006

During December 2006, GM had more than one million vehicles in stock in the US.

source: *Wall Street Journal – Eastern Edition*, 1/8/2007



ABSORPTION AND VARIABLE COSTING

- “GM, Ford, and DaimlerChrysler... are lopping thousands of dollars off sticker prices on 2007 models”
(source: Wall Street Journal, 9/27/2006)

- “Chrysler is slicing as much as \$10,000 off the \$30,000 price of the Dodge Durango, a big SUV whose sales have stalled.”

(source: Wall Street Journal, 12/15/2006)



ABSORPTION AND VARIABLE COSTING

- Absorption costing (AC) is required by GAAP and the IRS for external reporting
 - Fixed manufacturing overhead (FMOH) is allocated to units of product
 - FMOH is part of Cost of Goods Sold (CoGS) for units sold, part of balance-sheet inventory value for unsold units
 - Consistent with long-run pricing decisions that must cover full costs
- Variable costing (VC) is used internally
 - All current-period FMOH is treated as a current-period cost, regardless of whether units are sold or not
 - Consistent with CVP analysis, impact of fixed costs emphasized
 - Consistent with short-run pricing decisions

ABSORPTION AND VARIABLE COSTING: NET INCOME EFFECT

HOW DO THE DIFFERENT UNIT COSTS IMPACT NET INCOME?

- Sell units for \$30
- Unit costs are \$16 under absorption and \$10 under variable costing
- Fixed costs are \$150,000 (\$6 per unit)

	Year 0	Year 1	Year 2
Production	25,000	25,000	25,000
Sales	25,000	20,000	30,000

- Big question: Under which costing system is the operating income higher?

ABSORPTION AND VARIABLE COSTING: NET INCOME EFFECT

- Absorption allocates fixed costs to products (fixed costs are “absorbed”)
 - Decreases gross margin (i.e. COGS increase)
 - Defers fixed costs into inventory (if sales < production)

Let's work a numerical example!

ABSORPTION AND VARIABLE COSTING: NET INCOME EFFECT

- Mellon Co.,
in year 1 of operations,
had no beginning inventory,
produced 25,000 units
and sold 20,000 units
at \$30 each.

Absorption Costing Income Statement

Absorption Costing	
Sales ($20,000 \times \$30$)	\$ 600,000
Less cost of goods sold:	
Beginning inventory	\$ -
Add COGM ($25,000 \times \$16$)	<u>400,000</u>
Goods available for sale	\$ 400,000
Ending inventory ($5,000 \times \$16$)	<u>80,000</u>
	320,000
Gross margin	\$ 280,000
Less selling & admin. exp.	
Fixed	<u>160,000</u>
Operating income	\$ 120,000

ABSORPTION AND VARIABLE COSTING: NET INCOME EFFECT

- Mellon Co.,
in year 1 of operations,
had no beginning inventory,
produced 25,000 units
and sold 20,000 units
at \$30 each.

Variable Costing Income Statement

Variable Costing	
Sales ($20,000 \times \$30$)	\$ 600,000
Less variable expenses:	
Beginning inventory	\$ -
Add COGM ($25,000 \times \$10$)	250,000
Goods available for sale	\$ 250,000
Ending inventory ($5,000 \times \$10$)	50,000
Variable cost of goods sold	\$ 200,000
Contribution margin	\$ 400,000
Less fixed expenses:	
Manufacturing overhead	\$ 150,000
Selling & administrative expenses	160,000
Operating income	\$ 90,000

We exclude the fixed manufacturing OH.

COMPARING ABSORPTION AND VARIABLE COSTING

	<u>Cost of Goods Sold</u>	<u>Ending Inventory</u>	<u>Period Expense</u>	<u>Total</u>
Absorption costing				
Variable mfg. costs	\$ 200.000			
Fixed mfg. costs	120.000			
	<u>\$ 320.000</u>			
Variable costing				
Variable mfg. costs	\$ 200.000			
Fixed mfg. costs	-			
	<u>\$ 200.000</u>			

COMPARING ABSORPTION AND VARIABLE COSTING

- If production > sales, Absorption Costing Income > Variable Costing Income

	Cost of Goods Sold	Ending Inventory	Period Expense	Total
Absorption costing				
Variable mfg. costs	\$ 200,000	\$ 50,000	\$ -	\$ 250,000
Fixed mfg. costs	120,000	30,000	-	150,000
	<u>\$ 320,000</u>	<u>\$ 80,000</u>	<u>\$ -</u>	<u>\$ 400,000</u>
Variable costing				
Variable mfg. costs	\$ 200,000	\$ 50,000	\$ -	\$ 250,000
Fixed mfg. costs	-	-	150,000	150,000
	<u>\$ 200,000</u>	<u>\$ 50,000</u>	<u>\$ 150,000</u>	<u>\$ 400,000</u>

RECONCILING INCOME UNDER ABSORPTION & VARIABLE COSTING

- We can reconcile the difference between absorption and variable using the “shortcut method”.

$$\left(\begin{array}{c} \text{change in inventory} \\ \text{in units} \end{array} \right) \times \left(\begin{array}{c} \text{predetermined fixed} \\ \text{overhead rate per unit} \end{array} \right)$$

RECONCILING INCOME UNDER ABSORPTION & VARIABLE COSTING

Variable costing operating income	\$ 90,000
Add: Fixed mfg. overhead costs	
deferred in inventory	(5,000
units × \$6 per unit)	<u>30,000</u>

Absorption costing operating income

\$ 120,000

$$\frac{\text{Fixed mfg. overhead}}{\text{Units produced}} = \frac{\$150,000}{25,000} = \$6.00 \text{ per unit}$$

ABSORPTION AND VARIABLE COSTING: NET INCOME EFFECT

- In year 2 of operations, Mellon Co. started with an inventory of 5,000 units, produced 25,000 units & sold 30,000 units at \$30.

Absorption Costing Income Statement

Ending inventory from previous period.

	Absorption Costing
Sales ($30,000 \times \$30$)	\$ 900,000
Less cost of goods sold:	
Beg. inventory ($5,000 \times \$16$)	\$ 80,000
Add COGM ($25,000 \times \$16$)	400,000
Goods available for sale	<u>\$ 480,000</u>
Ending inventory	-
Gross margin	480,000
Less selling & admin. exp.	
Fixed	160,000
Operating income	<u>\$ 260,000</u>

25,000 units produced in the current period.

ABSORPTION AND VARIABLE COSTING: NET INCOME EFFECT

- In year 2 of operations, Mellon Co. started with an inventory of 5,000 units, produced 25,000 units & sold 30,000 units at \$30.

Variable Costing Income Statement

	Variable Costing
Sales (30,000 × \$30)	\$ 900,000
Less variable expenses:	
Beg. inventory (5,000 × \$10)	\$ 50,000
Add COGM (25,000 × \$10)	250,000
Goods available for sale	<hr/> \$ 300,000
Ending inventory	-
Variable cost of goods sold	<hr/> \$ 300,000
Contribution margin	<hr/> \$ 600,000
Less fixed expenses:	
Manufacturing overhead	\$ 150,000
Selling & administrative expenses	160,000
Operating income	<hr/> 310,000
\$ 290,000	

Excludes fixed manufacturing overhead.

ABSORPTION COSTING (AC) VS. VARIABLE COSTING (VC): SUMMARY

Production versus Sales	Total Inventory Effect	Period Expense Effect	Profit Effect
Produced > Sold	Increase	Fixed mfg. costs expensed AC <	Fixed mfg. costs expensed VC AC > VC
Produced < Sold	Decrease	Fixed mfg. costs expensed AC >	Fixed mfg. costs expensed VC AC < VC
Produced = Sold	No change	Fixed mfg. costs expensed AC =	Fixed mfg. costs expensed VC AC = VC

INCOME STATEMENT FORMAT: ABSORPTION VS. VARIABLE COSTING

- Absorption costing: classify costs by function
 - $\text{Revenues} - \text{Cost of Goods Sold} = \text{Gross profit}$
 - $\text{Gross profit} - \text{Selling General \& Administrative Costs} = \text{Operating income}$
- Variable costing: classify costs by behavior
 - $\text{Revenues} - \text{variable costs (production, sales, etc.)} = \text{Contribution margin}$
 - $\text{Contribution margin} - \text{fixed costs (production, sales, etc.)} = \text{Operating income}$

E8-23

- Sea Star Company manufactures diving masks with a variable cost of \$12.50. The masks sell for \$17.00. Budgeted fixed manufacturing overhead for the most recent year was \$396,000. Actual production was equal to planned production.
- Under each of the following conditions, state
 1. whether operating income is higher under variable or absorption costing and
 2. the amount of the difference in reporting operating income under the two methods.
- Treat each condition as an independent case.

E8-23

1. Production 110,000 units
Sales 107,000 units

2. Production 88,000 units
Sales 93,000 units

3. Production 80,100 units
Sales 80,100 units

Prof. Dr. Timo Vogelsang

MANAGERIAL ACCOUNTING (WINTER 2023)



COURSE OVERVIEW

Session	Topic	Hilton / Platt
1	The Changing Role of Managerial Accounting	Chapter 1
	Basic Cost Management Concepts	Chapter 2
2	Product / Job Costing	Chapter 3
	Transfer Pricing	Chapter 13
3	Cost-Volume-Profit Analysis	Chapter 7
	Inventory Costing (Absorption vs. Variable Costing)	Chapter 8
4	Decision-Making: Relevant Costs and Benefits	Chapter 14
	Responsibility Center, Performance Measures & Controls	(Chapter 12/13)
5	Activity-Based Costing	Chapter 5
6	Activity Analysis, Cost Behavior, and Cost Estimation	Chapter 6
	Budgets – Financial Planning and Analysis	Chapter 9
7	Standard Costing and Direct Cost Variances	Chapter 10
8	Signaling Effects of Incentives	
	Sustainability and Controlling	

CHAPTER 14

DECISION-MAKING: RELEVANT COSTS AND BENEFITS

OUTLINE

INFORMATION FOR DECISION-MAKING

ANALYSIS OF SPECIAL DECISIONS

OTHER ISSUES IN DECISION-MAKING

INFORMATION FOR DECISION-MAKING

RELEVANT

- Pertinent to a decision problem

ACCURATE

- Information should be precise

TIMELY

- Available in time for a decision



RELEVANT INFORMATION ...

- ... is bearing on the future
- ... differs among competing alternatives

EXAMPLES:

- Exclude sunk costs
- Include all relevant opportunity costs
- Exclude costs that are identical between alternatives: use differential costs

RELEVANT INFORMATION - EXAMPLE

- Worldwide Airways is thinking about replacing a three year-old loader with a new loader.

New loader	
List price	\$ 15.000
Annual operating expenses	45.000
Expected life in years	1
Old loader	
Original cost	\$ 100.000
Remaining book value	25.000
Disposal value now	5.000
Annual operating expenses	80.000
Remaining life in years	1

DECISION-MAKING

RELEVANT INFORMATION - EXAMPLE

	Keep Old Loader	Replace Old Loader	Differential Cost
Depreciation of old loader	\$ 25,000		
Write-off of old loader		\$ 25,000	\$ -
Proceeds from sale of old loader		(5,000)	5,000
Depreciation of new loader		15,000	(15,000)
Operating costs	80,000	45,000	35,000
Total costs	<u>\$ 105,000</u>	<u>\$ 80,000</u>	<u>\$ 25,000</u>

- If we keep the old loader, we will have depreciation costs of \$25,000. If we replace the old loader, we will write off the \$25,000 when sold. There is no difference in the cost, so it is not relevant.
- Neither of these results in incremental expenditure of cash!
- Sunk cost

DECISION-MAKING

RELEVANT INFORMATION - EXAMPLE

	Keep Old Loader	Replace Old Loader	Differential Cost
Depreciation of old loader	\$ 25,000		
Write-off of old loader		\$ 25,000	\$ -
Proceeds from sale of old loader		(5,000)	5,000
Depreciation of new loader		15,000	(15,000)
Operating costs	80,000	45,000	35,000
Total costs	\$ 105,000	\$ 80,000	\$ 25,000

- The \$5,000 proceeds will only be realized if we replace the old loader.
- This amount is relevant.

DECISION-MAKING

RELEVANT INFORMATION - EXAMPLE

	Keep Old Loader	Replace Old Loader	Differential Cost
Depreciation of old loader	\$ 25,000		
Write-off of old loader		\$ 25,000	\$ -
Proceeds from sale of old loader		(5,000)	5,000
Depreciation of new loader		15,000	(15,000)
Operating costs	80,000	45,000	35,000
Total costs	\$ 105,000	\$ 80,000	\$ 25,000

- We will only have depreciation on the new loader if we replace the old loader. This cost is relevant.

DECISION-MAKING

RELEVANT INFORMATION - EXAMPLE

	Keep Old Loader	Replace Old Loader	Differential Cost
Depreciation of old loader	\$ 25,000		
Write-off of old loader		\$ 25,000	\$ -
Proceeds from sale of old loader		(5,000)	5,000
Depreciation of new loader		15,000	(15,000)
Operating costs	80,000	45,000	35,000
Total costs	<u>\$ 105,000</u>	<u>\$ 80,000</u>	<u>\$ 25,000</u>

- The difference in operating costs is relevant to the immediate decision.

RELEVANT INFORMATION - EXAMPLE

- Here is an analysis that includes only relevant costs:

Relevant Cost Analysis		
Savings in variable expenses provided by the new loader	\$	35,000
Cost of the new loader		(15,000)
Disposal value of old loader		5,000
Net effect	\$	25,000

TYPES OF DECISIONS

OUTSOURCING A PRODUCT OR SERVICE (MAKE-OR-BUY)

ADD OR DROP A SERVICE/PRODUCT/DEPARTMENT

ACCEPT OR REJECT A SPECIAL ORDER

- Excess capacity vs. no excess capacity

ALLOCATION OF LIMITED RESOURCES

OUTSOURCE A PRODUCT OR SERVICE

- An Atlanta bakery has offered to supply in-flight desserts for 21¢ each.
- Here are Worldwide Airline's current cost for desserts:

Variable costs:	
Direct material	\$ 0.06
Direct labor	0.04
Variable overhead	0.04
Fixed costs:	
Supervisory salaries	0.04
Depreciation of equipment	0.07
Total cost per dessert	\$ 0.25

OUTSOURCE A PRODUCT OR SERVICE

- Not all of the allocated fixed costs will be saved if Worldwide purchases from the outside bakery.

	Cost per Dessert	Savings from Outsourcing
Variable costs:		
Direct material	\$ 0.06	\$ 0.06
Direct labor	0.04	0.04
Variable overhead	0.04	0.04
Fixed costs:		
Supervisory salaries	0.04	0.01
Equipment depreciation	0.07	-
Total cost per dessert	\$ 0.25	\$ 0.15

- If Worldwide purchases the dessert for 21 cents, it will only save 15 cents.
- Hence, Worldwide will have a loss of 6 cents per dessert purchased!

BEWARE OF “UNITIZED” FIXED COSTS

- Remember – fixed costs are fixed in total, not on a unit basis
- Many fixed costs will remain, regardless of a decision to outsource or produce internally

ADD/DROP A PRODUCT, SERVICE, ETC.

- Similar to outsourcing
 - What are avoidable costs that will be eliminated: variable costs/some fixed costs
 - If profit higher before (after) dropping the product/service then keep (drop) the product/service
 - Some fixed costs may be avoidable in the long-run, but not in the short run
- However, be aware of long-term implications: customer visibility, cross selling, supplier relations, etc.

ADD/DROP A PRODUCT, SERVICE, ETC.

- Worldwide Airways offers its passengers the opportunity to join its World Express Club.
- Club membership entitles a traveler to use the club facilities at the airport in Atlanta.
- Club privileges include a private lounge and restaurant, discounts on meals and beverages, and use of a small health spa.
- Avoidable fixed costs: salary & airport fees

DECISION-MAKING

ADD/DROP A PRODUCT, SERVICE, ETC.

Keep Club	
Sales	200,000
Food / Beverage	(70,000)
Personnel	(40,000)
Variable overhead	(25,000)
Contribution margin	65,000
Depreciation	(30,000)
Supervisor salary	(20,000)
Insurance	(10,000)
Airport fees	(5,000)
Allocated overhead	(10,000)
Loss	(10,000)

DECISION-MAKING

ADD/DROP A PRODUCT, SERVICE, ETC.

	Keep Club	Eliminate	Differential
Sales	200,000	0	200,000
Food / Beverage	(70,000)	0	(70,000)
Personnel	(40,000)	0	(40,000)
Variable overhead	(25,000)	0	(25,000)
Contribution margin	65,000	0	65,000
Depreciation	(30,000)	(30,000)	0
Supervisor salary	(20,000)	0	(20,000)
Insurance	(10,000)	(10,000)	0
Airport fees	(5,000)	0	(5,000)
Allocated overhead	(10,000)	(10,000)	0
Loss	(10,000)	(50,000)	40,000

DECISION-MAKING

ADD/DROP A PRODUCT, SERVICE, ETC.

	Keep Club	Eliminate	Differential
Sales	200,000	0	200,000
Food / Beverage	(70,000)	0	(70,000)
Personnel	(40,000)	0	(40,000)
Variable overhead	(25,000)	0	(25,000)
Contribution margin	65,000	0	65,000
Depreciation	(30,000)	(30,000)	0
Supervisor salary			(20,000)
Insurance			0
Airport fees			(5,000)
Allocated overhead			0
Loss	(10,000)	(50,000)	40,000

The differential amount reflects the fact that the company is \$40,000 better off by keeping the club.

- What are other factors to consider when deciding on keeping or dropping a product/service?

ANALYSIS OF AVOIDABLE COSTS

- Decisions like outsourcing or dropping/adding a product/service depend on avoidable costs in each scenario
- Big proportion of costs is fixed costs
- Avoidable fixed costs differ over time
 - Short-run: all variable, some fixed
 - Long-run: proportion of fixed costs that are avoidable increases – partition fixed into categories to analyze and identify avoidable costs
- Multi-level contribution margin

MULTI-LEVEL CONTRIBUTION MARGIN

- Multi-level CM partitions fixed costs into how they are assignable to the products/services, i.e. on which level

Contribution margin	
Revenue	
- Variable costs	CM I
- Product fixed costs	CM II
- Product group fixed costs	CM III
- Department fixed costs	CM IV
- Firm fixed costs	Operating Profit (CM V)

DECISION-MAKING

MULTI-LEVEL CONTRIBUTION MARGIN

- When would you drop a product?

In \$:	Organization					Total:		
	Product line 1		Product line 2					
	Group A		Group B	Group A	Group B			
Revenues	3000	5000	4000	2000	3000	17000		
Variable costs	2000	3500	2500	1200	1800	11000		
CM I	1000	1500	1500	800	1200	6000		
Product fixed costs	200	400	200	100	300	1200		
CM II	800	1100	1300	700	900	4800		
Product Group fixed costs	500		400	200	300	1400		
CM III	1400		900	500	600	3400		
Department fixed costs	1000			500		1500		
CM IV	1300			600		1900		
Firm fixed costs	1200					1200		
Operating Income	700					700		

MULTI-LEVEL CONTRIBUTION MARGIN

- Multi-level CM is a tool to analyze/control variable and fixed costs
- Supportive for make-or-buy decisions/adding or dropping a product (long-run considerations)
- Generally helpful for cost control
 - See where largest share of fixed costs lies
 - Investigate changes in variable and fixed costs over time
 - Try to constantly reduce fixed costs

ACCEPT OR REJECT A SPECIAL ORDER

- A travel agency offers Worldwide Airways \$150,000 for a round-trip flight from Hawaii to Japan on a jumbo jet for group charter.
- Worldwide usually gets \$250,000 in revenue from this flight.
- The airline is not planning to currently add any new routes and has two planes that are idle and could be used to meet the needs of the agency.

ACCEPT OR REJECT A SPECIAL ORDER

- Relevant cost data:

Typical Flight Between Japan and Hawaii		
Revenue:		
Passenger	\$ 250.000	
Cargo	<u>30.000</u>	
Total		\$ 280.000
Expenses:		
Variable expenses	90.000	
Allocated fixed expens	<u>100.000</u>	
Total		190.000
Profit		\$ 90.000

- Worldwide will save about \$5,000 in reservation and ticketing costs if the charter is accepted.

ACCEPT OR REJECT A SPECIAL ORDER

WITH EXCESS CAPACITY

Under excess capacity	
Special price for charter	\$ 150,000
Variable cost per flight	\$ 90,000
Reservation cost savings	<u>(5,000)</u>
Variable cost of charter	<u>85,000</u>
Contribution from charter	<u><u>\$ 65,000</u></u>

- Since the charter will contribute to fixed costs and Worldwide has idle capacity, it should accept the flight.

ACCEPT OR REJECT A SPECIAL ORDER

WITHOUT EXCESS CAPACITY

- What if Worldwide had no excess capacity?
- If Worldwide adds the charter, it will have to cut its least profitable route that currently has a contribution margin of \$80,000.

- Should Worldwide still accept the charter?

ACCEPT OR REJECT A SPECIAL ORDER

Assumes no excess capacity

Special price for charter	\$ 150,000
Variable cost per flight	\$ 90,000
Reservation cost savings	<u>(5,000)</u>
Variable cost of charter	85,000
Opportunity cost:	
Lost contribution on route	<u>80,000</u>
Total	<u><u>\$ (15,000)</u></u>

- If Worldwide has no excess capacity, it should reject the special charter.

ACCEPT OR REJECT A SPECIAL ORDER

WITH EXCESS CAPACITY

- Relevant costs will usually be the variable costs associated with the special order.
- Attention: This means that selling price is lower than the full costs! This should only be done if the special orders have no long-run implications.

WITHOUT EXCESS CAPACITY

- Same as above but opportunity cost of using the firm's facilities for the special order are also relevant.

ALLOCATION OF LIMITED RESOURCES

- Firms often face the problem of deciding how limited resources are going to be used.
- Usually, fixed costs are not affected by this decision, so management can focus on maximizing total contribution margin.

ALLOCATION OF LIMITED RESOURCES

- Product-mix decisions are decisions that managers make about which products to sell and in what quantities



DECISION RULE (WITH ONE CONSTRAINT)

- Choose the product that produces the highest contribution margin per unit of the constraining resource (not the highest contribution margin per unit of the product)

ALLOCATION OF LIMITED RESOURCES

- Martin, Inc. produces two products and selected data is shown below:

	Products	
	Webs	Highs
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%
Machine time required per unit	1.00 min.	0.50 min.

- The amount of machine hours required to satisfy demand is higher than the capacity available.
What should Martin do?

ALLOCATION OF LIMITED RESOURCES

- Calculate the contribution margin per unit of the scarce resource (machine hours).

	Products	
	Webs	Highs
Contribution margin per unit	\$ 24	\$ 15
Machine hours required per unit	÷ 1.00 min.	÷ 0.50 min.
Contribution margin per minute	\$ 24 min.	\$ 30 min.

- Highs should be emphasized. It is the more valuable use of the scarce resource (MH), yielding a contribution margin of \$30 per minute as opposed to \$24 per minute for the Webs.
- If there are no other considerations, it is optimal to produce to meet current demand for Highs and then use remaining capacity to make Webs.

ALLOCATION OF LIMITED RESOURCES

- Let's see how this plan would work.
- Allotting the scarce resource: machine hours

Weekly demand for Highs	2,200 units
--------------------------------	--------------------

Time required per unit	x .50 minutes
------------------------	---------------

Time required to make Highs	1,100 minutes
-----------------------------	---------------

Total machine time available	2,400 minutes
-------------------------------------	----------------------

Time used to produce Highs	1,100 minutes
----------------------------	---------------

Time available for Webs	1,300 minutes
-------------------------	---------------

Time required per unit	x 1.00 minute
------------------------	---------------

Production of Webs	1,300 units
---------------------------	--------------------

ALLOCATION OF LIMITED RESOURCES

- According to the plan, Martin will produce 2,200 Highs and 1,300 Webs. Martin's CM looks like this.

	Webs	Highs
Production and sales (units)	1,300	2,200
Contribution margin per unit	\$ 24	\$ 15
Total contribution margin	<u><u>\$ 31,200</u></u>	<u><u>\$ 33,000</u></u>

- The total contribution margin for Martin, Inc. is \$64,200.
- Any other combination would result in less profit.

ALLOCATION OF LIMITED RESOURCES

LINEAR PROGRAMMING

- When there are multiple constraints (limited demand, limited resources of several kinds), we can use linear programming
- It maximizes the total contribution margin from multiple products under multiple constraints
- To make decisions with multiple constraints, we need some computing power
- Possible solution: Excel Solver (Navigation bar “Data”)

P14-58

- Oceana Co. sells 3 products, manufactured in 4 departments.
- Machine and labor skills are specialized, hence cannot be switched from one department to another.
- Inventory remains constant, price and cost data as follows:

	Product		
	M50	T79	B81
Unit costs:			
Direct material	\$ 28	\$ 52	\$ 68
Direct labor:			
Department 1	48	24	48
Department 2	84	56	56
Department 3	\$ 96	—	\$ 64
Department 4	36	\$ 72	36
Variable overhead	108	80	100
Fixed overhead	60	40	128
Variable selling expenses	12	8	16
Unit selling price	784	492	668

P14-58

EXPECTED SALES DEMAND

Product	Monthly Unit Sales
M50	500
T79	400
B81	1,000

EXPECTED CAPACITY

Monthly Capacity Availability	Department			
	1	2	3	4
Normal machine capacity in machine hours	3,500	3,500	3,000	3,500
Capacity of machines being repaired in machine hours	(500)	(400)	(300)	(200)
Available machine capacity in machine hours	<u>3,000</u>	<u>3,100</u>	<u>2,700</u>	<u>3,300</u>
Available labor in direct-labor hours	3,700	4,500	2,750	2,600

P14-58

- Requirements per product:

Labor and Machine Specifications per Unit of Product					
Product	Labor and Machine Time				
M50	Direct-labor hours	2	3	3	1
	Machine hours	1	1	2	2
T79	Direct-labor hours	1	2	—	2
	Machine hours	1	1	—	2
B81	Direct-labor hours	2	2	2	1
	Machine hours	2	2	1	1

- Calculate monthly requirement for MH and DLH to determine bottleneck
- Determine the monthly production schedule that maximizes profit
- Identify alternatives management might consider to meet the entire demand

OTHER ISSUES IN DECISION-MAKING

- Managerial performance should be judged on the same factors that are considered in making decisions.
- Short-term vs. long-term decisions
- Several helpful hints in decision making:
 - Ignore sunk costs.
 - Beware of unitized fixed costs.
 - Beware of allocated fixed costs and identify avoidable costs.
 - Pay special attention to identifying and including opportunity costs in the analysis of alternatives.

(CHAPTERS 12 / 13)

RESPONSIBILITY CENTERS, PERFORMANCE MEASUREMENT & CONTROLS

OUTLINE

THE ENVIRONMENT

DECENTRALIZATION

RESPONSIBILITY CENTERS

DELEGATION & GOAL CONGRUENCE

PERFORMANCE MEASUREMENT

MANAGEMENT CONTROLS

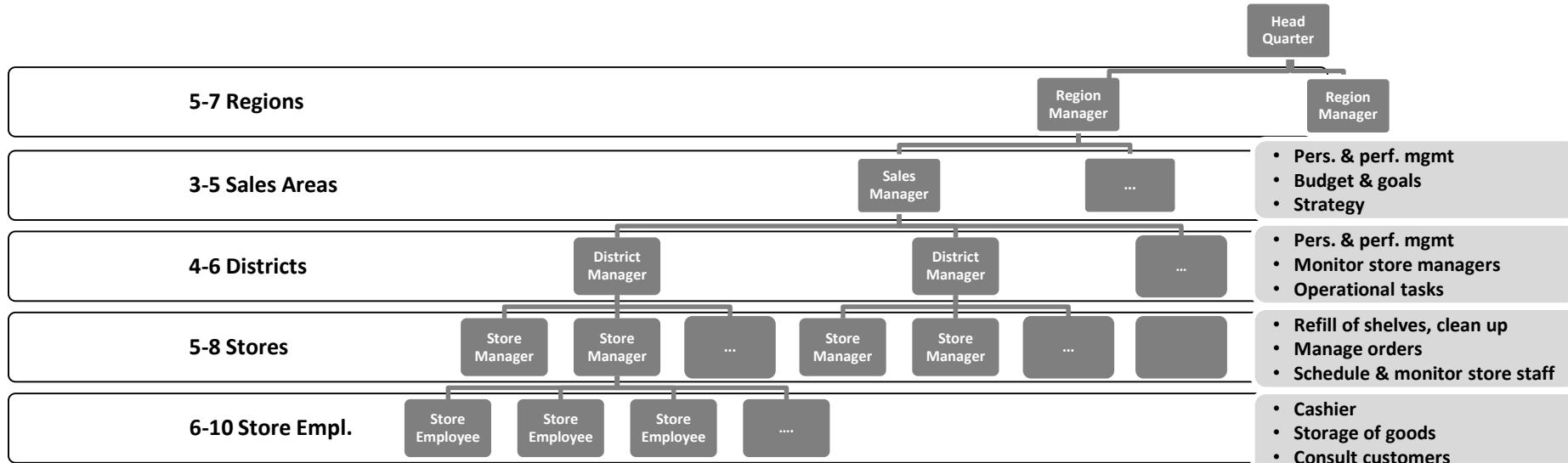
BALANCED SCORECARD

A POSSIBLE ENVIRONMENT

A GERMAN DISCOUNT RETAIL CHAIN

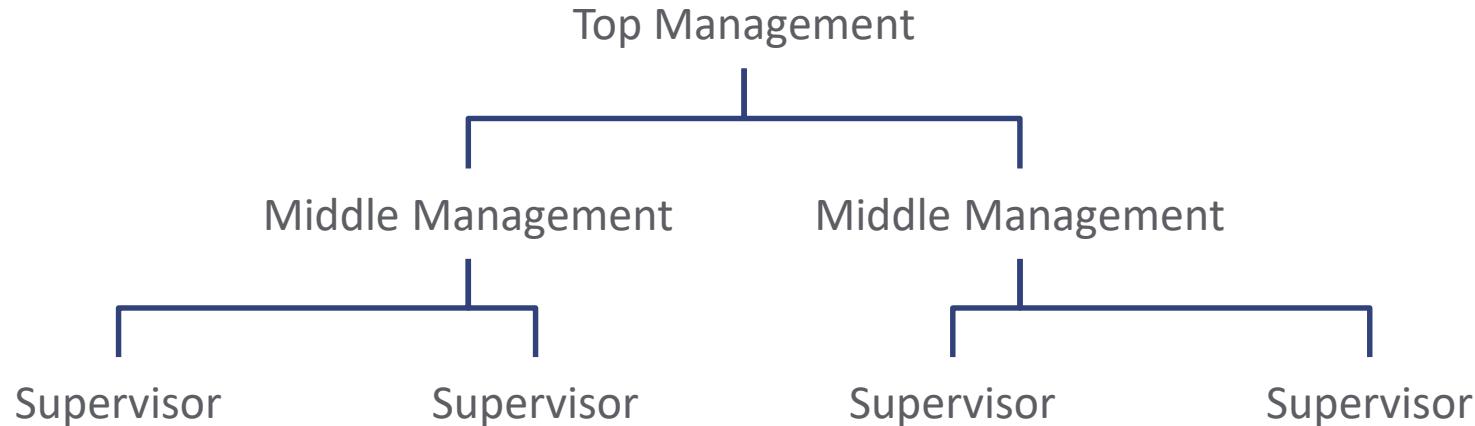


- Large nationwide retailer operating discount supermarkets in Germany with >2,000 stores



RESPONSIBILITY CENTERS

DECENTRALIZATION



What are the advantages and disadvantages of decentralized decision-making?

DECENTRALIZATION

PROS

- Lower level managers have more “local” information
- Improved reaction time
- Reduces burden on top management

CONS

- Top management (perhaps) includes better decision makers (more global information, more talent)
- People lower in the hierarchy will serve their own interests
 - Try to align their goals to the goals of the company

RESPONSIBILITY ACCOUNTING

- Responsibility accounting measures the performance of people and departments
 - Name the “owners” of a part of the business and measure their results

RESPONSIBILITY CENTER

- A subunit whose manager is held accountable for specified results – he/she is the “owner”
- Types of responsibility center reflects the extent to which decision making is delegated (i.e., the extent of decentralization)

RESPONSIBILITY CENTERS

COST CENTER

- Unit has control over the incurrence of costs (e.g. *Bottling plant of a soft drink company*)

REVENUE CENTER

- Responsible for revenue generation (e.g. *Ticket sales division of an airline*)

PROFIT CENTER

- Unit has control over both costs and profits (e.g. *College of engineering at a university*)

INVESTMENT CENTER

- Responsible for profits and capital invested (e.g. *European division of a multinational company*)

GOAL CONGRUENCE

- Goal congruence: get center managers to strive to achieve the goals set by the company
- Difficult to achieve
 - Managers are often unaware of the effect of their decisions on the firm/other units
 - Managers are typically more concerned with their unit's performance than the firm's performance
- How do organizations get managers to make decisions in the best interest of the company?
- (Principal-Agent Problem, Nobel Prize 2016, Bengt Holmström and Oliver Hart)

PRINCIPAL-AGENT-MODELS (VERY BROAD OVERVIEW)

- A principal hires an agent to perform a task (effort e in exchange for a wage w)
- The final outcome x depends on e and some random variable
(principal is risk neutral, agent is risk averse)
- Principal has utility $u_p = x - w$ and agent has utility $u_a = v_1(w) - v_2(e)$
- (v_1 is increasing and concave and v_2 is increasing and convex)
- With **symmetric information**, effort is verifiable and principal offers a fixed wage for specified effort level
- With **moral hazard**, when effort is not contractible, the agent can choose the effort that is best for him given the contract
 - If the principal proposes a fixed wage, the agent's payment does not depend on effort and she will chose the lowest possible effort level

MANAGEMENT INCENTIVES

CARROTS AND STICKS

- What mechanisms incentivize managers to act in the company's best interest?

- Bonus payments
- Promotions
- Terminations/Demotions
- Perks/autonomy

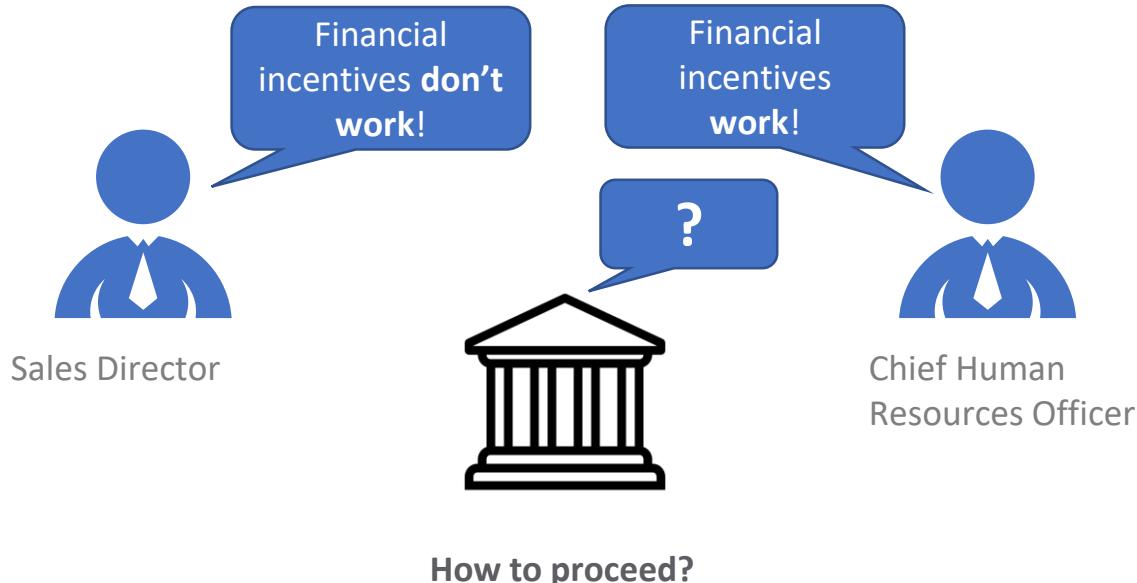
MANAGEMENT CONTROLS IN GENERAL

(FEICHTER & GRABNER 2020)

- **Result Controls:** Based on explicit performance measures
- **Action Controls:** Employee behavior will be directly guided (direct monitoring, supervisor monitoring, mystery shopping etc.)
- **Culture Controls:** Cooperate culture ensures that employees act in the interest of the organization. Employees may control each other (social pressure).
- **Personnel Controls:** Intrinsic motivation of employees. Employees know how to contribute to the organizational goal and have the ability/resources to do so

A COMMON SCENARIO

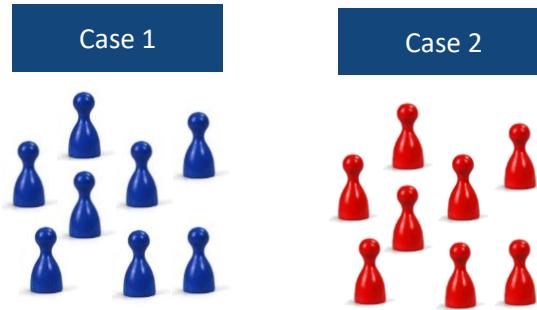
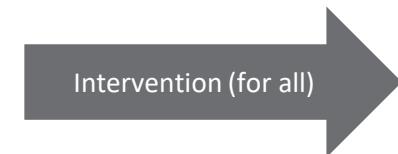
BONUS PAYMENTS



EXCURSION – HOW TO ADDRESS THE QUESTION

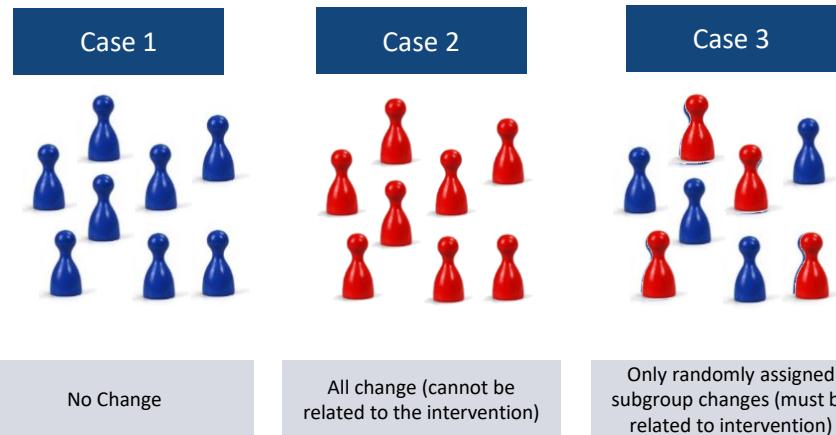
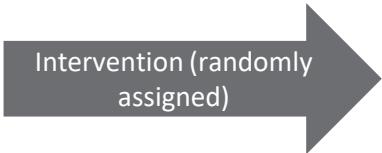
EVALUATION

Normally:



Pilot Study

(„A-B Test“, Randomized Controlled Trial (RCT)):



THE POTENTIAL OUTCOME FRAMEWORK (VERY BROAD OVERVIEW)

- Suppose we want to know the causal effect of a binary treatment X_i on the outcome Y_i
- For example let Y_i be health and the treatment is a new medicine with
 - $X_i = 1 \rightarrow$ takes new medicine
 - $X_i = 0 \rightarrow$ does not take new medicine
- For each individual there exist **two potential outcomes**
- $Y_i(1)$ is the outcome of individual i if she takes the new medicine
- $Y_i(0)$ is the outcome of individual i if she does not take the new medicine
- The causal effect of the treatment on the outcome of individual i is

$$\text{Causal effect of individual } i = Y_i(1) - Y_i(0)$$

THE POTENTIAL OUTCOME FRAMEWORK (VERY BROAD OVERVIEW)

- **The identification problem:** We cannot identify the causal effect for individual i because we either observe $Y_i(1)$ or $Y_i(0)$, but never both!
- **The selection problem:** If we let individuals select into different treatments the effect between both groups might depend on individual characteristics
- However, if we **randomly assign** the treatment to individuals the individual characteristics should on average be the same in both groups and we are able to estimate the **average causal effect in a population**
- (Causal Inference, Nobel Prize 2021, Guido Imbens, Joshua Angrist, David Card)

MANAGEMENT INCENTIVES

- What information do firms have to determine manager's performance?

QUANTITATIVE INFORMATION

- Financial performance measures
- Non-financial performance measures

QUALITATIVE INFORMATION/OBSERVATION

MARKET INFORMATION

PERFORMANCE MEASUREMENT

PERFORMANCE MEASURES IN A SUPERMARKET STORE



Big questions when thinking about performance measures:

- What can be influenced?
 - Personnel Expenses, Inventory Losses, Sales, Profits?
- What aligns the interests between Headquarter and Store?
 - e.g. sales or profits? Customer Satisfaction?
- What are the store managers capable of?
 - Do they understand the underlying production function (e.g. in case of profits)?
- What creates the least dysfunctional behavior (e.g. gaming or multitasking problems)
 - Personnel Expenses might reduce profits, Sales might create a strong focus etc.

Possible Performance Figures (KPIs) of a Supermarket Store:

Store profit? Store sales? Inventory losses? Customer Satisfaction?

BONUS PAYMENTS



Big questions when thinking about implementing bonus payments:

- Monetary or non-monetary
 - Employees might have preference for **different bonus domains** (e.g. leisure time)
- How big?
 - Small incentives might **crowd-out** motivation, big incentives are not necessarily profitable and create **dysfunctional** behavior
- For which group? Only store managers or all store employees?
 - Team incentives aligns all interests in a store but might lead to **freeriding** problems
- Tournament (the best performing stores receive something), Goal, or Performance Pay?
 - Tournament might lead to unfavorable high levels of **competition**. Performance goals might lead to reduced effort after reaching the goal. Performance pay is potentially difficult to implement.

BEHAVIORAL ECONOMICS OF BONUS PAYMENTS

Unintentional effects of bonus payments that can result in no or negative effects:

"the road to hell is paved with good intentions"

- The Cobra Effect:
 - India during British rule. The British government, concerned about the number of cobras in Delhi
 - offered a bounty/reward for every dead cobra
 -what happened?
 - Further historical example: Hanoi, Vietnam (1902, French colonial rule), bounty program that paid a reward for each rat killed. To receive the bounty, people needed to provide the tail of a rat.



BEHAVIORAL ECONOMICS OF BONUS PAYMENTS

- Soviet Union, state glass-production
- Managers and employee paid on the basis of the weight of the glass produced
- What happened?



BEHAVIORAL ECONOMICS OF BONUS PAYMENTS

- Soviet Union, state glass-production
 - Managers and employee paid on the basis of the weight of the glass produced
 - What happened?
-
- The factory changed (instead of added) the incentive
 - They payed based on size (square meters of glass produced)
 - What happened?



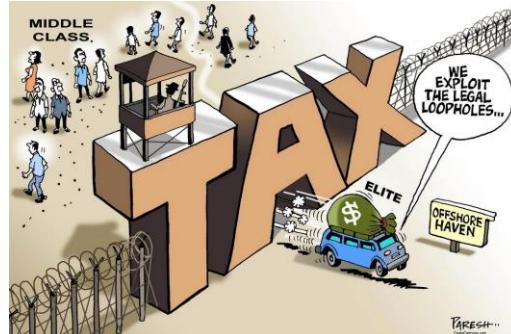
Uber



- Sometime you need to add instead of replace incentives:
- 


WHY CAN A BONUS GO WRONG?

- Loophole



- Social signal
(more in the last lecture)



PERFORMANCE MEASUREMENT

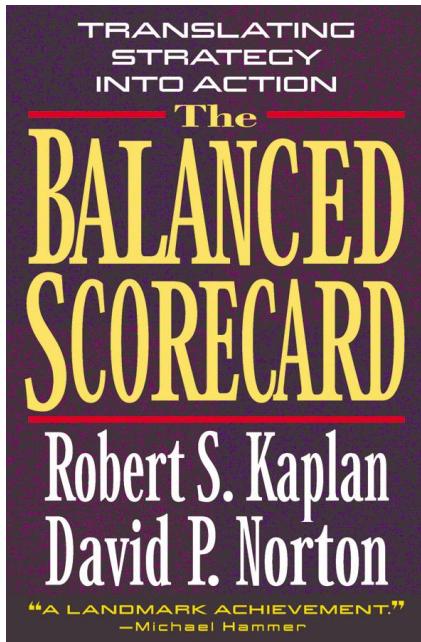
BALANCED SCORECARD

- We talked about incentivizing one or two KPIs but how can you align the overall goal?
- The balanced scorecard is a balanced approach to the area of performance evaluation.
- Managers are evaluated on a series of financial and nonfinancial measures in a variety of areas.



BALANCED SCORECARD

KAPLAN / NORTON (1992)



PERFORMANCE MEASUREMENT

BALANCED SCORECARD

EVIDENCE FROM PRACTICE:

USERS OF THE BALANCED SCORECARD



KBR

SAATCHI & SAATCHI



FMC

Mobil

ROCKWATER
ENERGY SOLUTIONS



CHEMICAL
BANK[®]

AMD

Hilton
HOTELS & RESORTS

BLO
BOSTON LYRIC OPERA
2011/2012 35TH ANNIVERSARY SEASON



Duke Medicine

Pfizer

DAIMLER

Cigna

verizon

IBM

store
24



PERFORMANCE MEASUREMENT

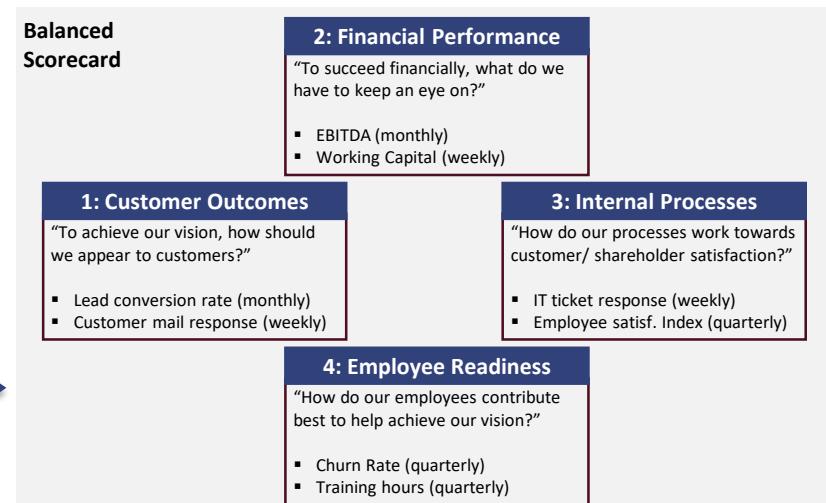
BALANCED SCORECARD



PERFORMANCE MEASUREMENT

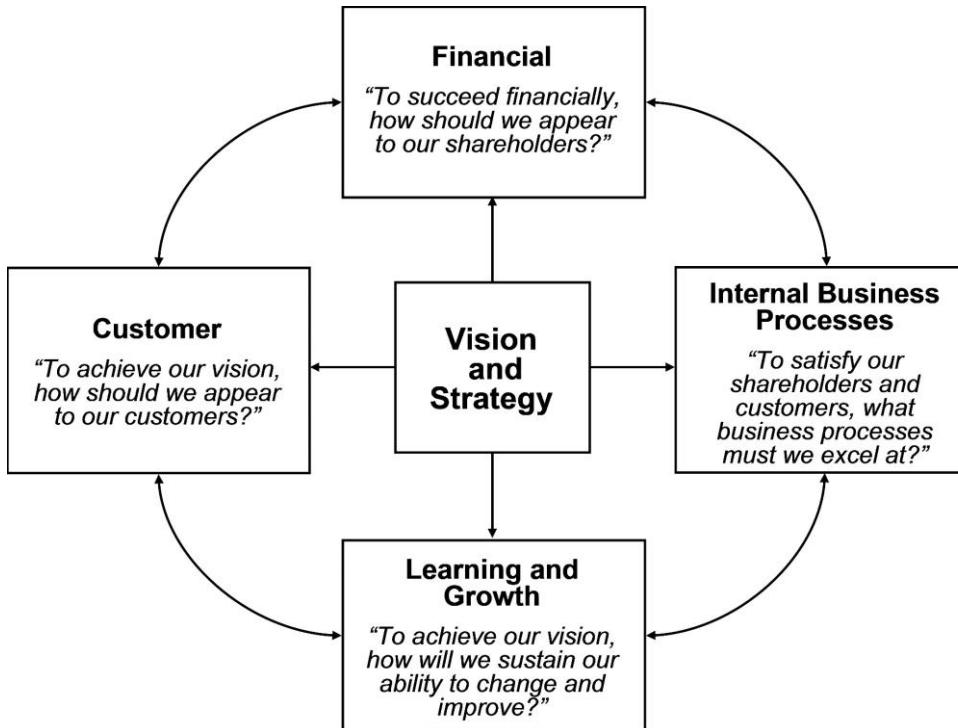
BALANCED SCORECARD (KAPLAN / NORTON 1992)

- The Balanced Scorecard (BSC) helps align performance with strategic goals by assembling measures of different aspects that are relevant for a company's strategy.
- The BSC enables a “balanced” view on performance measurement by its diversity of incorporated perspectives and measures.



PERFORMANCE MEASUREMENT

THE BALANCED SCORECARD PERSPECTIVES



PERFORMANCE MEASUREMENT

SUPERMARKET CASE – BALANCED SCORECARD (EXAMPLE)

2: Financials

- Store sales (daily)
- Sales per shelf meter (daily)
- Inventory held (daily)

1: Customers

- Customer complaints (weekly)
- Customer satisfaction compared to other stores of the supermarket chain (quarterly)
- % of customers with chain discount card (monthly)

3: Internal Processes

- Avg. queuing time per customer (daily)
- Empty shelf incidences (weekly)
- Products spotted after “best before” date (weekly)

4: Employees

- Churn Rate (quarterly)
- Employee satisfaction compared to other stores of the supermarket chain (quarterly)
- Share of part-time posts (monthly)

PERFORMANCE MEASUREMENT

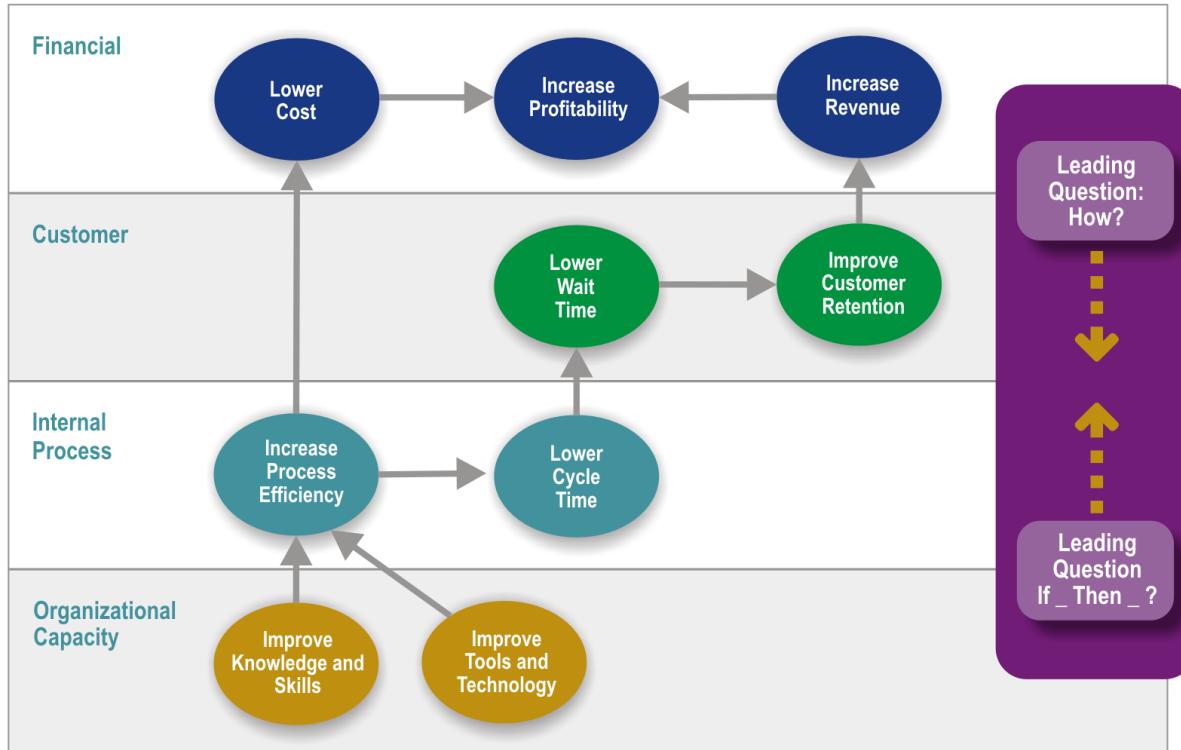
EXAMPLE: STRATEGY MAP & PERFORMANCE MEASUREMENT

STRATEGY MAP		MEASURE	TARGET	ACTUAL	PERCENT BETTER THAN TARGET
<i>Financial</i>	Grow new-store sales Improve price mark-ups	<i>Financial</i>			
		1. Sales margin	12.0%	13.0%	8.33
		2. Percentage of sales from new stores	30.00%	31.04%	3.47
		3. Average price mark-up growth	7.00%	7.60%	8.57
		4. Sales growth per new store	16.00%	17.11%	6.94
<i>Customer</i>	Attract more new customers to the chain Increase customer satisfaction	<i>Customer</i>			
		1. New relationships with target customers	120	123	2.50
		2. 'Mystery shopper' store experience rating (/10)	7.50	8.51	13.47
		3. Sales to new customers	34.0%	36.7%	7.94
		4. Customer satisfaction rating	92.00%	94.88%	3.13
<i>Internal Business Process</i>	Institute an original & effective advertising campaign Enhance customers' in-store experience	<i>Internal Business Process</i>			
		1. Retail Industry Association sales staff knowledge & attitude rating	80.00%	93.04%	16.30
		2. Advertising campaign awareness rating (/10)	8.0	8.90	11.25
		3. Sales staff non-compliance with company service code	30.0%	25.2%	16.00
		4. New advertising campaign awards	25	27	8.00
<i>Learning & Growth</i>	Develop an innovative & experienced marketing team Increase sales staff satisfaction and morale	<i>Learning & Growth</i>			
		1. Awards won by marketing team recruits	49	53	8.16
		2. Sales staff training investment (\$m)	6.60	6.90	4.55
		3. Retail experience of new marketing managers (years)	17.00	17.50	2.94
		4. Employee satisfaction	72.00%	82.68%	14.83

PERFORMANCE MEASUREMENT

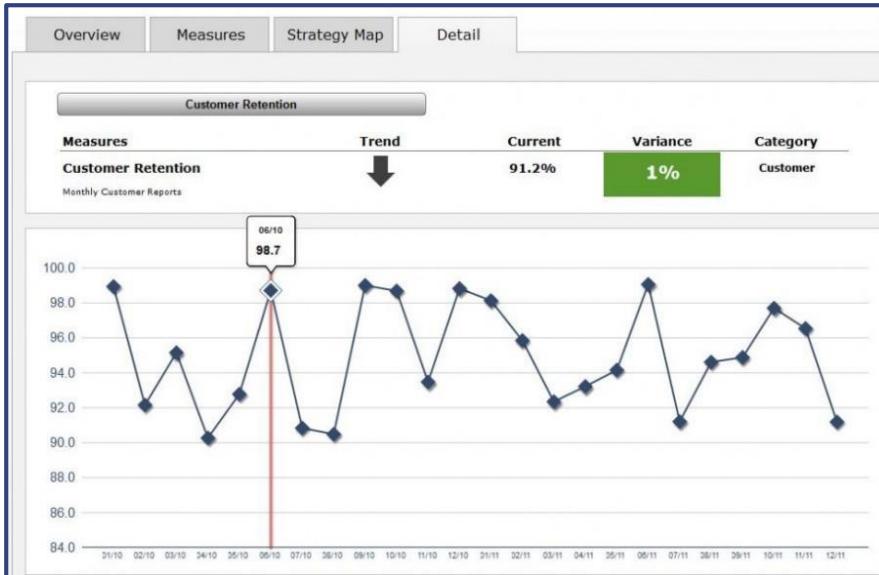
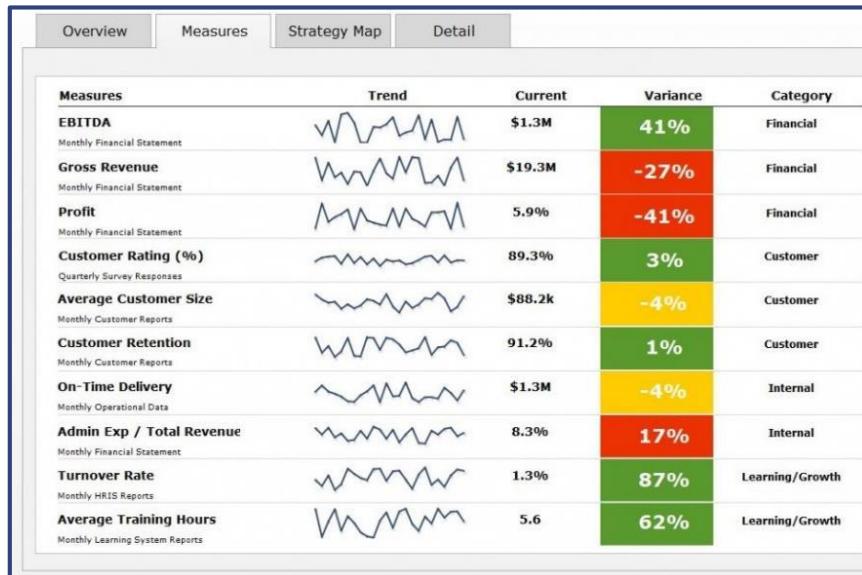
STRATEGY & BALANCED SCORECARD

STRATEGIC MAPPING



PERFORMANCE MEASUREMENT

EXAMPLE OF A DASHBOARD IN PRACTICE



Prof. Dr. Timo Vogelsang

MANAGERIAL ACCOUNTING (WINTER 2023)



COURSE OVERVIEW

Session	Topic	Hilton / Platt
1	The Changing Role of Managerial Accounting	Chapter 1
	Basic Cost Management Concepts	Chapter 2
2	Product / Job Costing	Chapter 3
	Transfer Pricing	Chapter 13
3	Cost-Volume-Profit Analysis	Chapter 7
	Inventory Costing (Absorption vs. Variable Costing)	Chapter 8
4	Decision-Making: Relevant Costs and Benefits	Chapter 14
	Responsibility Center, Performance Measures & Controls	(Chapter 12/13)
5	Activity-Based Costing	Chapter 5
6	Activity Analysis, Cost Behavior, and Cost Estimation	Chapter 6
	Budgets – Financial Planning and Analysis	Chapter 9
7	Standard Costing and Direct Cost Variances	Chapter 10
	Signaling Effects of Incentives	
8	Sustainability and Controlling	

CHAPTER 5

ACTIVITY-BASED COSTING

OUTLINE

TRADITIONAL, VOLUME-BASED COSTING SYSTEMS

ACTIVITY-BASED COSTING (ABC)

THE TWO-STAGE PROCESS

EXAMPLE: TRADITIONAL COSTING & ABC

ACTIVITY-BASED COSTING: KEY ISSUES

(ACTIVITY-BASED MANAGEMENT)

CUSTOMER PROFITABILITY

ACTIVITY-BASED COSTING

CASE

- Patio Grill Company
- 3 grills: standard (STD), deluxe (DEL), ultimate (ULT)
- Uses job-order product-costing with POHR
- Pricing policy: 120% of costs
- Fierce competition forces Patio grill to sell
 - STD at a \$10 discount (cp. to target price)
 - DEL at a \$20 discount (cp. to target price)
- ULT can be sold at a price greater than expected (\$40 above target price)

CASE

- What could be reasons that two products are sold at a discount (i.e., costs are too high) while one is sold at a premium (relative to target price)?
- For instance:

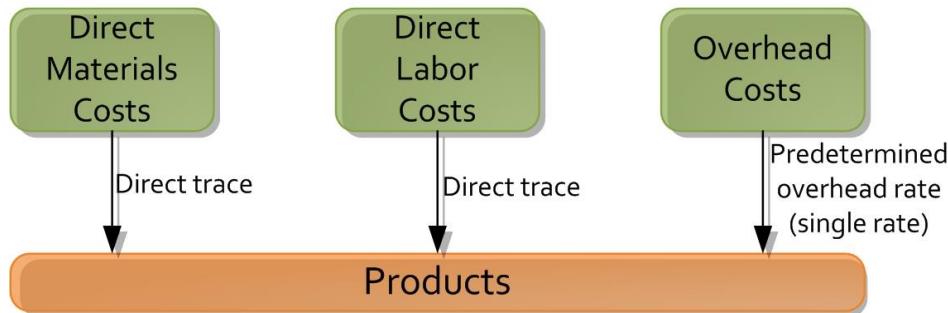
Cost control

Accuracy of cost allocation

TRADITIONAL COSTING SYSTEMS

PROBLEMS WITH TRADITIONAL PRODUCT COSTING

- All manufacturing overhead is applied based on a single, volume-based cost driver (typically direct labor or machine hours)
- Some resources will not be consumed in proportion to the activity of the cost driver (e.g., cleaning, insurance, straight-line factory depreciation unrelated to labor/machine hours)



TRADITIONAL COSTING SYSTEMS

BAD DECISIONS RESULT FROM HAVING INCOMPLETE COST INFORMATION

- Price products poorly
- Make inefficient quantity decisions
- Reward (punish) employees for poor (good) performance
- Do (not) spend time refining production process of products manufactured efficiently (inefficiently)

COSTING SYSTEMS: TRADITIONAL VS. ABC

CHALLENGE: INCREASE ACCURACY IN THE ALLOCATION OF OVERHEAD!

- Increase number of indirect-cost pools (instead of lumping all overhead costs together)
- Use different allocation basis (cost driver) for each cost pool

ACTIVITY-BASED COSTING (ABC)

ABC: OVERVIEW

ACTIVITY-BASED COSTING ...

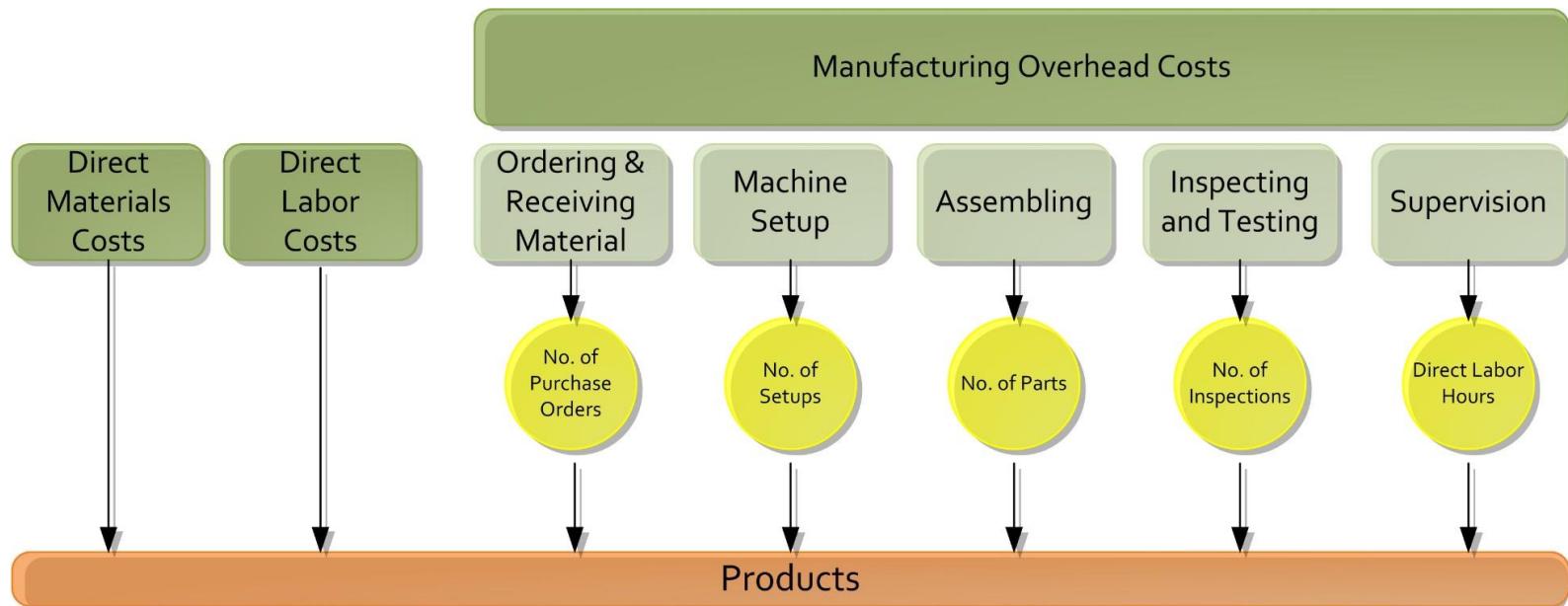
- ... is a method of assigning overhead costs based on the amount of overhead each product consumes or causes.

TWO-STAGE PROCEDURE IN ASSIGNING COSTS

1. Identify activity cost pools and assign OH: cost pools associated with significant activities that cause rather homogenous costs
2. Identify cost drivers: choose different cost-allocation base for each cost pool and allocate cost to products

ACTIVITY-BASED COSTING

ABC: TWO-STAGE PROCESS



STAGE 1: IDENTIFY ACTIVITY COST POOLS AND ASSIGN OVERHEAD

FOCUS ON SIGNIFICANT ACTIVITIES IN THE PRODUCTION

- Activity: event/task/unit of work with a specified purpose
- 4 broad categories for activity cost pools (see next slide)
 - Unit level
 - Batch level
 - Product-sustaining level
 - Facility level

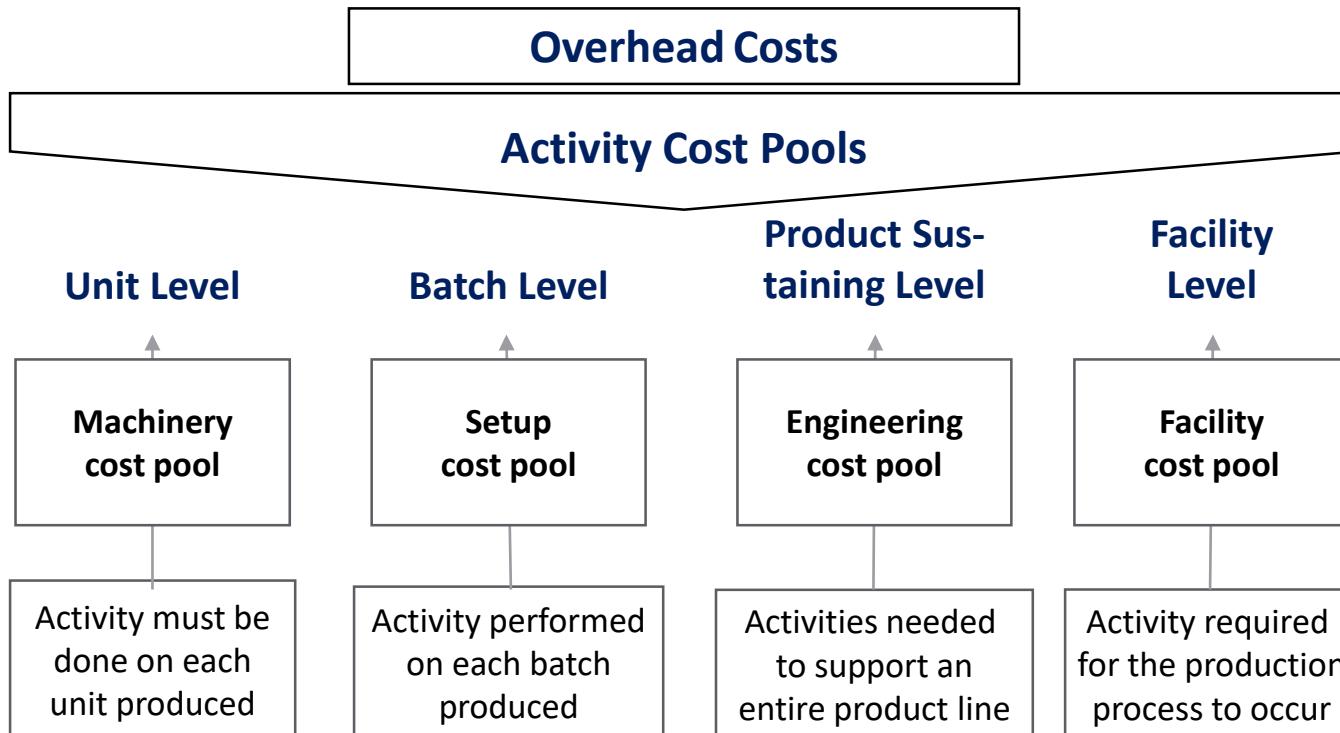
ALLOCATE OH TO ACTIVITY COST POOLS

STAGE 1: IDENTIFY ACTIVITY COST POOLS AND ASSIGN OVERHEAD

- Activity cost pools fall into 4 broad categories (cost hierarchies)
 - Unit level: done for each unit of production (e.g., operating machinery)
 - Batch level: performed for each batch (e.g., machine setup, purchasing, quality assurance)
 - Product-sustaining level: support entire product line (e.g., engineering design)
 - Facility level: required for entire process (e.g., insurance, electricity, cleaning, taxes)

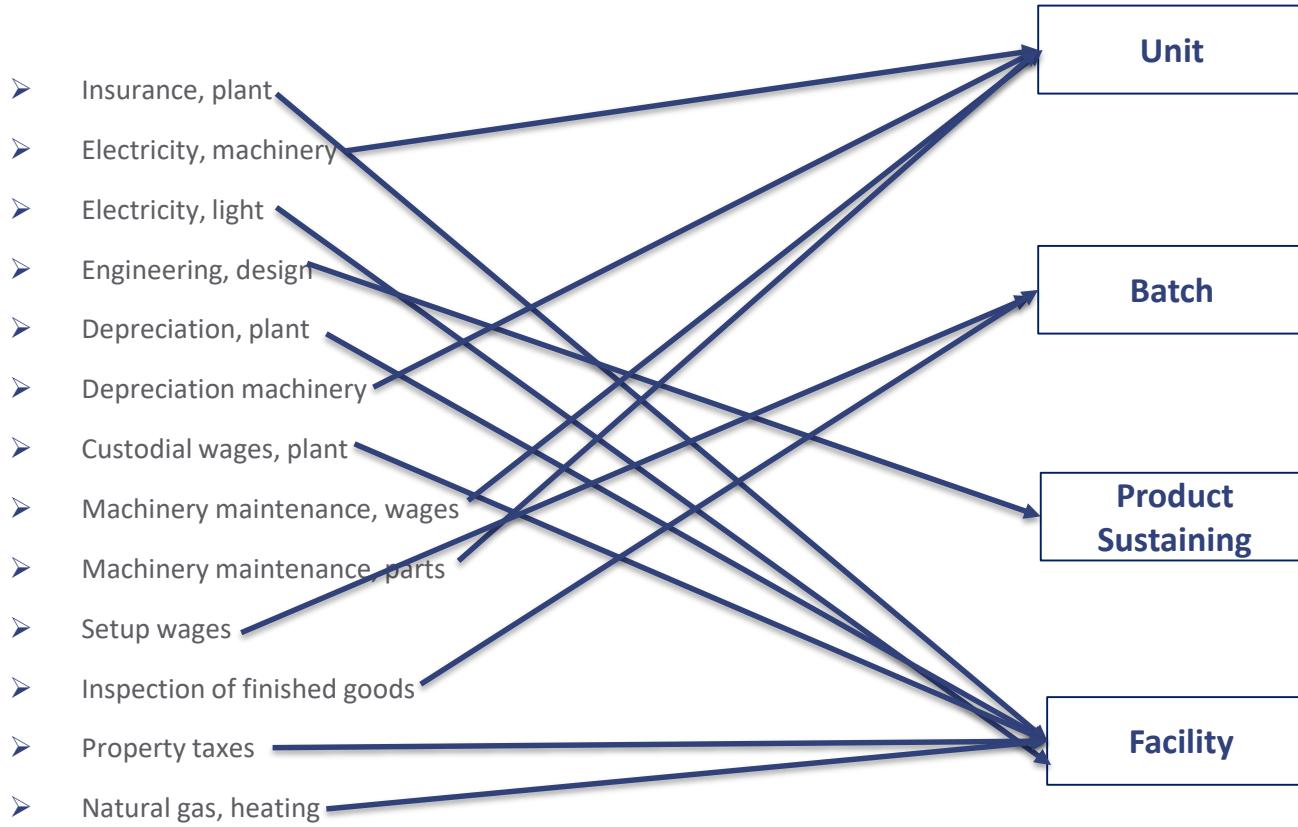
ACTIVITY-BASED COSTING

STAGE 1: IDENTIFY ACTIVITY COST POOLS AND ASSIGN OVERHEAD



ACTIVITY-BASED COSTING

E5-27



ACTIVITY-BASED COSTING

E5-27

Unit	Batch	Product Sustaining	Facility
Electricity, machinery	Setup wages	Engineering design	Electricity, light
Depreciation, machinery	Inspection of finished goods		Natural gas, heating
Machinery maintenance, parts			Property taxes
Machinery maintenance, wages			Depreciation, plant
			Insurance, plant
			Custodial wages, plant

STAGE 2: IDENTIFY COST DRIVERS AND ALLOCATE COSTS

IDENTIFY COST DRIVERS FOR EACH COST POOL

- Objective: High level of correlation to how the cost is incurred, e.g., purchase orders in procurement, number of set-up in machine set-ups, etc.

ALLOCATE OVERHEAD FROM COST POOLS TO PRODUCTS

BASED ON THEIR CONSUMPTION OF THE ACTIVITY

- e.g., machine hours, pieces inspected, number of orders/shipments per product line, sqm used in warehouse, etc.

ACTIVITY-BASED COSTING

E5-28

Unit	Batch	Product Sustaining	Facility
Electricity, machinery Depreciation, machinery Machinery maintenance, parts Machinery maintenance, wages	Setup wages Inspection of finished goods	Engineering design Cost driver: <ul style="list-style-type: none">➤ Production runs	Electricity, light Natural gas, heating Property taxes Depreciation, plant Insurance, plant
Cost driver: <ul style="list-style-type: none">➤ Machine hours➤ Nr. of units produced		Cost driver: <ul style="list-style-type: none">➤ direct labor hours/costs	Cost driver: <ul style="list-style-type: none">➤ square footage Custodial wages, plant

EXAMPLE: TRADITIONAL COSTING & ABC

- Patio Grill Company manufactures three product lines, all high-end, gas barbecue grills: Standard (STD), Deluxe (DEL), and Ultimate (ULT).
- Traditional costing system: Overhead is applied on the basis of direct-labor hours.
- The company's budgeted manufacturing overhead costs are lumped together in one single cost pool.

ACTIVITY-BASED COSTING

EXAMPLE: TRADITIONAL COSTING & ABC

- Production and cost data

	STD	DEL	ULT
Planned monthly production			
- Volume in Units	10,000	8,000	2,000
- Production runs	80 runs of 125 units	80 runs of 100 units	40 runs of 50 units
Direct material per product	\$ 100	\$ 120	\$ 180
Direct labor per product (hours are basis for POHR)	\$ 180 (9 hrs at \$20)	\$ 220 (11 hrs at \$20)	\$ 260 (13 hrs at \$20)
Machine hours per product	10	12	17
Machine hours per product line	100,000	96,000	34,000
Budgeted manuf. overhead		\$ 4,896,000	

ACTIVITY-BASED COSTING

EXAMPLE: TRADITIONAL COSTING & ABC

- Traditional costing: Calculation of the predetermined overhead rate
- Budgeted manufacturing overhead: \$4,896,000
- Direct labor, budgeted hours:

STD: 10,000 units x 9 hours	90,000
DEL: 8,000 units x 11 hours	88,000
ULT: 2,000 units x 13 hours	26,000
Total direct-labor hours	204,000

- Predetermined overhead rate:

$$\$4,896,000 / 204,000 \text{ hours} = \$24/\text{hour}$$

ACTIVITY-BASED COSTING

EXAMPLE: TRADITIONAL COSTING & ABC

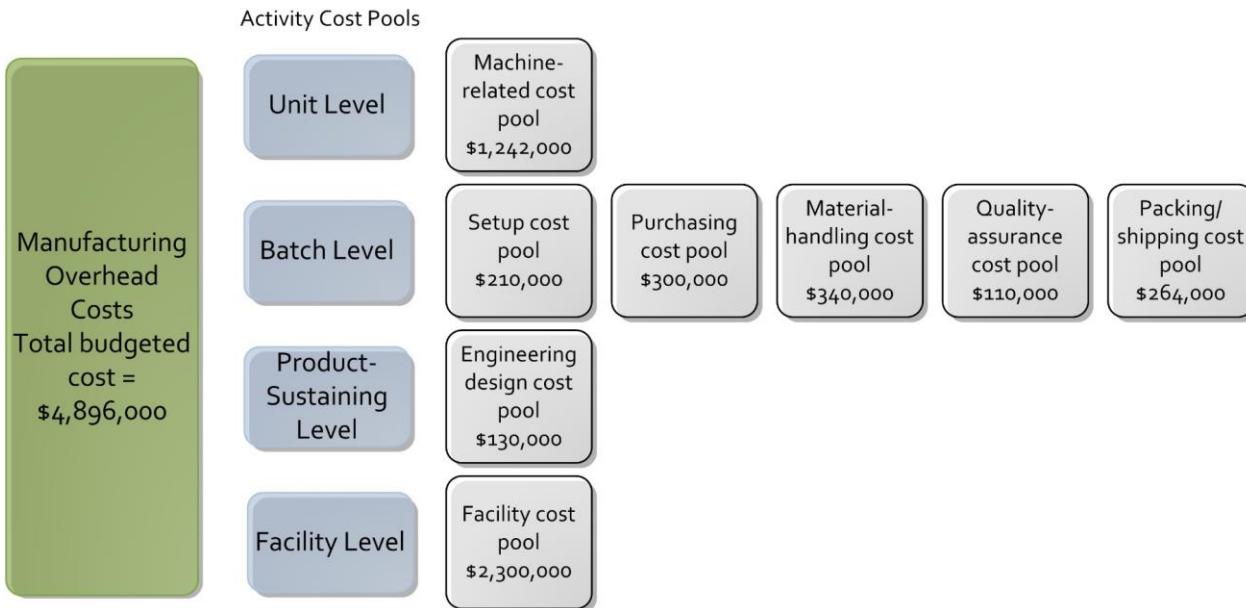
- Traditional costing: Calculation of product costs

	STD	DEL	ULT
Direct material	\$ 100	\$ 120	\$ 180
Direct labor	\$ 180	\$ 220	\$ 260
Manufacturing Overhead	\$ 216 (9 hrs at \$24)	\$ 264 (11 hrs at \$24)	\$ 312 (13 hrs at \$24)
Total	\$ 496	\$ 604	\$ 752
Target Price (20% mark-up)	\$ 595.2	\$ 724.8	\$ 902.4

ACTIVITY-BASED COSTING

EXAMPLE: TRADITIONAL COSTING & ABC

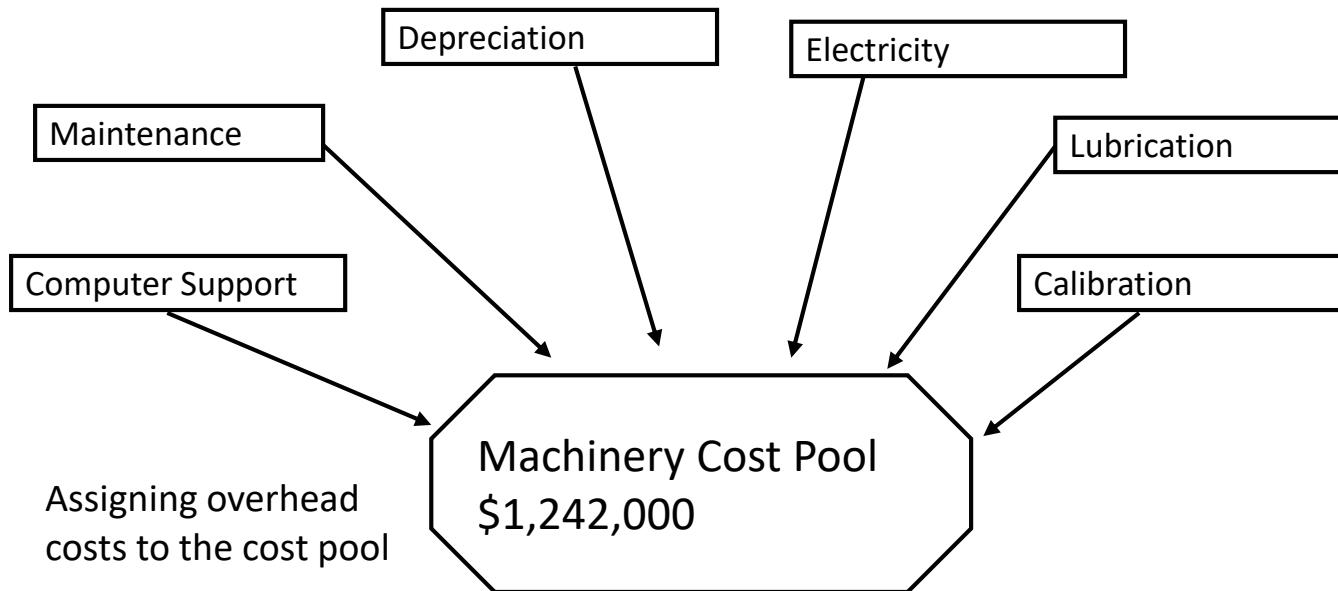
- Activity-based costing: Cost Pool identification & OH allocation



ACTIVITY-BASED COSTING

EXAMPLE: TRADITIONAL COSTING & ABC

- Activity-based costing: Cost Pool identification & OH allocation



EXAMPLE: TRADITIONAL COSTING & ABC

- Activity-based costing: Cost Driver identification

- Machine related → Machine hours
- Setup → Production runs
- Purchasing → Purchase orders
- Material handling → Production runs
- Quality assurance → Inspection hours
- Packing/shipping → Shipments
- Engineering design → Engineering hours
- Facility → Machine hours

See book,
p. 173

ACTIVITY-BASED COSTING

EXAMPLE: TRADITIONAL COSTING & ABC

- Activity-based costing: Cost Driver and cost allocation
 - Activity: machine-related (\$ 1,242,000), cost driver: machine hours

	STD	DEL	ULT
Planned monthly production			
- Volume in Units	10,000	8,000	2,000
- Production runs	80 runs of 125 units	80 runs of 100 units	40 runs of 50 units
Direct material per product	\$ 100	\$ 120	\$ 180
Direct labor per product (hours are basis for POHR)	\$ 180 (9 hrs at \$20)	\$ 220 (11 hrs at \$20)	\$ 260 (13 hrs at \$20)
Machine hours per product	10	12	17
Machine hours per product line	100,000	96,000	34,000

EXAMPLE: TRADITIONAL COSTING & ABC

- Activity-based costing: Cost Driver and cost allocation
 - Activity: machine-related (\$ 1,242,000)
 - Cost driver: machine hours

EXAMPLE: TRADITIONAL COSTING & ABC

- Activity-based costing: Cost Driver and cost allocation
 - Activity: machine-related (\$ 1,242,000)
 - Cost driver: machine hours (230,000)
- Pool rate = \$1,242,000 / 230,000 hours= \$5.40
- Which are the activity costs per product line & unit?

ACTIVITY-BASED COSTING

EXAMPLE: TRADITIONAL COSTING & ABC

- Activity-based costing: Cost Driver and cost allocation
 - Activity: machine-related (\$ 1,242,000), cost driver: machine hours (230,000)
- Pool rate = \$1,242,000 / 230,000 hours= \$5.40
- Activity costs per product line & unit:

Product Line	Cost driver quantity (hours)	Activity Cost per product line	Production volume	Activity costs per unit
STD	100,000	\$540,000	10,000	\$54.00
DEL	96,000	\$518,400	8,000	\$64.80
ULT	34,000	\$183,600	2,000	\$91.80

ACTIVITY-BASED COSTING

EXAMPLE: TRADITIONAL COSTING & ABC

Product Costs	STD	DEL	ULT
Direct material	\$100.00	\$120.00	\$180.00
Direct labor	\$180.00	\$220.00	\$260.00
Total direct costs per unit	\$ 280.00	\$ 340.00	\$ 440.00
Manufacturing OH			
Machine related	\$54.00	\$64.80	\$ 91.80
Setup	\$8.40	\$10.50	\$ 21.00
Purchasing	\$10.00	\$12.00	\$ 52.00
Material handling	\$13.60	\$17.00	\$ 34.00
Quality assurance	\$4.00	\$5.00	\$ 15.00
Packing/shipping	\$12.00	\$12.00	\$ 24.00
Engineering design	\$5.00	\$5.00	\$ 20.00
Facility	overcosted	20.00	\$ 170.00
Total ABC OH/unit	\$207.00	\$246.30	undercosted
Total product cost per unit	\$487.00	\$586.30	\$ 867.80
From traditional product costing	\$496.00	\$ 604.00	\$ 752.00

See book,
p. 173

ACTIVITY-BASED COSTING

EXAMPLE: TRADITIONAL COSTING & ABC

- Activity-based costing
- Compare actual prices with target prices (120% of product costs) from traditional and activity-based costing

	STD	DEL	ULT
Target Price			
- Traditional	595.20	724.80	902.40
- ABC costing	584.40	703.56	1,041.36
	Overcosted	Overcosted	Undercosted
Actual price	585.00	705.00	940.00

ABC: BENEFITS AND CRITIQUES

BENEFITS

- Identification of products that were overcosted or undercosted by traditional methods
- If some products are overcosted, other products are undercosted → overcosted products are subsidizing the undercosted products (called cost cross-subsidization)
- Traditional, volume-based costing systems overcost high-volume products and undercost complex, low-volume lines

ABC: BENEFITS AND CRITIQUES

BENEFITS

- Two conditions where ABC is beneficial, (i.e., there would be a significant difference between a traditional costing system and ABC):
 1. There is a large portion of non-unit-level activities such that a unit-level volume-based cost driver will not appropriately allocate the costs, and
 2. There is diversity among the products in the consumption of the various activities.

ABC: BENEFITS AND CRITIQUES

CRITIQUE:

- Requires a significant amount of time and cost to implement
- Portion of OH still allocated to products by means of some arbitrary base
(observations/subjective assessments of capacity & activities)

COST/BENEFIT ANALYSIS WITH RESPECT TO THE NUMBER OF DIFFERENT COST POOLS

KEY ISSUES IN ABC

- Cost Driver: A characteristic of an event or activity that results in the incurrence of costs.
- In selecting a cost driver, we must consider . . .

Degree of
Correlation

Cost of
Measurement

Behavioral
Effects

KEY ISSUES IN ABC

CONSIDERATIONS FOR CHANGE TO ABC

- Direct labor is a small percentage of total costs.
- Sales are increasing, but profits are declining.
- Marketing does not use costs reports for pricing decisions.
- Product-line profit margins are hard to explain.
- Line managers do not believe the product costs reported.
- Some products that have reported high profit margins are not sold by competitors.

ACTIVITY-BASED COSTING

ABC EXAMPLE (E5-29)

- Rainbow Spray Paints, Inc. has used a traditional costing system to apply Quality Control costs to all products at 16% of D/L cost. Monthly direct labor cost for enamel paint line is \$98,000.
- Management is considering to implement ABC and gathered the following information for the enamel paint product line:

Activity Cost Pool	Cost Driver	Pool Rates	Quantity of Driver
Incoming mat. inspection	Type of mat.	\$23.00/type	24 types
In-process inspection	Number of units	\$.28/unit	35,000 units
Product certification	Per order	\$144.00/order	50 orders

1. Calculate quality control cost to be assigned to the enamel paint line under (a) traditional costing and (b) ABC.
2. Does traditional costing over- or undercost the paint line with respect to quality control costs? By how much?

CUSTOMER PROFITABILITY ANALYSIS

- Customer profitability analysis uses activity-based costing to determine the activities, costs, and profit associated with serving particular customers.



CUSTOMER PROFITABILITY ANALYSIS

- Even when a firm has profitable products, customer-related costs can make certain customer relationships unprofitable.
- What are characteristics of a “good” (profitable) vs. “bad” (unprofitable) customer?

CUSTOMER PROFITABILITY ANALYSIS

- “The customer is always right!”
- But what if (s)he ...
 - Orders very frequently,
 - Orders small quantities,
 - Requires special packaging,
 - Demands fast services,
 - Often changes orders,
 - ...?



Customer profitability includes much more than order quantity and prices!

CUSTOMER PROFITABILITY ANALYSIS

- A company may use these customer-related costs to help determine the profitability of each customer.

Customer-Related Activities	Cost Driver Base	Cost Driver Rate
Order processing	Purchase orders	\$ 150
Sales contacts (phone calls, faxes, etc.)	Contacts	100
Sales visits	Visits	1,000
Shipment processing	Shipments	200
Billing and collection	Invoices	160
Design/engineering change orders	Design changes	4,000
Special packaging	Units packaged	40
Special handling	Units handled	60

CUSTOMER PROFITABILITY ANALYSIS

- During 2015, customer A and customer B each have ordered 250 units at \$30 which cost the firm \$15 to produce.
- Customer A ordered the units in 7 orders, while customer B placed 2 big orders (orders cause order processing, shipment processing and billing/collection activities).
- Customer A had 6 sales contacts throughout the year, while customer B had 1 visit. Neither needed special handling or packaging.
 1. Which customer is more profitable?
 2. Based on your analysis, what is your recommendation to management?

ACTIVITY-BASED COSTING

P5-69

MADISON ELECTRIC PUMP CORPORATION:

- 3 models: Regular, Advanced, and Deluxe
- Job order costing, OH applied based on DL hours
- Target price: 110% of costs, regular sold at discount (\$220)

	Regular Model	Advanced Model	Deluxe Model
Annual sales(units)	20,000	1,000	10,000
Direct Material	\$ 20	\$ 50	\$ 84
Direct Labor	20 (1h at \$ 20)	40 (2h at \$ 20)	40 (2h at \$ 20)
Manufacturing OH	170 (1h at \$ 170)	340 (2h at \$ 170)	340 (2h at \$ 170)
Total product cost	\$ 210	\$ 430	\$ 464
Target price	\$ 231	\$ 473	\$ 510.40

ACTIVITY-BASED COSTING

P5-69

OVERHEAD BUDGET

Depreciation, machinery	\$2,960,000
Maintenance, machinery	\$240,000
Depreciation, taxes, and insurance for factory	\$600,000
Engineering	\$700,000
Purchasing, receiving, and shipping	\$500,000
Inspection and repair of defects	\$750,000
Material Handling	\$800,000
Miscellaneous manufacturing overhead costs	\$590,000
Total	\$7,140,000

ACTIVITY-BASED COSTING

P5-69

- The following activity cost pools and cost drivers were identified

Activity Cost Pool	Cost Driver	Regular Model	Advanced Model	Deluxe Model
I: Depreciation, machinery Maintenance, machinery	Machine time	39%	13%	48%
II: Engineering Inspection and repair of defects	Engineering hours	47%	6%	47%
III: Purchasing, receiving, and shipping Material handling	Number of material orders	47%	8%	45%
IV: Depreciation, taxes, and insurance for factory Miscellaneous manufacturing overhead	Factory space usage	42%	15%	43%

P5-69

- Calculate product costs based on ABC!
- Compare target prices!
- Memo to explain differences and provide recommendations!

Prof. Dr. Timo Vogelsang

MANAGERIAL ACCOUNTING (WINTER 2023)



COURSE OVERVIEW

Session	Topic	Hilton / Platt
1	The Changing Role of Managerial Accounting	Chapter 1
	Basic Cost Management Concepts	Chapter 2
2	Product / Job Costing	Chapter 3
	Transfer Pricing	Chapter 13
3	Cost-Volume-Profit Analysis	Chapter 7
	Inventory Costing (Absorption vs. Variable Costing)	Chapter 8
4	Decision-Making: Relevant Costs and Benefits	Chapter 14
	Responsibility Center, Performance Measures & Controls	(Chapter 12/13)
5	Activity-Based Costing	Chapter 5
6	Activity Analysis, Cost Behavior, and Cost Estimation	Chapter 6
	Budgets – Financial Planning and Analysis	Chapter 9
7	Standard Costing and Direct Cost Variances	Chapter 10
8	Signaling Effects of Incentives	
	Sustainability and Controlling	

CHAPTER 6

ACTIVITY ANALYSIS, COST BEHAVIOR, AND COST ESTIMATION

OUTLINE

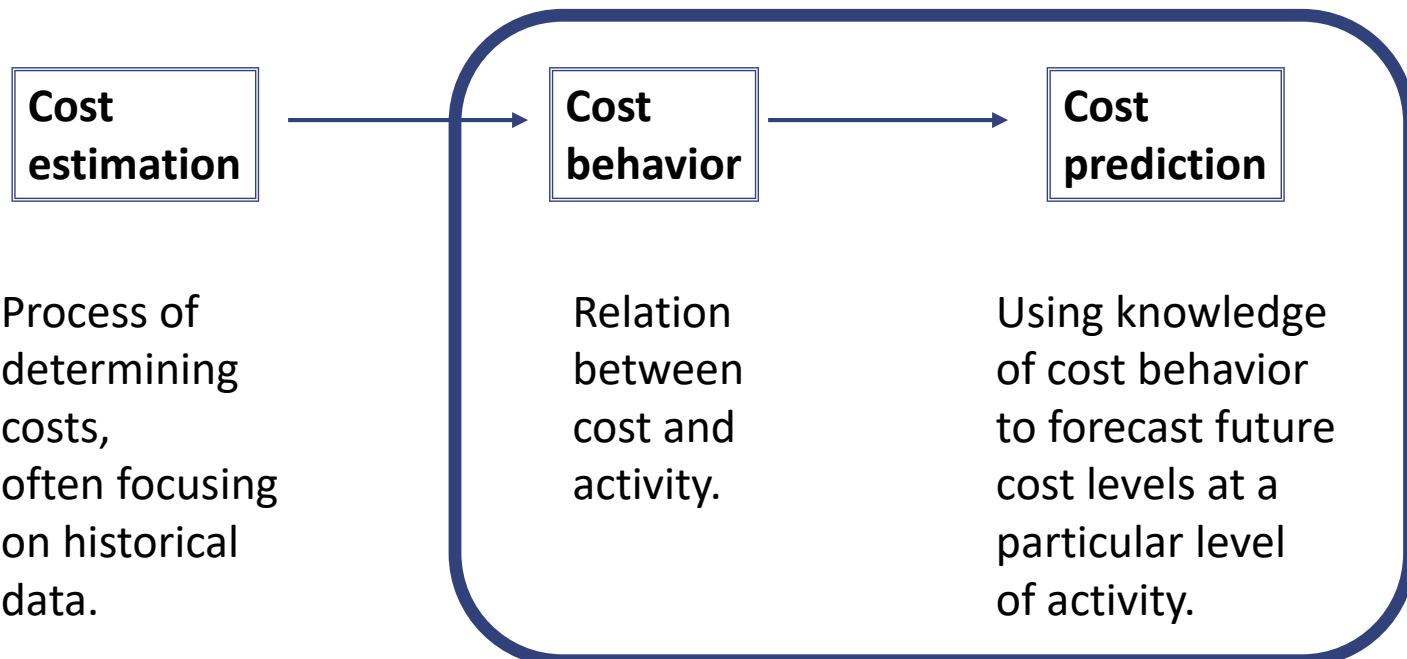
TYPES OF COSTS – VARIABLE, FIXED, STEP FIXED OR STEP VARIABLE, ETC.

COST BEHAVIOR PATTERNS

COST ESTIMATION METHODS

DATA PROBLEMS

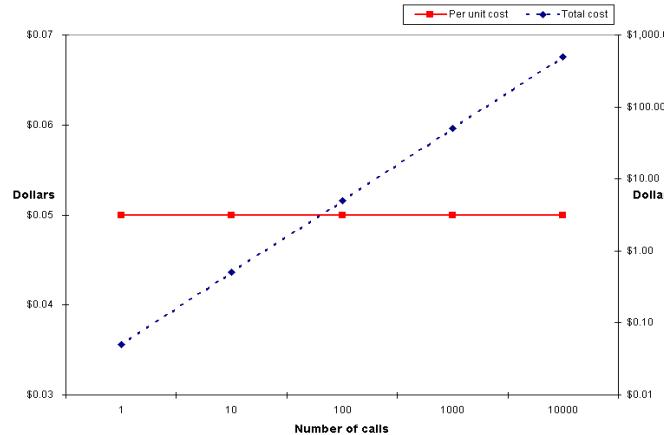
STEPS IN COST ANALYSIS & ESTIMATION



VARIABLE AND FIXED COSTS

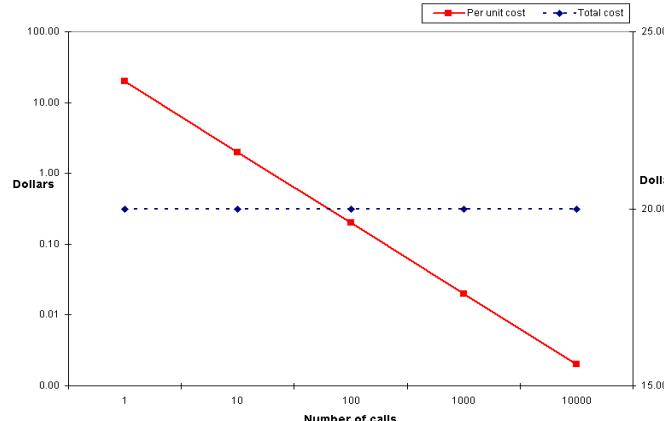
VARIABLE COST

- A cost that is constant per unit but changes in total as volume changes
- Materials (parts), fuel costs for a trucking company



FIXED COST

- A cost which does not change in total but changes on a per-unit basis as volume changes
- Straight-line depreciation, insurance



VARIABLE AND FIXED COSTS

- Recall the summary of our discussion on cost behaviour from Chapter 2.

Cost	in total	per unit
Variable	Total variable cost changes as activity level changes.	Variable cost per unit remains the same over wide ranges of activity.
Fixed	Total fixed cost remains constant when the activity level changes.	Fixed cost per unit decreases as activity level increases.

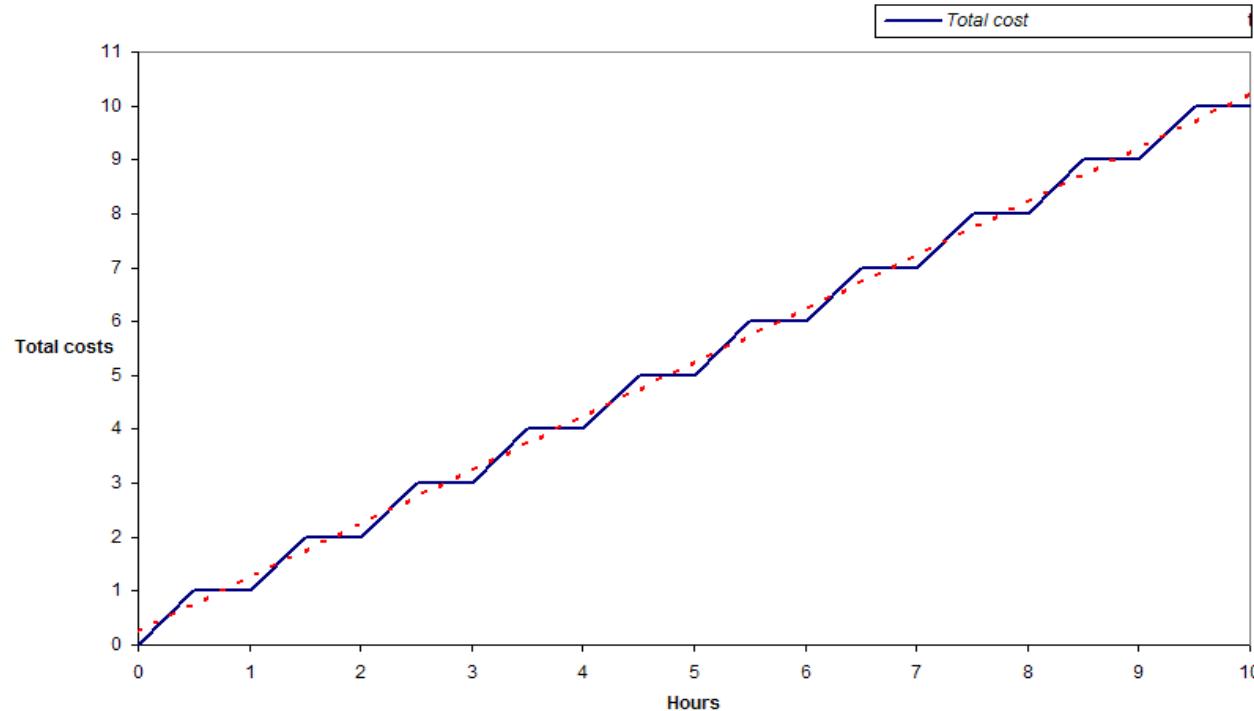
STEP-VARIABLE COSTS

- Costs increase in small steps instead of continuously
- Nearly variable costs, some fixed costs
- As volume increases, the need for additional resources increases, but not one by one

EXAMPLE

- Wages for a salesperson: temporary/additional personnel as demand increases

STEP-VARIABLE COSTS



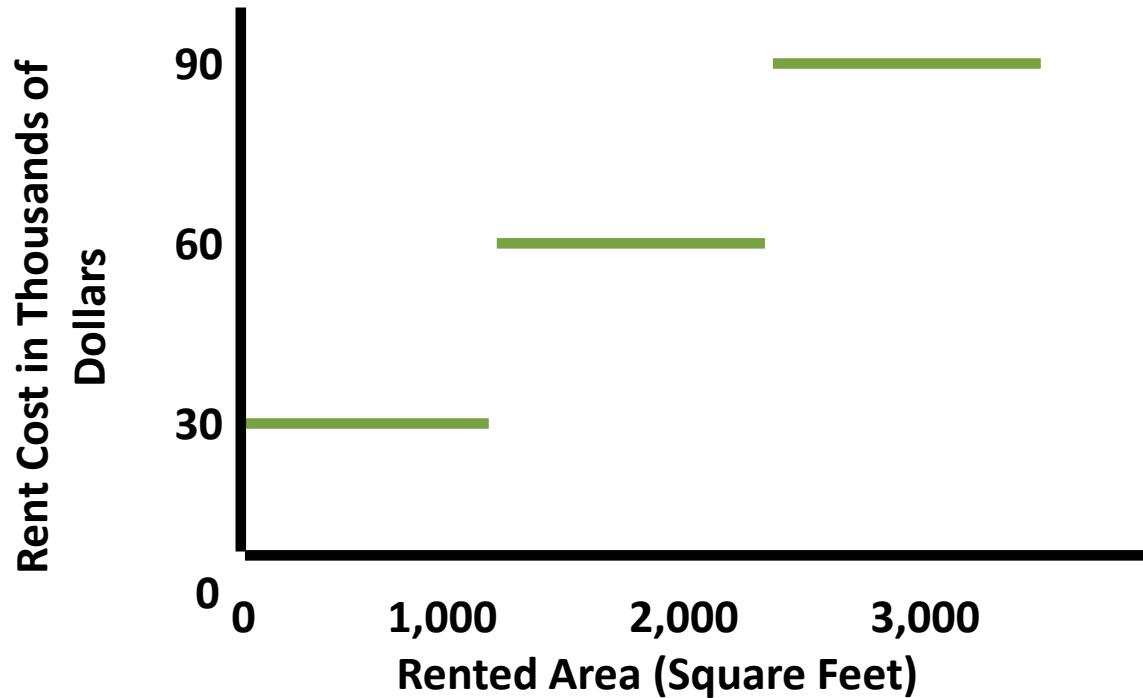
STEP-FIXED COSTS

- Total costs remain unchanged for a wide range of activity
- Costs then jump to a new higher level for the next range of activity

EXAMPLE

- Office space is available at a rental rate of \$30,000 per year in increments of 1,000 square feet. As the business grows more space is rented, increasing total rent.

STEP-FIXED COSTS



STEP-VARIABLE AND STEP-FIXED

SPEED OF ADJUSTMENT

- Step-variable costs can be adjusted quickly
- Step-fixed costs cannot be adjusted quickly

RANGE OF ACTIVITY

- Step-variable costs are constant over a very narrow range of activity (sales person)
- Step-fixed costs are constant over a wide range of activity (new factory)
- By understanding these impacts you can better estimate future costs and plan for various outcomes!

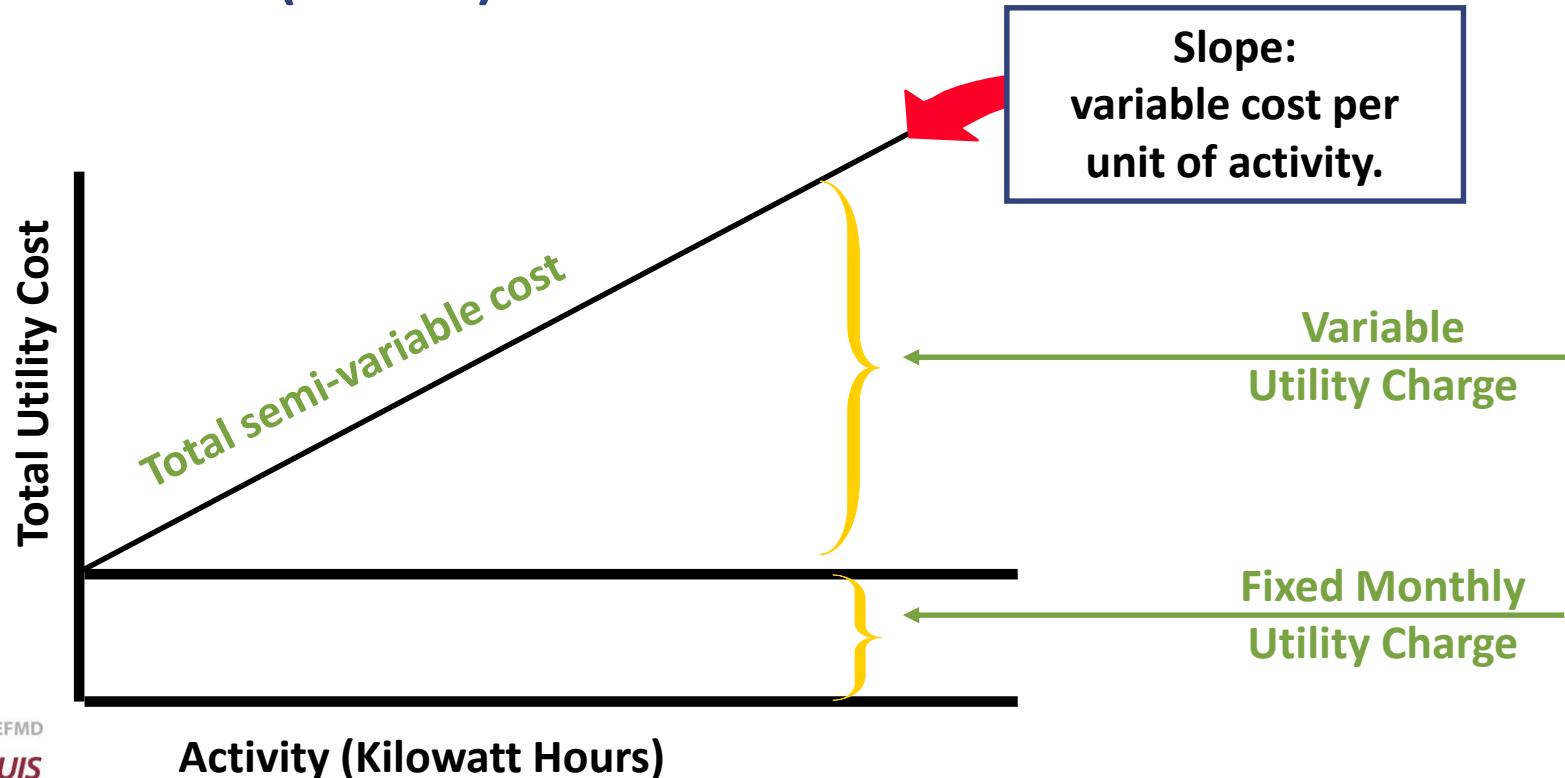
SEMI-VARIABLE (MIXED) COSTS

- Have a fixed as well as a variable component
- Total cost = Fixed costs + Variable costs

EXAMPLE

- Assembly line workers are paid minimum wage plus \$2 per unit produced. Charges associated with hiring these workers amounted to \$30,000.
- Cost of a delivery truck – lease payment/depreciation is fixed, but gasoline is variable
- Phone bill – flat rate: fixed, international calls: variable

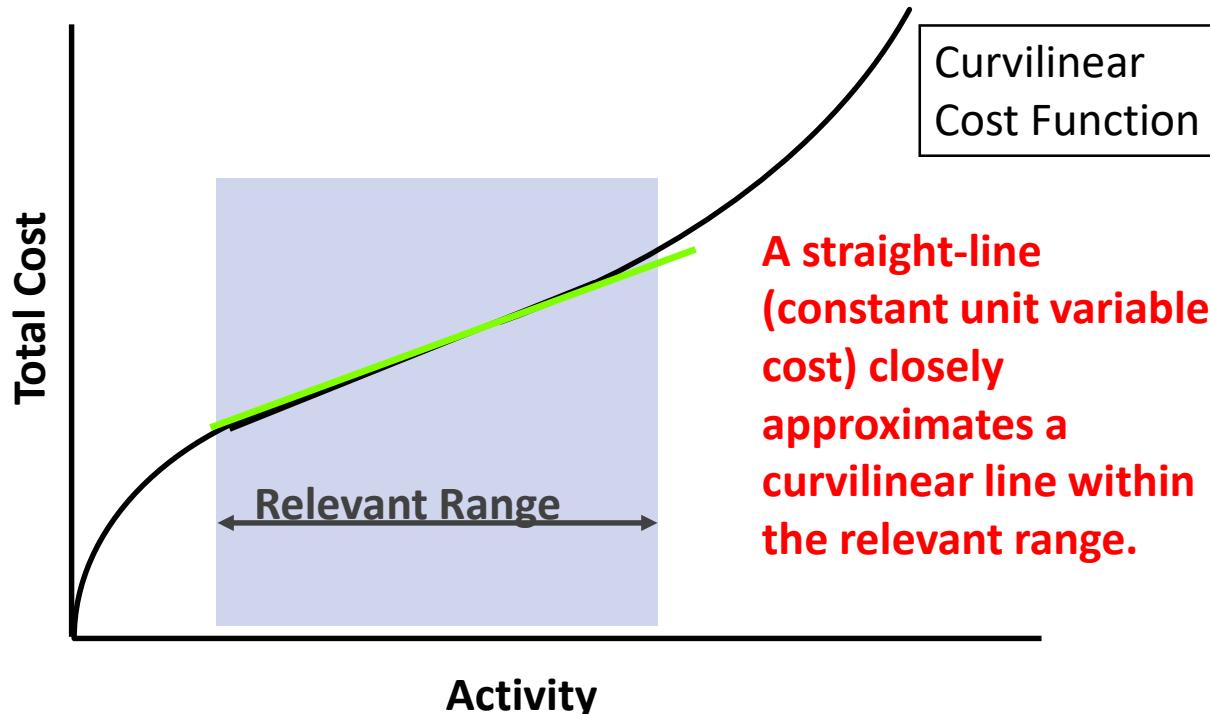
SEMI-VARIABLE (MIXED) COSTS



CURVILINEAR COST

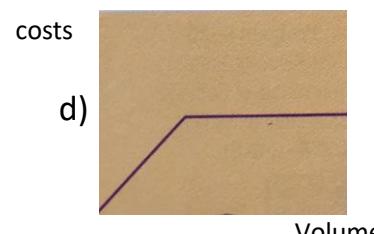
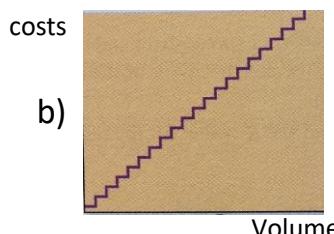
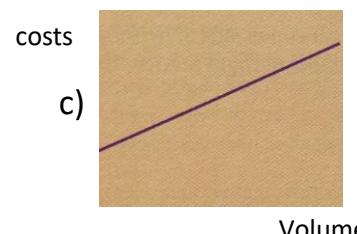
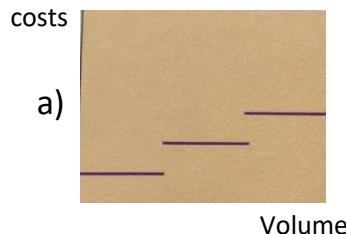
- In theory every cost pattern would consist of straight lines – assuming we are only looking at very narrow costs.
- In reality, most costs are a combination of factors – new/efficient equipment and old/less efficient equipment, combination of electric and gas heating in a plant, etc.
- Many costs have a **curvilinear** cost pattern.

CURVILINEAR COST



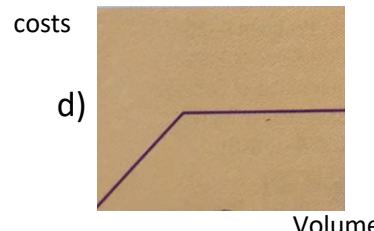
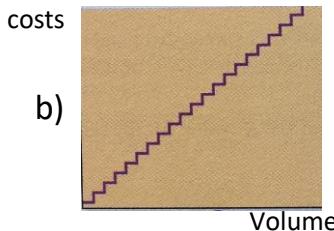
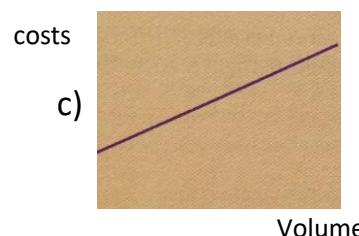
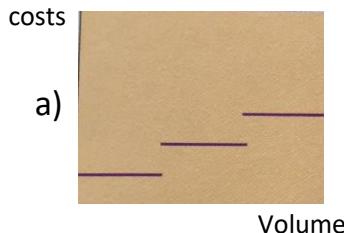
P6-35: WHICH GRAPH REPRESENTS THESE COSTS?

- The cost of online back-up storage at a rate of \$2.50 per gigabyte, up to 50 gigabyte, beyond which storage is unlimited



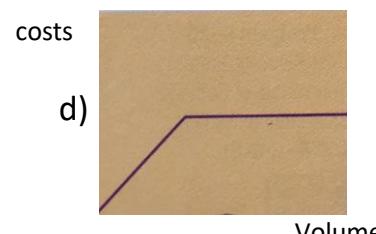
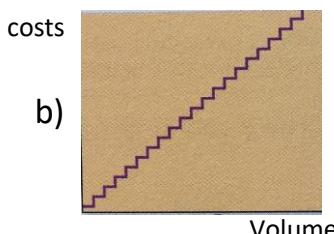
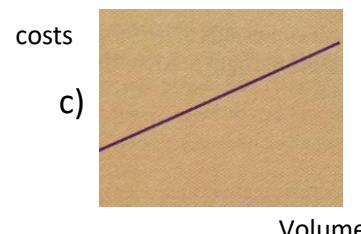
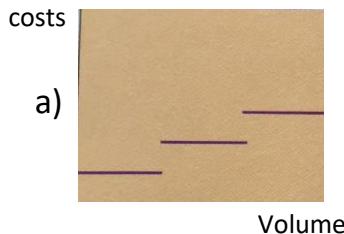
P6-35: WHICH GRAPH REPRESENTS THESE COSTS?

- The cost of outsourcing diagnostic blood testing by a hospital. The hospital pays an independent lab a fee of \$ 1,000 per month plus \$3 for each test done.



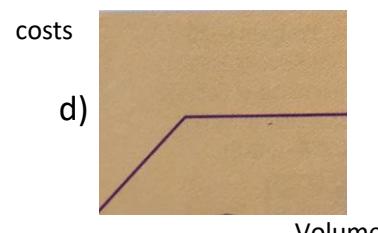
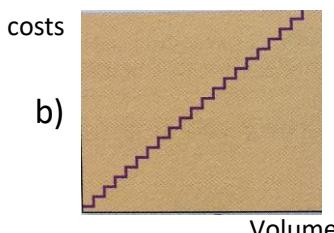
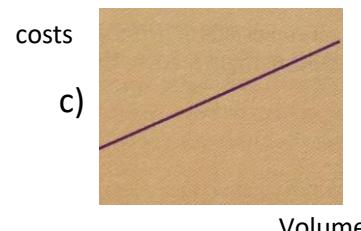
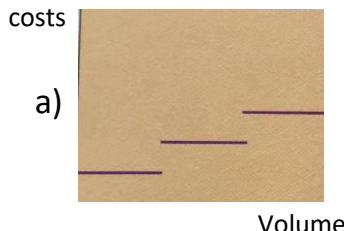
P6-35: WHICH GRAPH REPRESENTS THESE COSTS?

- The salary costs of the shift supervisors at a truck depot. Each shift is eight hours. The depot operates with 1, 2, or 3 shifts at various times of the year.

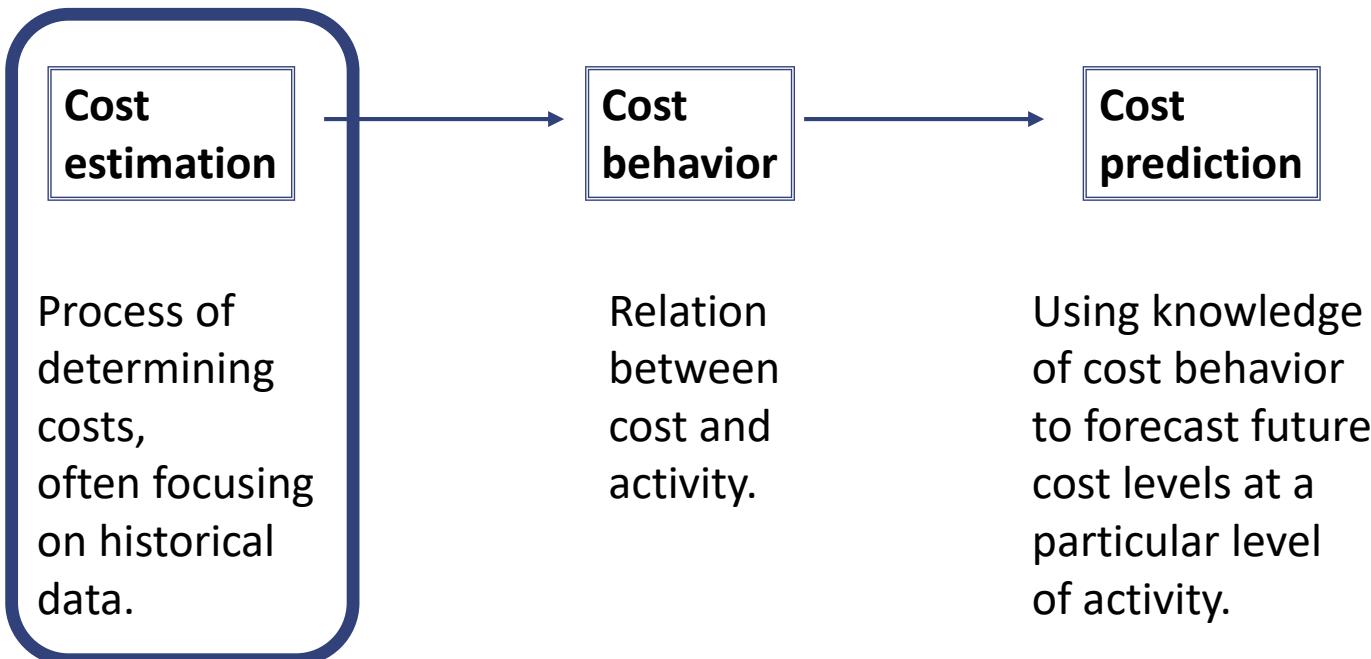


P6-35: WHICH GRAPH REPRESENTS THESE COSTS?

- The wages of table-service personnel in a restaurant. The employees are part-time workers, who can be called upon for as little as 2 hours at a time.



STEPS IN COST ANALYSIS & ESTIMATION



COST ESTIMATION

ACCOUNT CLASSIFICATION METHOD

- Detailed review of each account in the cost item

VISUAL-FIT METHOD

- Fit line to a scatter plot

HIGH-LOW METHOD

- Uses highest and lowest data points

LEAST-SQUARES REGRESSION METHOD

- Statistical approach to establish relations

ACCOUNT-CLASSIFICATION METHOD

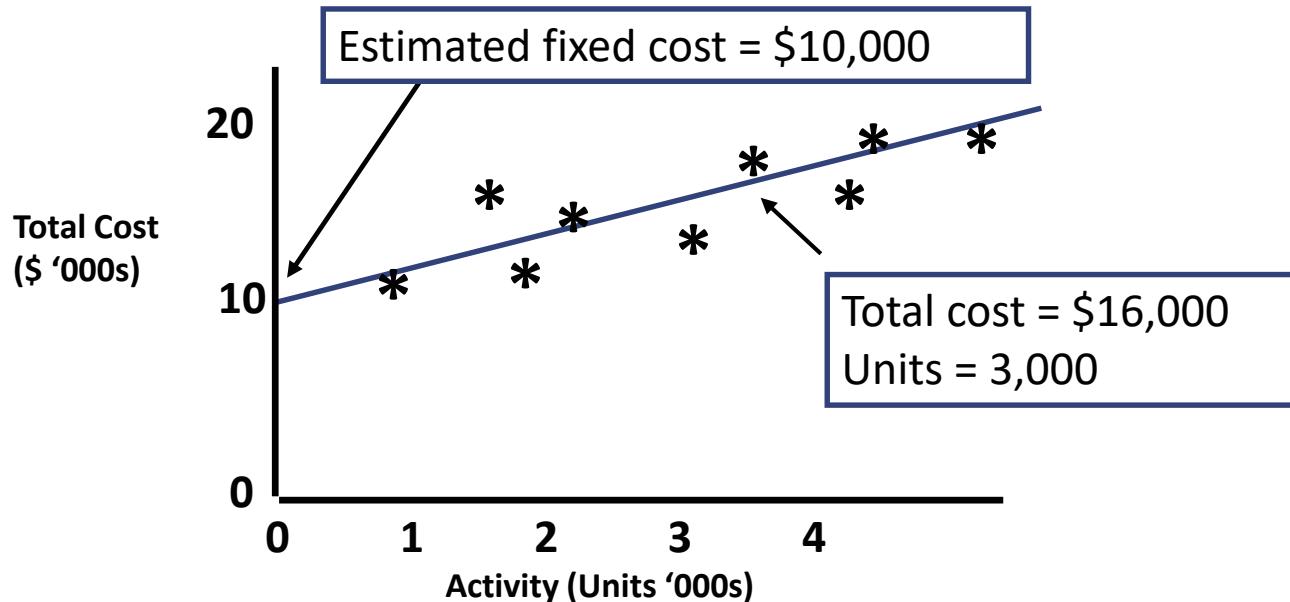
- Careful examination of ledger accounts
- Classify items as variable, fixed, or semi-variable
 - Building depreciation expense – fixed, facility
 - Raw materials – rolled steel – variable, unit level
 - Machine retooling expense – variable, batch level
- Estimates future costs under various scenarios; Use historical information as starting point

VISUAL-FIT METHOD

- Examine costs by plotting points on a graph (called a scatter diagram) and place a line through the points to yield a cost function.
- Use with semi-variable costs
- Use when you have no idea about cost behavior patterns
- Easy, identifying outliers, BUT lack of “objectivity”

COST BEHAVIOR ETC.

VISUAL-FIT METHOD



Total variable cost = Total cost – Total fixed cost

$$\text{Total variable cost} = \$16,000 - \$10,000 = \$6,000$$

$$\text{Unit variable cost} = \$6,000 \div 3,000 \text{ units} = \$2$$

HIGH-LOW METHOD

- Uses two data points only – the highest and lowest, for an activity within the relevant range.
- Variable Cost per Unit =
$$\frac{\text{highest} - \text{lowest costs}}{\text{highest} - \text{lowest activity levels}}$$
- Fixed Costs = Total Cost – unit variable cost * units

- Use this information to estimate future cost patterns
- “Objective”, but other data points are ignored!

HIGH-LOW METHOD

EXAMPLE

- Total costs incurred are \$35,000 when 10,000 units are produced and \$115,000 when 50,000 units are produced.
- What are fixed costs and variable cost per unit?
 - Change in units : 40,000
 - Change in costs: 80,000
 - Variable cost per unit: \$2 ($80,000/40,000$)
 - Fixed costs: \$15,000 [$(35,000-(10,000*2)$ or $115,000-(50,000*2)$]

LEAST-SQUARES REGRESSION METHOD

- Statistical approach that is both objective and considers all data points.
- Univariate regression: $Y = a + bX$
 - Y: Dependent variable (total cost)
 - X: Independent variable (activity)
 - a: Intercept (fixed costs)
 - b: Slope coefficient (variable costs)
- $TC = FC + VC \cdot A$
 - TC = Total cost; FC = Fixed cost
 - VC = Variable cost per unit; A = Activity

LEAST-SQUARES REGRESSION METHOD

- Multivariate (multiple) regression:

$$Y = a + bX + cZ$$

- X and Z are independent variables (different activities)
- e.g., electricity used to run machines and for light in the facility. Total electricity costs are hence a function of machine hours and sqm of the facility
- More accurate cost predictions

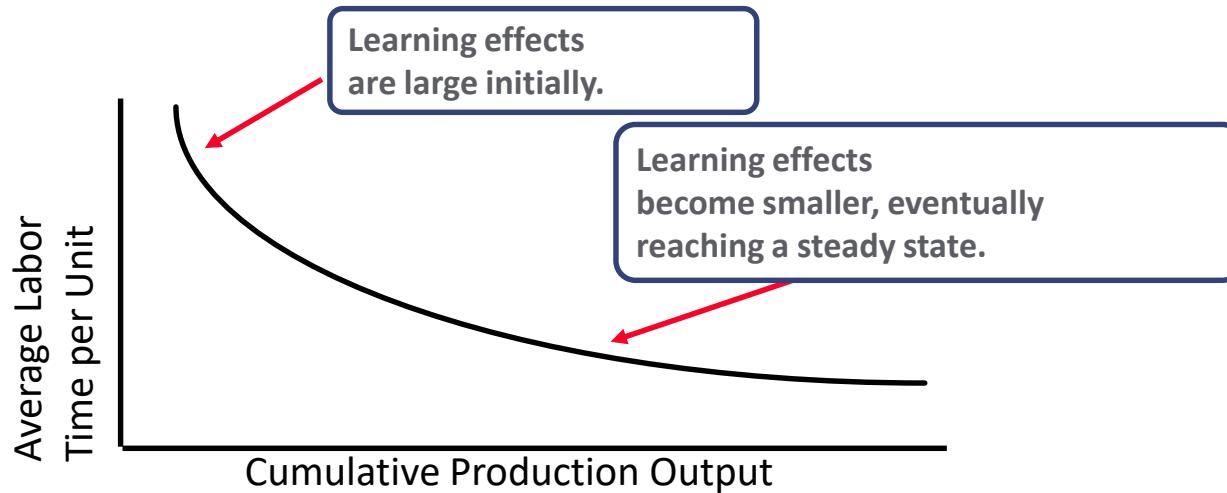
LEAST-SQUARES REGRESSION METHOD

DATA COLLECTION PROBLEMS

- Missing data
- Outliers
- Mismatched time periods – production activity on daily basis, while costs are recorded monthly
- Allocated costs – appear as variable, although they are fixed
- Inflation

LEARNING CURVES

- In many production processes, production efficiency increases with experience.
- Labor time/cost required per unit declines.



LEARNING CURVES

EXAMPLE

- Airplane development and production planning and pricing
- Cost of first units produced vs. cost of 500th unit produced

E6-24

- Lancaster Meat Company's controller used the account classification method to compile the following information:
 - Depreciation on buildings and eqpt. of \$21,000 per month
 - Meat costs \$1.20 per pound of sausage
 - Compensation costs are \$0.85 per pound of sausage produced
 - Supervisor salaries are \$11,000 per month
 - Utility bills are \$5,000 per month plus \$0.25 per pound of sausage produced
- 1. Which costs are variable, fixed or semi-variable?
- 2. Write a cost formula to express the cost behavior of the firm's production costs.

E6-25

- Brazilia Bus Tours incurred the following maintenance costs during the recent tourism season.

Month	Miles Traveled by Buses	Maintenance Cost
November	12,750	17,100
December	15,900	17,400
January	19,050	17,550
February	22,500	18,000
March	30,000	18,750
April	12,000	16,500

- Using High-Low method, estimate VC per mile and FC per month
- Develop a formula to express the cost behavior of maintenance costs
- What would maintenance costs be if 34,000 miles were traveled in one month?

CHAPTER 9

FINANCIAL PLANNING AND ANALYSIS

- THE BUDGET -

OUTLINE

BUDGETING

TYPES OF BUDGETS AND SUPPORTING BUDGETS

- Sales
- Production
- etc.

BEHAVIORAL IMPACTS OF BUDGETS

BUDGETING SYSTEMS

BUDGET FUNCTIONS

- Planning
- Facilitating Communication and Coordination
- Allocating Resources
- Controlling Profit and Operations
- Evaluating Performance and Providing Incentives

Budget:

a detailed plan, expressed in quantitative terms, that specifies how resources will be acquired and used during a specified period of time.

TYPES OF BUDGETS

- Master Budget
- Budgeted financial statements

- Capital Budget
- Financial Budget



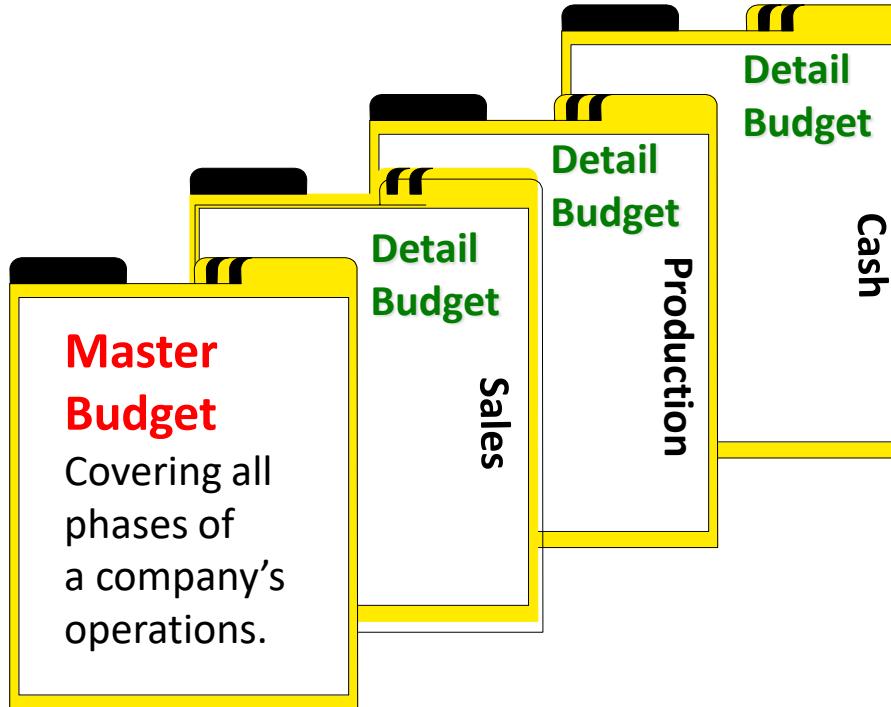
SHORT-RANGE BUDGETS



LONG-RANGE BUDGETS

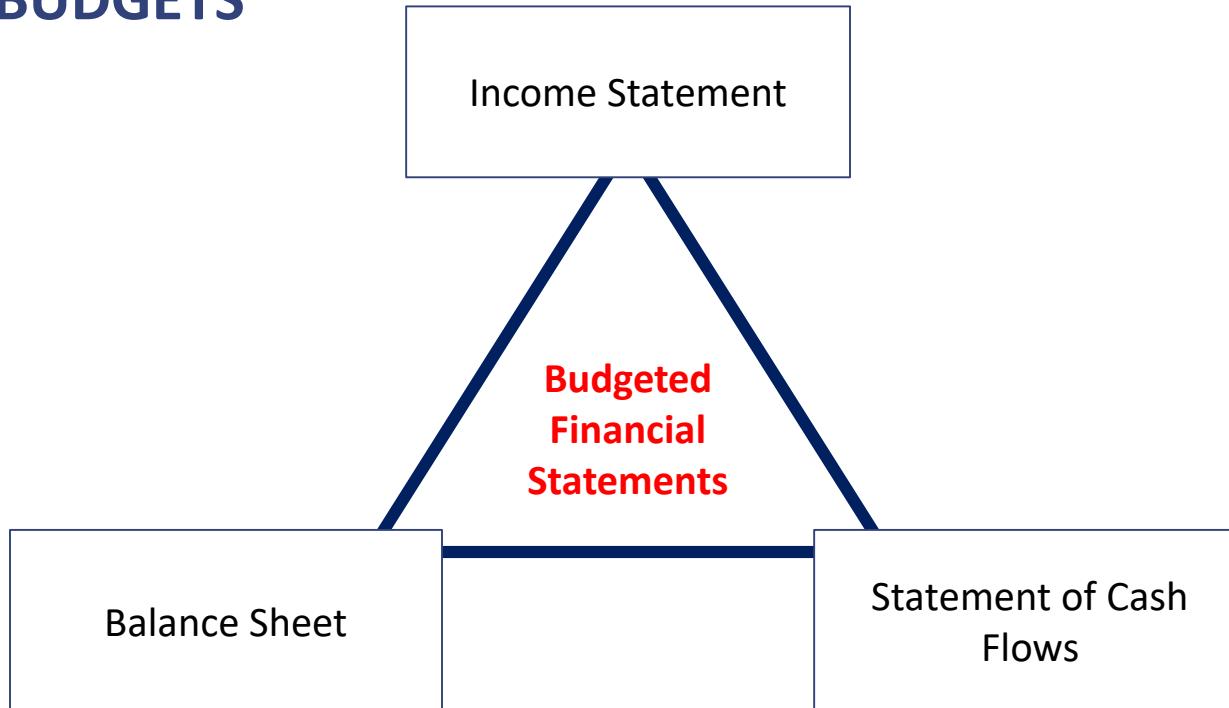
THE BUDGET

TYPES OF BUDGETS

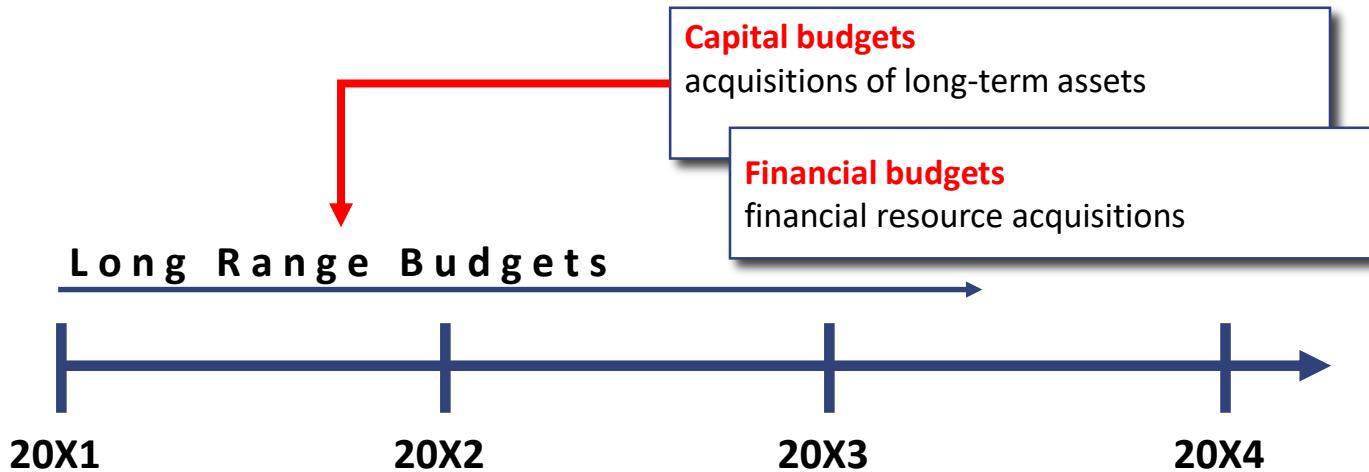


THE BUDGET

TYPES OF BUDGETS



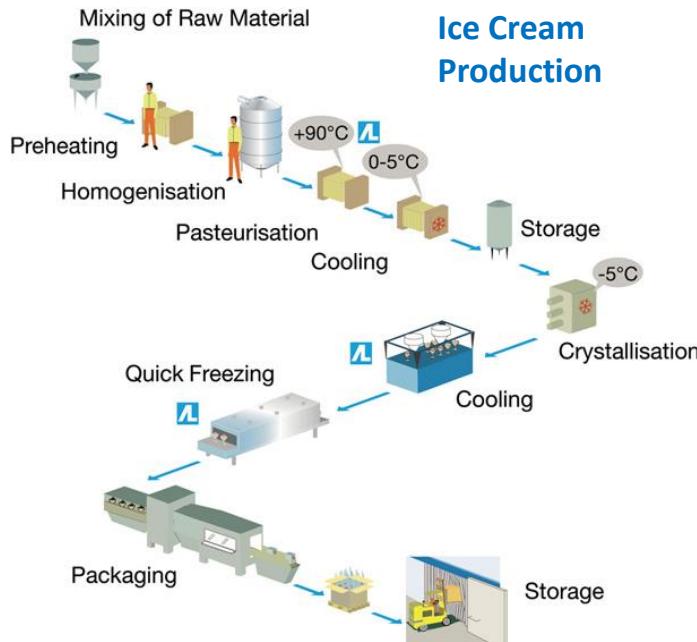
TYPES OF BUDGETS



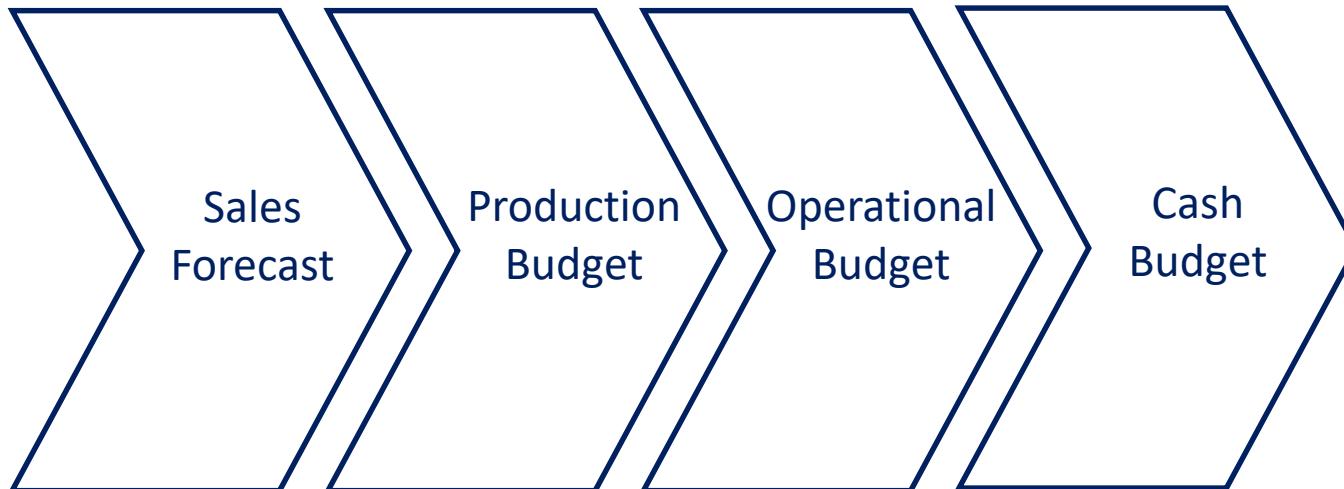
STEPS IN PREPARING A MASTER BUDGET

HOW WOULD YOU PROCEED?

1. Sales
2. Production
3. Cash



STEPS IN PREPARING A MASTER BUDGET



1. SALES BUDGET

FACTORS TO CONSIDER:

- Company's recent sales level/growth rate
- Industry trends
- Price changes/competitor price changes
- Tax changes/regulatory changes
- Planned advertising/competitors advertising
- Macro-economic factors
- Market research/customer satisfaction
- New product introductions (own or competitor)
- ...

2. PRODUCTION BUDGET

- Inventory = sales – production
- Might need to retain inventory for next quarter's sales
- Optimal inventory levels will depend on:
 - Lost contribution margin from foregone sale
 - Cost of holding inventory (spoilage/holding costs)
 - Probability sales will deviate from budgeted levels
- Services firm: no inventory

3. OPERATIONAL BUDGET

- To achieve the sales budget and desired inventory levels, how much do we need to produce?
- Use knowledge of cost behavior to budget:
 - Direct materials / labor cost
 - Overhead cost
 - Selling and administrative costs

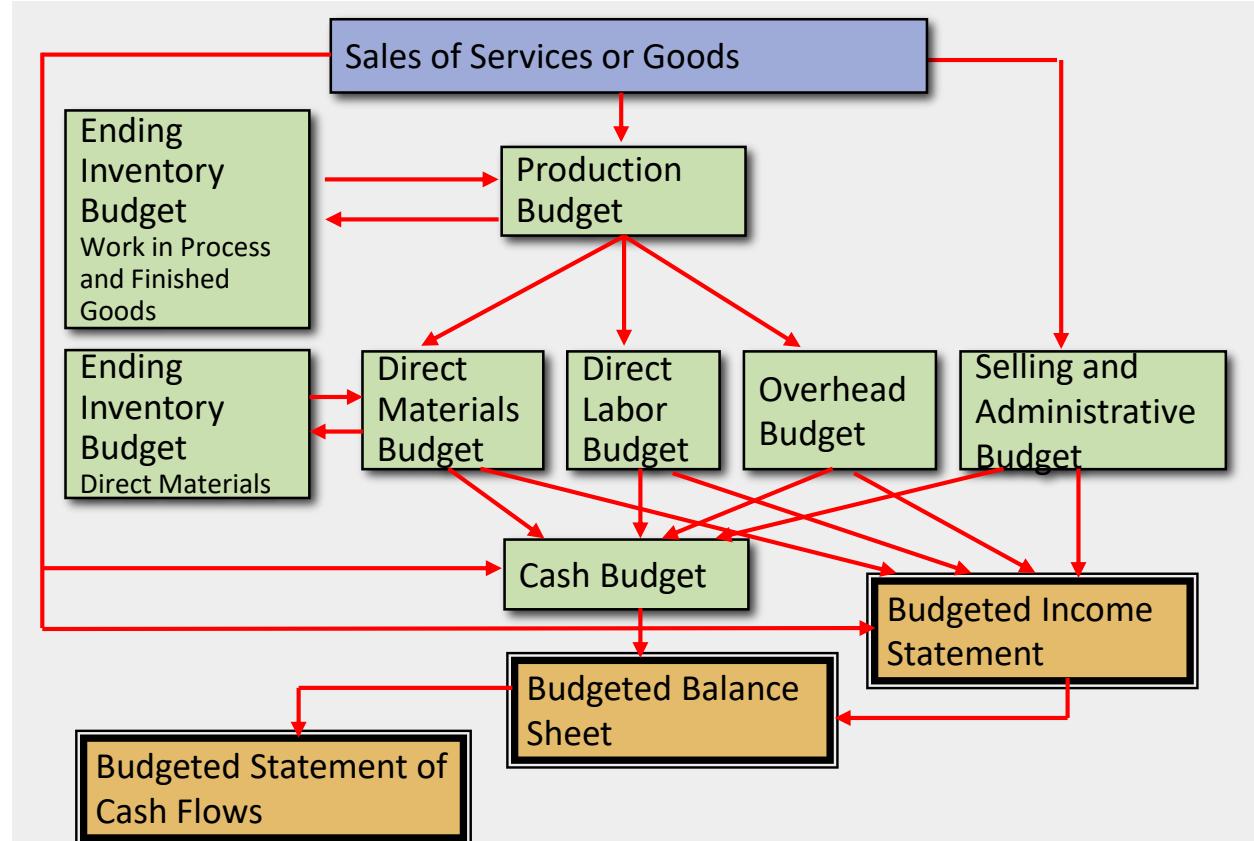
Next Session: Examine difference between budget and actual to learn about performance

4. CASH BUDGET

- After developing the sales & operational budget: think about effect of transactions on cash
- Example: Payment terms
 - When do I expect to collect cash from customers?
 - When do I expect to pay cash to suppliers?
 - Might need to borrow from a bank or sell stock
- Budgeting will help plan for meeting cash needs throughout the peaks and valleys of business
 - Needs to be on a frequent basis to avoid surprises!

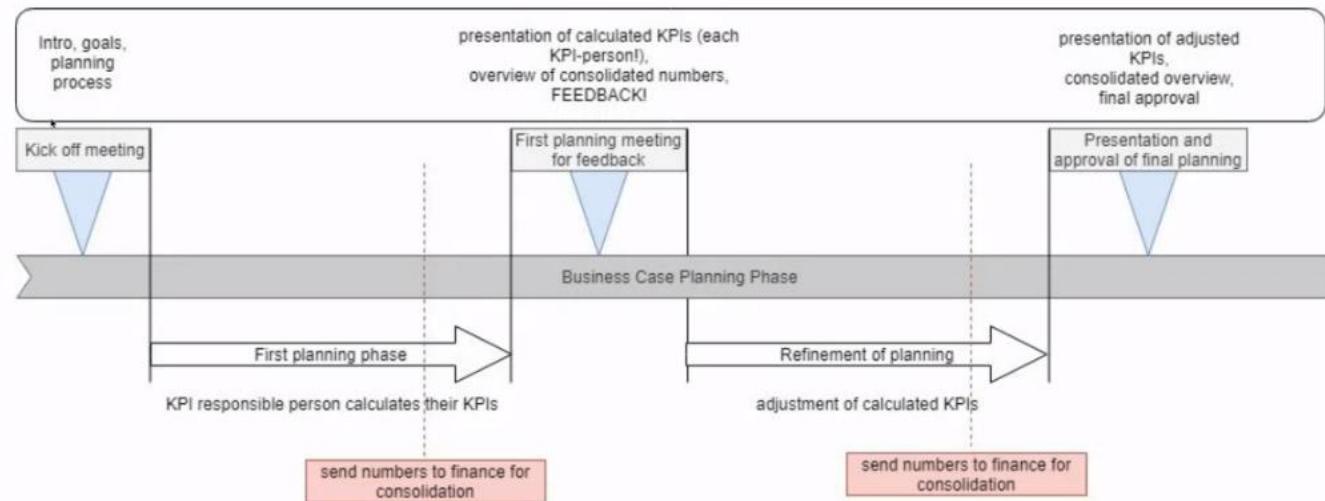
THE BUDGET

MASTER BUDGET



EXAMPLE – PLANNING PROCESS OF AN ONLINE DATING PLATFORM

Quarterly Business Case Process



BEHAVIORAL IMPACT OF BUDGETS

BUDGETARY SLACK: PADDING THE BUDGET

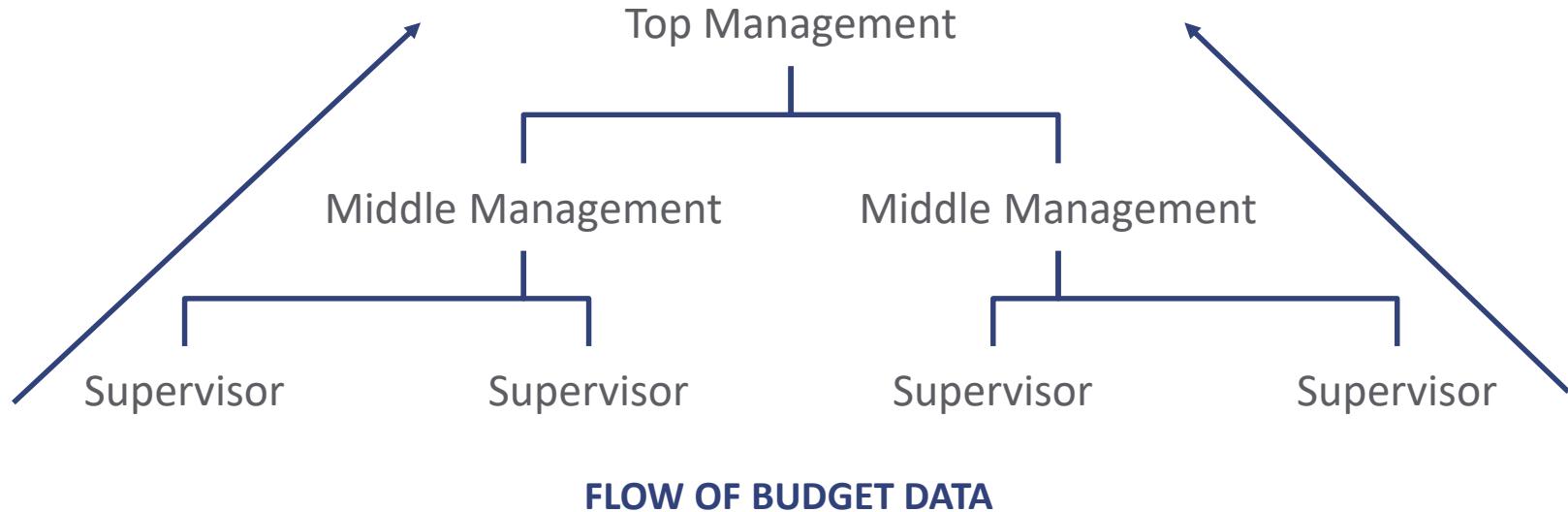
- People often perceive that performance looks better in their superiors' eyes if they can “beat the budget.”
- Cope with uncertainty
- Budgeted costs are often cut during resource allocation

RECOMMENDATIONS

- Avoid to use budgets as negative evaluation tool
- Reward meeting the budget & to provide accurate budgets

BEHAVIORAL IMPACT OF BUDGETS

PARTICIPATIVE BUDGETING



COMMENTS ON BUDGETING

“Always negotiate the lowest targets and the highest rewards!”

“Always meet the numbers, never beat them!”

“Never share knowledge or resources with other teams – they are the enemy!”

“Never put customer care above sales targets!”

“Always make the bonus, whatever it takes!”

“Always ask for more resources than you need, expecting to be cut back to what you actually need.”

“Never provide accurate forecasts!”

“Always spend what’s in the budget!”

“Always have the ability to explain adverse variances!”

“Never take risks!”

Source : Schäffer

TIME IS CHANGING...

Planungsgrundsätze bei BOSCH

- 
- 01** Anstatt vom „Detail zum Groben“ vom „Groben zum Detail“
 - 02** Planung so spät wie möglich starten
 - 03** Nur noch wesentliche Eckdaten Benchmark-bezogen planen
 - 04** Reduzierung des Planungshorizontes auf zwei Jahre
 - 05** Steuerung über rollierende Prognosen statt mit Plan-Ist-Vergleichen
 - 06** Keine Rekursionsschleifen, sondern Plananpassungsregeln im Voraus
 - 07** Stark konsekutive Informationsweitergabe – simultane Abläufe
 - 08** Trennung zwischen Incentivierungs- und Planzielen

Quelle: Stoß/Assenkerschbaumer/Bley, Controlling & Management Review, Sonderheft 1/2015, S. 16-23.

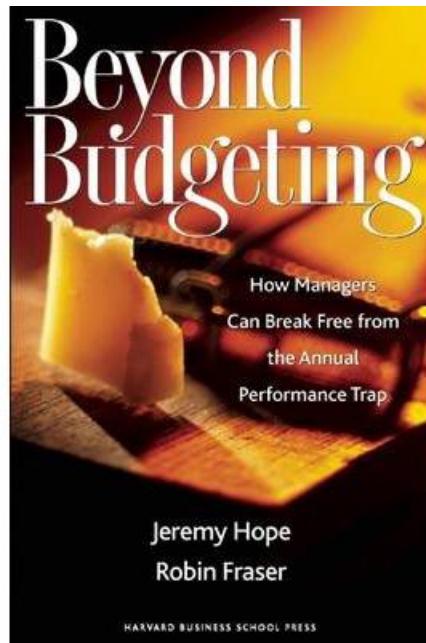
COMMENTS ON BUDGETING

Can you imagine a company without budgeting?

Source : Schäffer / Petrikowski

BEYOND BUDGETING

HOPE/FRASER (1998)



Source : Schäffer / Petrikowski



The screenshot shows the Haufe website's header. On the left is a menu icon (three horizontal lines). In the center is the "HAUFE." logo. On the right are user icons (profile and search) and a navigation bar with links: "Haufe" (highlighted), "Controlling", "Controllerpraxis", "Rechnungslegung", and "Controller Magazin".

Nachhaltigkeit, Digitalisierung und Beyond Budgeting sind die zentralen Controllingthemen

 SERIE 28.09.2022

WHU Campus for Controlling 2022

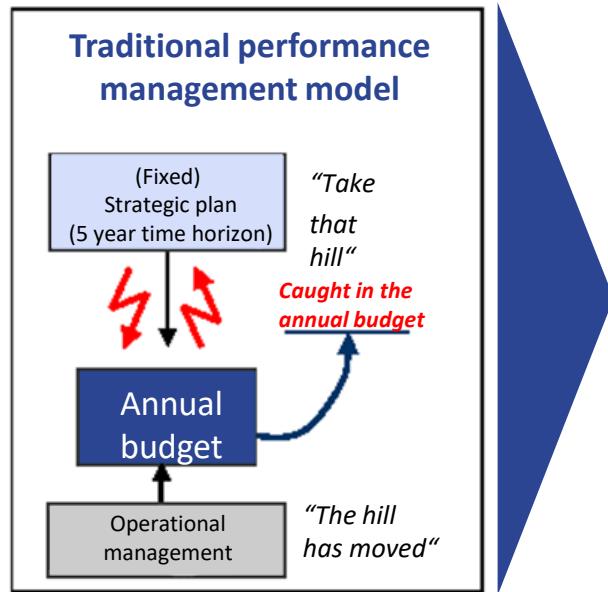


Jacqueline Klug

Wissenschaftliche Mitarbeiterin WHU Vallendar



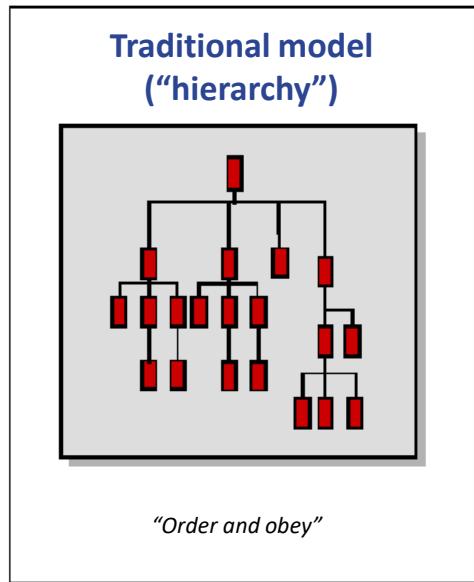
BASIC IDEA (1): MANAGEMENT PROCESSES



Source : Hope/Fraser (2001); Morlidge (2017)

1. **Rhythm:** Organise management processes dynamically around business rhythms and events; not around the calendar year only.
2. **Targets:** Set directional, ambitious and relative goals; avoid fixed and cascaded targets
3. **Plans and forecasts:** Make planning and forecasting lean and unbiased processes
4. **Resource allocation:** Foster a cost conscious mind-set and make resources available as needed; not through detailed annual budget allocations
5. **Performance evaluation:** Evaluate performance holistically and with peer feedback for learning and development; not based on measurement only and not for rewards only
6. **Rewards:** Rewards shared success against competition; not against fixed performance contracts

BASIC IDEA (2): LEADERSHIP PRINCIPLES



Source : Hope/Fraser (2001); Morlidge (2017)



7. **Purpose:** Engage and inspire people around bold and noble causes; not around short-term financial targets
8. **Values:** Govern through shared values and sound judgement; not through detailed rules and regulations
9. **Transparency:** Make information open for self-regulation, innovation, learning and control; don't restrict it
10. **Organisation:** Cultivate a strong sense of belonging and organise around accountable teams; avoid hierarchical control and bureaucracy
11. **Autonomy:** Trust people with freedom to act; don't punish everyone if someone should abuse it
12. **Customers:** Connect everyone's work with customer needs; avoid conflicts of interest

EXAMPLE: SVENSKA HANDELSBANKEN

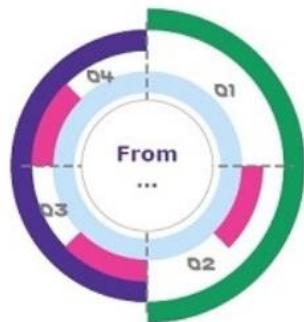
No budgeting
process
anymore
at Svenska
Handelsbanken:



- Performance culture**
 - Top-down challenge and local stretch targets
 - Culture of constant questioning and elimination of costs
 - Internal promotion of managers
- Decentralization**
 - Roughly 600 branches make mostly autonomous decisions, e.g., credit decisions are fundamentally made on site
 - Focus on customers, not on products
 - Lean head office: 300 employees in 2000, i.e. 0.5 employees per branch
 - Service centers have to sell their services internally
- Coordination**
 - Informal monthly meetings between top managers instead of formal planning process: Discussion based on results, exchange of information and ideas
 - Transparent, continuous MIS
 - All managers receive information simultaneously; KPIs are accessible to everyone
- Performance management**
 - Success is defined in relation to competition and internal groups
 - Few head office performance indicators: ROE (group), ROE + cost/income (region) cost/income + profit/loss per employee (branch)
 - Annual identification of the “winner” on the regional level
 - Ongoing performance monitoring in branches, employees are involved
 - Bonuses not individual but rather group related

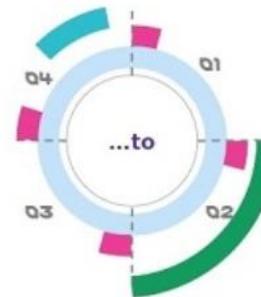
MERCK ALSO GOES IN THIS DIRECTION

WE REPLACED THE STATIC BUDGETING PROCESS BY LEAN TOP-DOWN TARGET SETTING AND ROLLING FORECASTING



- Strategy Development (SD)
- Operational Planning (OP)
- Target Setting (TS)
- Monthly Actuals (ACT)
- Forecasts (F)

- Strategy development (SD) in H1
- Operational planning (OP) in H2
- Target setting (TS) embedded in OP
- 3 forecasts (F) in Q2, Q3, Q4
- Monthly actuals (ACT)



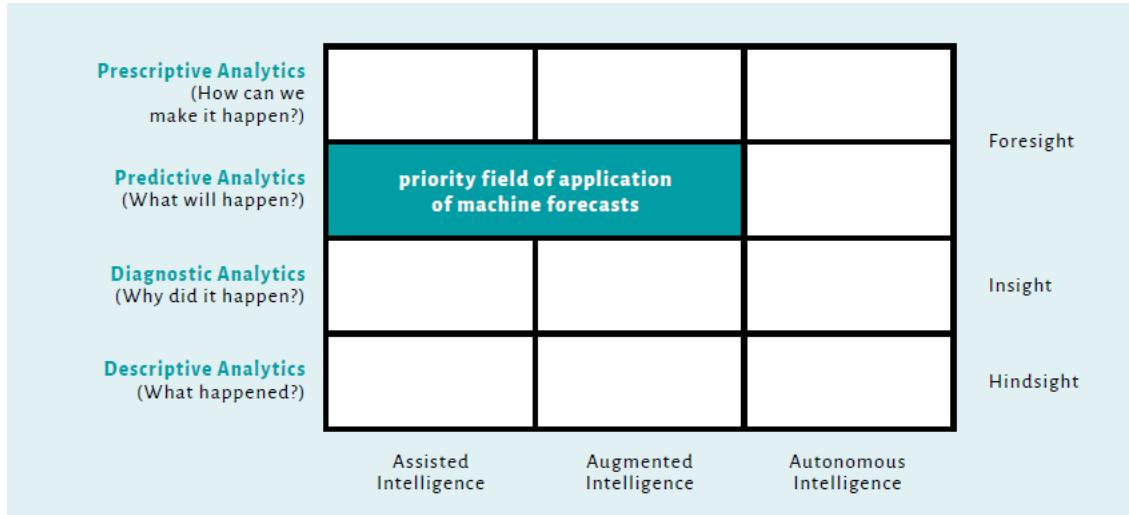
- **Shortened SD**
- **No OP**
- **Top-Down target setting (TS) in Q4**
- **4 rolling forecasts (F) in Q1, Q2, Q3, Q4**
- **Sustained monthly actuals (ACT)**

LEAP | ICV Controlling Excellence Award | May 2023

NEW TREND IN BUDGETING?

ARTIFICIAL INTELLIGENCE

- But why do companies hesitate to use AI in their budgeting processes?



PROF. DR. HEIMO LOSBICHLER: Artificial Intelligence in Controlling (2020)

Prof. Dr. Timo Vogelsang

MANAGERIAL ACCOUNTING (WINTER 2023)



COURSE OVERVIEW

Session	Topic	Hilton / Platt
1	The Changing Role of Managerial Accounting	Chapter 1
	Basic Cost Management Concepts	Chapter 2
2	Product / Job Costing	Chapter 3
	Transfer Pricing	Chapter 13
3	Cost-Volume-Profit Analysis	Chapter 7
	Inventory Costing (Absorption vs. Variable Costing)	Chapter 8
4	Decision-Making: Relevant Costs and Benefits	Chapter 14
	Responsibility Center, Performance Measures & Controls	(Chapter 12/13)
5	Activity-Based Costing	Chapter 5
6	Activity Analysis, Cost Behavior, and Cost Estimation	Chapter 6
	Budgets – Financial Planning and Analysis	Chapter 9
7	Standard Costing and Direct Cost Variances	Chapter 10
8	Signaling Effects of Incentives	
	Sustainability and Controlling	

CHAPTER 10

STANDARD COSTING AND DIRECT COST VARIANCES

OUTLINE

BUDGETS GIVE A “BENCHMARK” TO COMPARE TO ACTUAL RESULTS

DEVIATIONS FROM BUDGET – VARIANCE ANALYSIS

- Static vs. flexible budgets
- Standard costing – what is it and why use it
- Variance analysis – what and why
 - Material variances – rate and usage
 - Labor variances – rate and efficiency
 - Interaction of variances

PREPARING A BUDGET

- When preparing a budget, we first budget a specific output (production) quantity
- We then rely on standard costs to budget total costs
- Budgeted Output Quantity * Standard Costs
- Standard costs reflect how many input units should be consumed per unit of output and at what unit cost

Static Budget (standard budget):
Budgeted Output Quantity * Standard Costs

PREPARING A BUDGET

- What do differences between Actual and Static Budget tell us?
- Companies will typically sell a different quantity and at different costs
- $\text{Actual} = \text{Actual Output Quantity} * \text{Actual Costs}$

STATIC AND FLEXIBLE BUDGETS

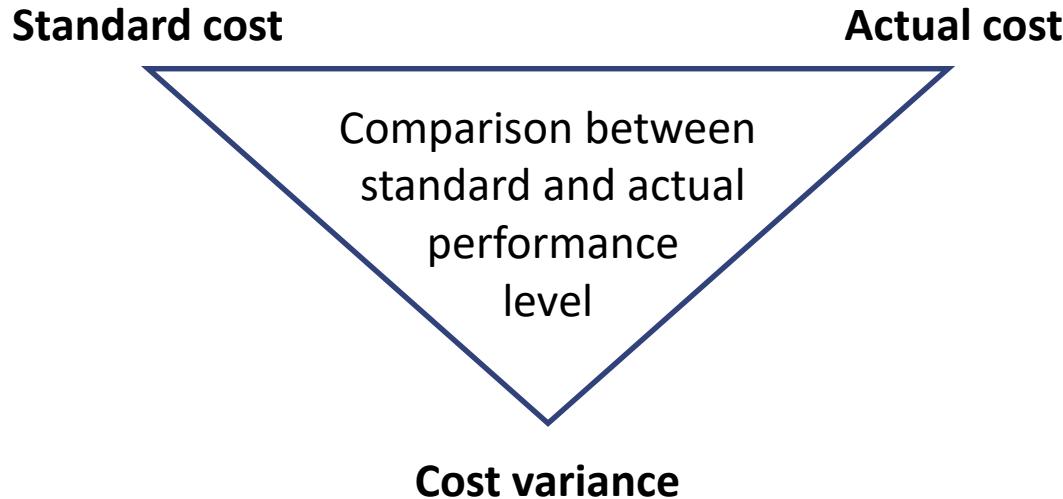
- Comparing actual costs to static budget:
 - Expect higher (lower) variable cost with higher (lower) quantity sold
 - Effect of volume on costs may overwhelm any production efficiency effect

**Need for a flexible budget to isolate
effect of production efficiency**

STATIC AND FLEXIBLE BUDGETS

- Flexible Budget: Show revenues and expenses that should have occurred at the actual level of activity.
- Actual Output Quantity * Standard Costs
 - Multiply standard cost by actual volume to create flexible budget (or standard budget/cost)
- Flexible budget is the benchmark against which the firm compares actual costs
 - Controls for effect of volume on costs

COST VARIANCE

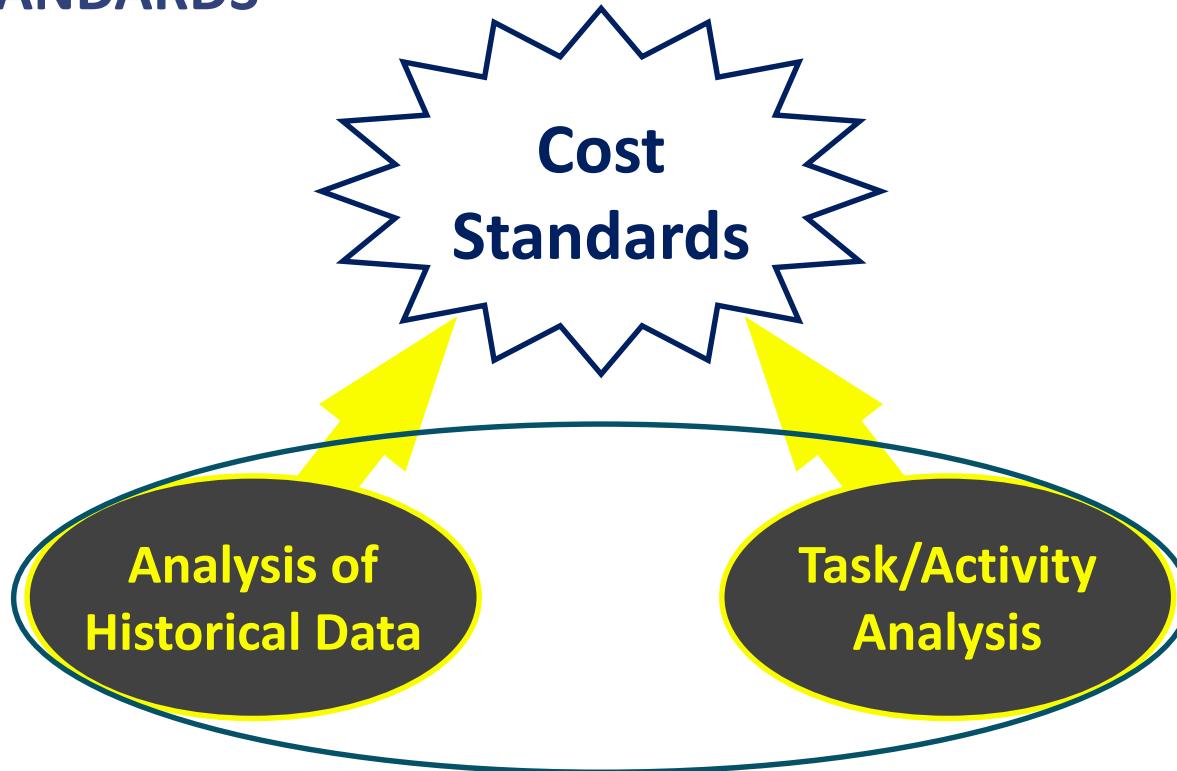


Allows firms to understand how/why they missed/outperformed the budget

STANDARD COSTING

- Costs = quantity * unit costs
- Standard costs reflect how many units should be consumed (standard input quantity) per unit of output and at what unit cost (standard input price)
- Standards are established for:
 - Material prices and quantities
 - Labor rates and time required
- Standards reflect what management expects costs and efforts to be

SETTING STANDARDS



COST VARIANCE ANALYSIS

- Cost variance: Difference between actual cost and standard cost

Standard cost = Standard quantity(SQ)*Standard price(SP)

Actual cost = Actual quantity(AQ)*Actual price(AP)

- Cost variance = AP*AQ – SP*SQ
- Is variance due to differences in the price of materials or because materials were used more/less efficiently?

**Not knowing whether purchasing or production caused
the variance makes it difficult to take action**

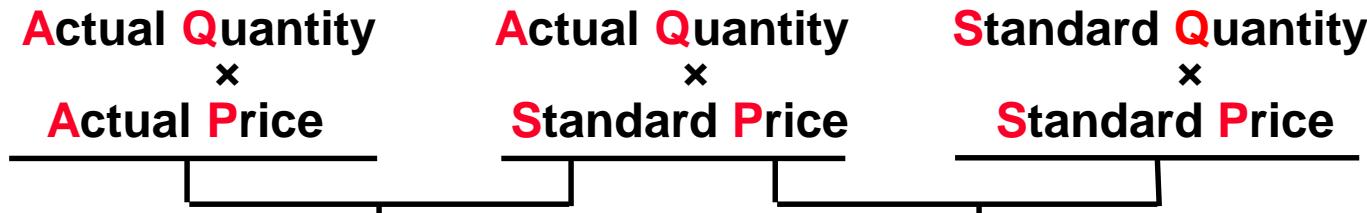
COST VARIANCE ANALYSIS

- Decompose cost variance into price and quantity variance
- Price variance: $(AP-SP) * AQ$
C.compares actual price with standard price, holding quantity constant
- Quantity variance: $SP * (AQ-SQ)$
C.compares actual quantity with standard quantity, holding price constant

Allows the firm to understand how/why they missed the standard

COST VARIANCE ANALYSIS

- A general model for variance analysis: → Memorize this formula!



$$AQ * (AP - SP)$$

AP = Actual Price

AQ = Actual Quantity

$$SP * (AQ - SQ)$$

SP = Standard Price

SQ = Standard Quantity

COST VARIANCE ANALYSIS

- Analyze variances for both material and labor

MATERIAL

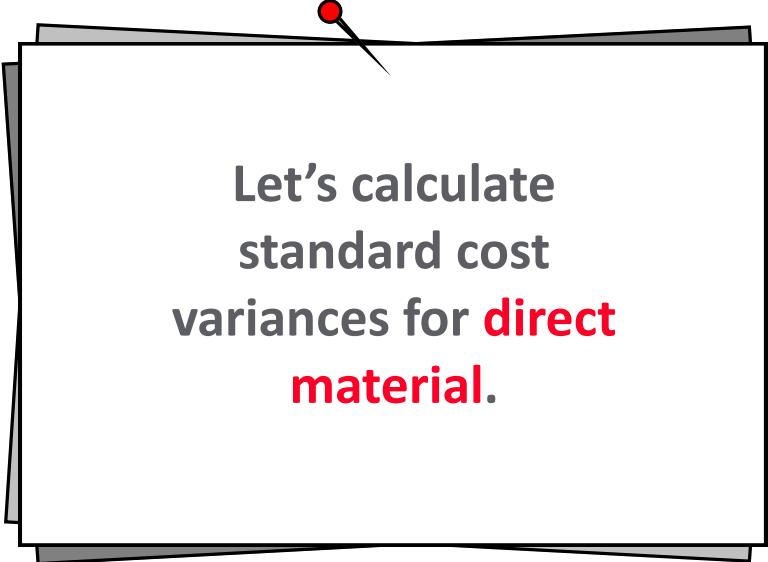
- Material Price Variance
- Material Quantity Variance

LABOR

- Labor Rate Variance
- Labor Efficiency Variance

This model enables to track price and quantity variances
for multiple categories of direct material/labor

COST VARIANCE ANALYSIS



Let's calculate
standard cost
variances for **direct**
material.

HANSON'S MATERIAL VARIANCES

- Hanson Inc. has the following direct material standard to manufacture one Zippy:
 - 1.5 pounds per Zippy at \$4.00 per pound
- Last week 1,700 pounds of material were purchased and used to make 1,000 Zippies. Material cost amounts to a total of \$6,630.
- Calculate price and quantity variances for direct material!

HANSON'S MATERIAL VARIANCES

Standard quantity = 1,000 zippies * 1.5 lbs. per zippy = 1,500

Standard price = \$4

Actual quantity = 1,700

Actual price = (6,630 / 1,700) = \$3.90

- What is the direct material price variance? F or UF?
- What is the direct material quantity variance? F or UF?
- Favorable (unfavorable) variances positively (negatively) impact income

STD. COSTING & VARIANCES

HANSON'S MATERIAL VARIANCES : SUMMARY

Actual Quantity x <u>Actual Price</u>	Actual Quantity x <u>Standard Price</u>	Standard Quantity x <u>Standard Price</u>
1,700 lbs.	1,700 lbs.	1,500 lbs.
x	x	x
\$3.90 per lb.	\$4.00 per lb.	\$4.00 per lb.
\$6,630	\$ 6,800	\$6,000
Price variance \$170 favorable	Quantity variance \$800 unfavorable	

HANSON'S MATERIAL VARIANCES

- Hanson Inc. has the following material standard to manufacture one Zippy:
- 1.5 pounds per Zippy at \$4.00 per pound
- Last week 2,800 pounds of material were purchased at a total cost of \$10,920, and 1,700 pounds were used to make 1,000 Zippies

How do we compute variances when units purchased differs from units produced?

HANSON'S MATERIAL VARIANCES

WHEN PURCHASED QUANTITY DIFFERS FROM QUANTITY USED:

- Some firms calculate an additional purchase price variance, considering the entire quantity purchased
 - purchase price variance (quantity purchased)
 - price variance (quantity used)
- The quantity variance is computed only on the quantity used

HANSON'S MATERIAL VARIANCES

- Hanson Inc. has the following material standard to manufacture one Zippy:
- 1.5 pounds per Zippy at \$4.00 per pound
- Last week 2,800 pounds of material were purchased at a total cost of \$10,920, and 1,700 pounds were used to make 1,000 Zippies.
- Same as previous question except purchased 2,800 pounds

STD. COSTING & VARIANCES

HANSON'S MATERIAL VARIANCES

Actual Quantity
Purchased
 \times
Actual Price

2,800 lbs.

\times

\$3.90 per lb.

\$10,920

Actual Quantity
Purchased
 \times
Standard Price

2,800 lbs.

\times

\$4.00 per lb.

\$11,200

$$MPV = AQ(AP - SP)$$

$$MPV = 2,800 \text{ lbs.}$$

$$\times (\$3.90 - 4.00)$$

$$MPV = \$280 \quad \text{Favorable}$$

Purchase price variance
\$280 favorable

Purchase price variance higher
than price variance as *quantity purchased > quantity used*.

STD. COSTING & VARIANCES

HANSON'S MATERIAL VARIANCES: SUMMARY

Actual Quantity \times <u>Actual Price</u>	Actual Quantity \times <u>Standard Price</u>	Standard Quantity \times <u>Standard Price</u>
1,700 lbs. \times \$3.90 per lb.	1,700 lbs. \times \$4.00 per lb.	1,500 lbs. \times \$4.00 per lb.
\$6,630	\$ 6,800	\$6,000

Price variance: \$170 fav.

Quantity variance: \$800 unfav.

Price variance is **unchanged** because actual quantity used is unchanged

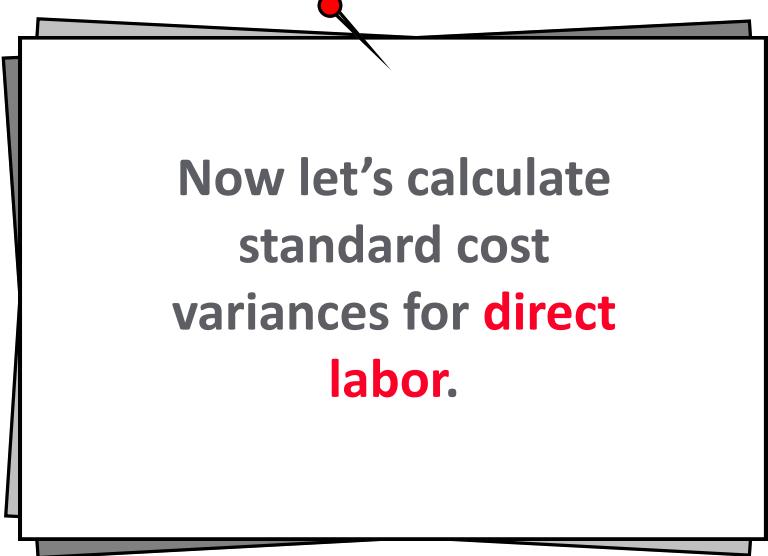
Quantity variance is **unchanged** because actual and standard quantities used are unchanged.

MATERIAL VARIANCES

WHAT CAUSES MATERIAL VARIANCES?

- Price variances
 - Changing raw material prices
 - Substitution of raw materials
- Quantity variances
 - Inefficient employees causing excess waste
 - Poor quality materials purchased
 - Changes in manufacturing processes
- Responsibility
 - Procurement for pricing and quality
 - Production for use of materials

STD. COSTING & VARIANCES



Now let's calculate
standard cost
variances for **direct**
labor.

HANSON'S LABOR VARIANCES

- Hanson Inc. has the following direct labor standard to manufacture one Zippy:
- 1.5 standard hours per Zippy at \$10.00 per direct labor hour
- Last week 1,550 direct labor hours were worked at a total labor cost of \$15,810 to make 1,000 Zippies.

HANSON'S LABOR VARIANCES

Standard hours = 1,5 hrs * 1,000 = 1,500 hrs

Standard rate = \$10

Actual hours = 1,550 hrs

Actual rate = \$15,810 / 1,550 hrs = \$ 10.20

- What is the direct labor rate variance? F or UF?
- What is the direct labor efficiency variance? F or UF?
- Favorable (unfavorable) variances positively (negatively) impact income.

STD. COSTING & VARIANCES

HANSON'S LABOR VARIANCES

<u>Actual Hours</u> \times <u>Actual Rate</u>	<u>Actual Hours</u> \times <u>Standard Rate</u>	<u>Standard Hours</u> \times <u>Standard Rate</u>
1,550 hours	1,550 hours	1,500 hours
\times	\times	\times
\$10.20 per hour	\$10.00 per hour	\$10.00 per hour
\$15,810	\$15,500	\$15,000
		
Rate variance \$310 unfavorable		Efficiency variance \$500 unfavorable

LABOR VARIANCES

WHAT CAUSES LABOR VARIANCES?

- Labor rate variances
 - Skill mismatches: Assigning highly skilled workers to low skill jobs or vice versa
 - Competition increases market wages
- Labor efficiency variances
 - Skill mismatches
 - Lower than expected material quality
- Responsibility
 - Production managers who make job assignments
 - Procurement who purchases materials

INTERACTION AMONG VARIANCES

- One choice can impact several variances → hard to disentangle responsibilities
 - Use cheaper material → F material price variance
 - Cheaper material breaks easily → UF material quantity variance
 - Assembly takes longer due to broken parts → UF labor hours variance
- Analyze the net impact on income!

MANAGEMENT BY EXCEPTION

- Focus on quantities and costs that differ from standard costs by substantial margin
 - Depends on type and size of firm and the production process
- Examine whether uncontrollable factors caused the variance
 - Uncontrollable shocks can also have indirect effects

Example: high oil prices can lead companies to use more labor and less automation

WHAT VARIANCES SHOULD BE INVESTIGATED?

SIZE OF VARIANCE

- Dollar amount
- Percentage of standard

RECURRING VARIANCES

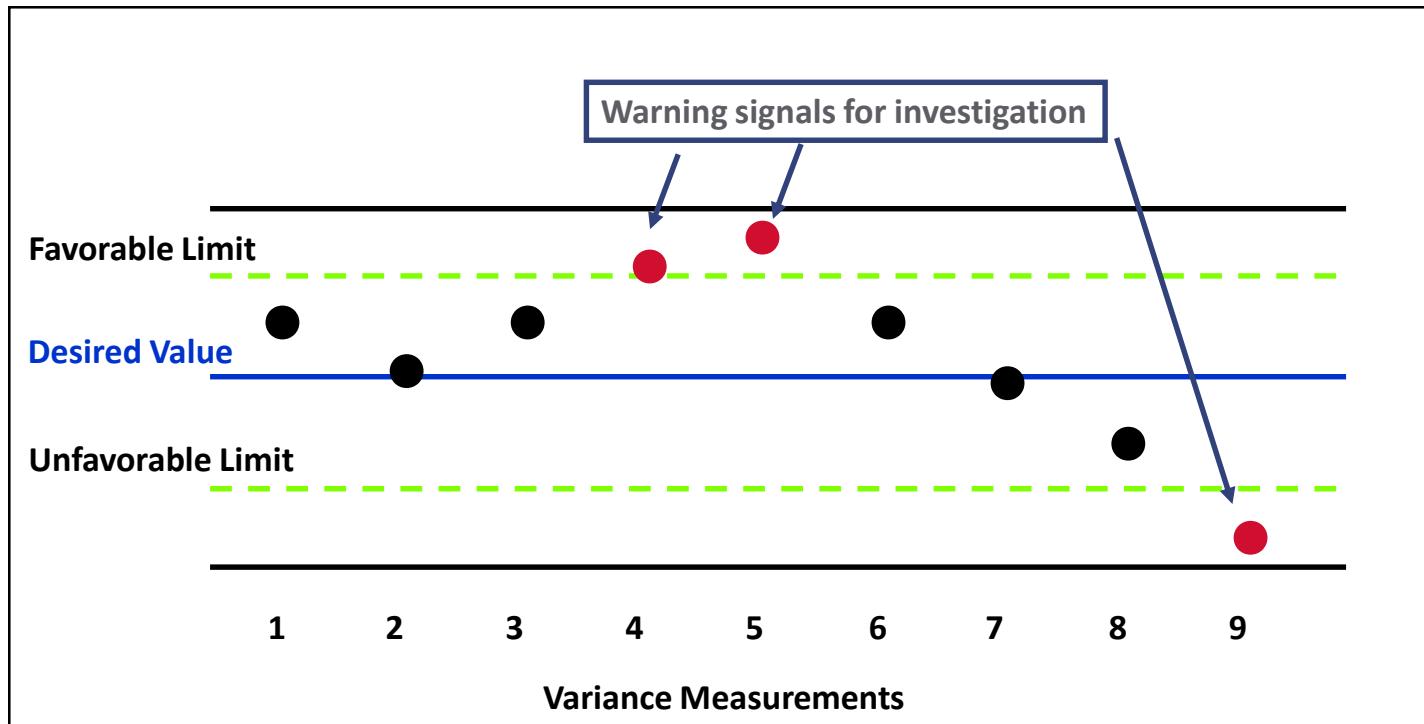
TRENDS

CONTROLLABILITY

FAVORABLE VARIANCES

COSTS AND BENEFITS OF INVESTIGATION

STATISTICAL CONTROL CHART



P10-36

- Wolfe operates a landscaping business and has recently expanded into providing fertilizer services to clients; unfortunately many clients complained.
- In the first year, he had 55 fertilizer clients. Each client got 6 applications and was billed \$40 per application. Details:
 - Two applications were Type 1 and four were Type 2 fertilizer.
 - They purchased 5,000 lbs of Type 1 at \$.53/lb. and 10,000 lbs of Type 2 at \$.40/lb.
 - Actual usage of Type 1 was 3,700 lbs and Type 2 was 7,800 lbs.
 - Labor cost for new employee was \$11.50 /hr (paid premium), logged 165 hrs.
- Standards were established as:
 - DL – 40 min / app at \$9.00 per hour
 - DM – 40 pounds per app at \$.50 / lb Type 1 and \$.42/ lb Type 2.

P10-36

1. Compute DM variances (for both types of fertilizer).
2. Compute DL variances.
3. Compute actual costs per application (unused fertilizer goes into inventory). Was the new service financially successful?
4. Analyze the variances from (1) and (2). Was it a success from an overall cost-control perspective?
Why did customers complain?
5. Should he continue next year in light of complaints?

Prof. Dr. Timo Vogelsang

MANAGERIAL ACCOUNTING (WINTER 2023)



COURSE OVERVIEW

Session	Topic	Hilton / Platt
1	The Changing Role of Managerial Accounting	Chapter 1
	Basic Cost Management Concepts	Chapter 2
2	Product / Job Costing	Chapter 3
	Transfer Pricing	Chapter 13
3	Cost-Volume-Profit Analysis	Chapter 7
	Inventory Costing (Absorption vs. Variable Costing)	Chapter 8
4	Decision-Making: Relevant Costs and Benefits	Chapter 14
	Responsibility Center, Performance Measures & Controls	(Chapter 12/13)
5	Activity-Based Costing	Chapter 5
6	Activity Analysis, Cost Behavior, and Cost Estimation	Chapter 6
	Budgets – Financial Planning and Analysis	Chapter 9
7	Standard Costing and Direct Cost Variances	Chapter 10
8	Signaling Effects of Incentives	
	Sustainability and Controlling	

SIGNALING EFFECTS OF INCENTIVES

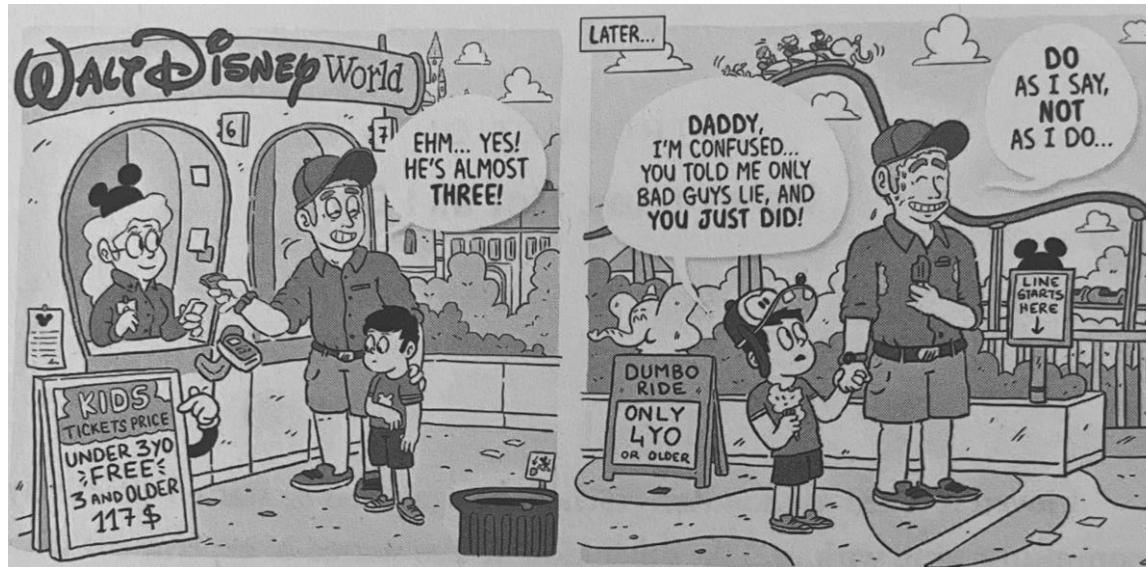
IMAGINE THE FOLLOWING SITUATION:



*50€ for the student with
the best exam!*

What would you think?

SIGNALS ARE EVERYWHERE

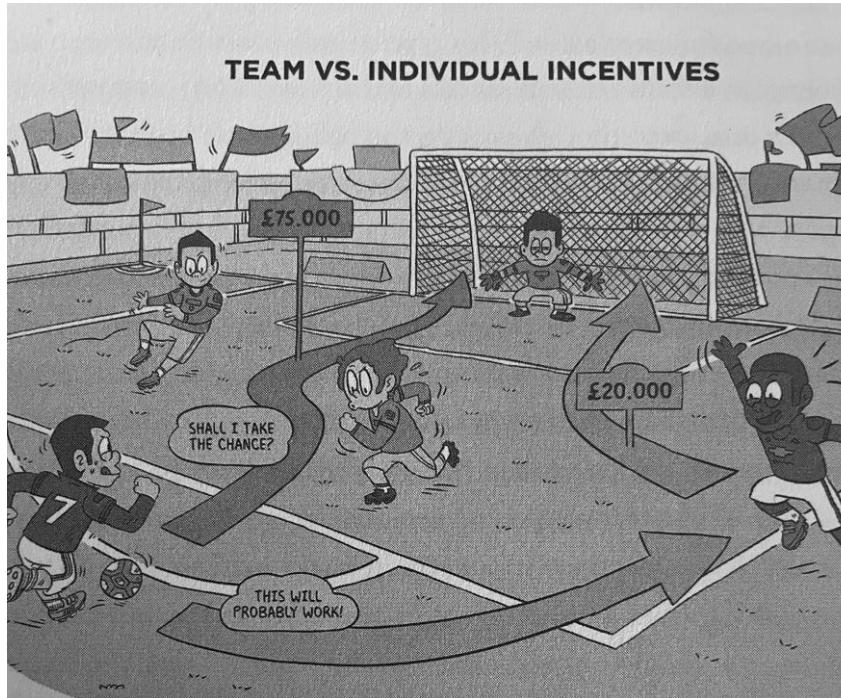


Source: Uri Gneezy "Mixed Signals"

MIXED SIGNALS

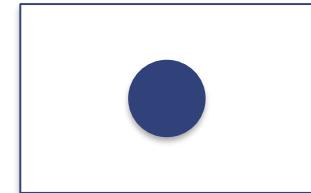
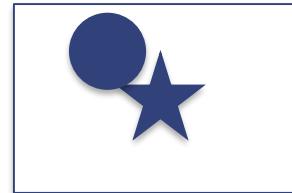
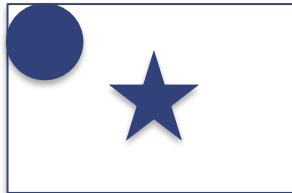
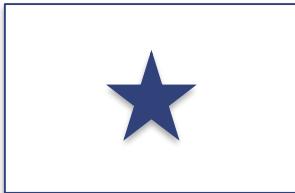
- Incentivizing short-term, but encouraging long-term
 - CEO appointments
 - Short-term bonuses but appointed for long-term success
 - Teacher bonus
 - Based on standardized (short-term) student tests
- Incentivizing individual, but encouraging team
 - Goal bonus for soccer player
 - Alexis Sánchez (ManU 2019) received £75,000 for a goal and only £20,000 for an assist
 - Teammate Pogba received £50,000 for a goal and only £20,000 for an assist
 - Yet, the main goal is winning the game

MIXED SIGNALS



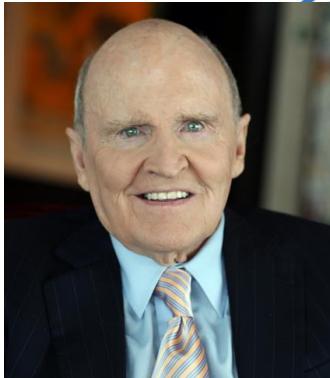
Source: Uri Gneezy "Mixed Signals"

WE ALL HAVE A STORY

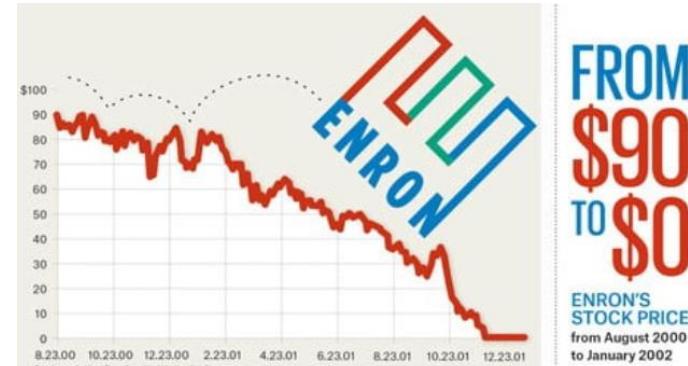


- What is your story?
- Difficulty with incentives:
we are all story tellers and we can interpret a lot in different incentives
- Maybe even well thought through incentives might leave room for interpretation

...AND YOU CAN ALSO PICK A STORY (CONFIRMATION BIAS)



VS.



<https://explified.com/enron-scandal-explained/>



TYPICAL TYPES OF SIGNALS

- Social signaling
 - What do others think about me?
- Self-signaling
 - What do I think about me?

INCENTIVES

- Incentives are neither good nor bad
- It depends on the attached signal
- ...and the story we tell with the signal

EXAMPLE

BLOOD DONATIONS



Hi Mum,
yeah, I am also
donating blood....

Jim



I don't have the
time, I have to
earn money

John

EXAMPLE

BLOOD DONATIONS

- Now the blood bank decides to pay \$50
- This not only affects the blood banks bank account...
- ...it also alters the signal of donating blood



I cannot tell
my mum
anymore...



It pays better
than my other
job!

What problem can result from this?

How can we solve this?

A CASE STUDY (1)

THE ENVIRONMENT

- German retail chain operating 315 grocery stores
- 1-2 apprentices in a store
- Apprentices in the store have the tasks of regular store employees
- They work 40 hours (Monday till Saturday)
- They have 1-2 day of vocational school
- Receive a fix wage of around €800 without any variable component
- They have an annual vacation of 36 days
- Store manager is direct supervisor

APPRENTICES CASE – BONUS PAYMENTS FOR ATTENDANCE



Chief Human
Resources Officer –
South Germany

I think my apprentices are staying at home although not being sick

A different region tried an attendance bonus (for all employees at once) and it seems to work....

?



How to proceed?

APPRENTICES CASE – BONUS PAYMENTS FOR ATTENDANCE

Design the intervention!

CASE: APPRENTICES

THE INTERVENTION

Attendance Bonus

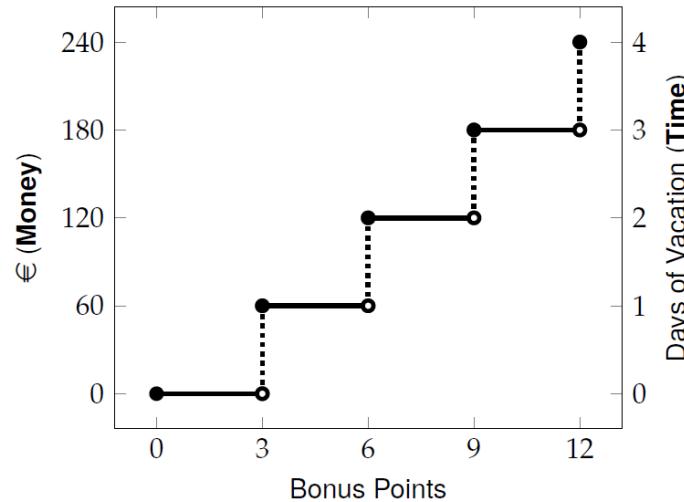
- One point for every month without unplanned absence
- **Three points** correspond to **one unit of bonus**

Money Treatment:

- One unit of bonus is EUR 60
- Maximum bonus of EUR 240 (1/4 of monthly salary)

Time Treatment:

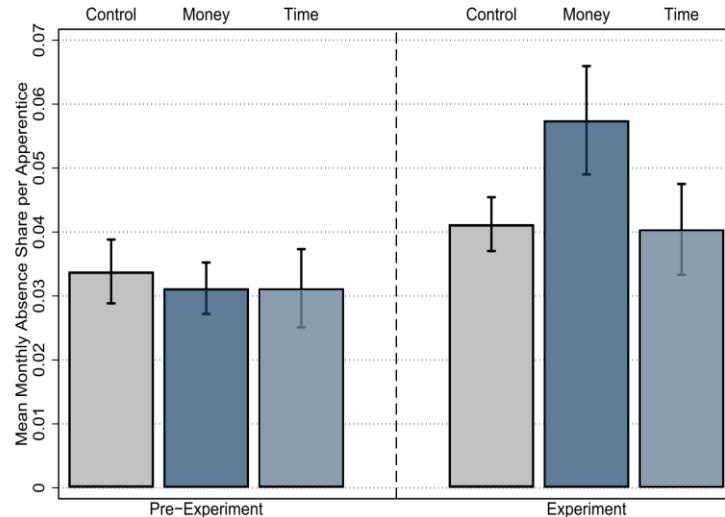
- One unit of bonus is 1 day of vacation
- Maximum bonus of 4 days of vacation



Points (For each month without absence)	Euro Amount	Additional Vacation Days
3	60,-	1
6	120,-	2
9	180,-	3
12	240,-	4

CASE: APPRENTICES

TREATMENT EFFECTS



KEY INSIGHTS:

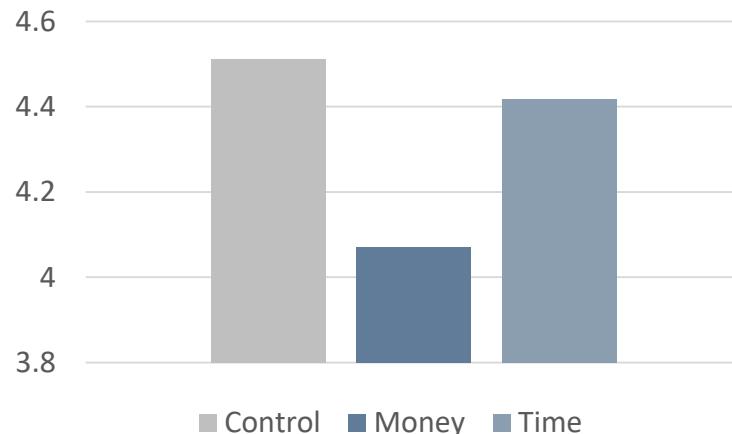
- 1) While prior the pilot (i.e. the experiment) the absence share of apprentices are comparable due to the randomization
- 2) The financial bonus increased absence of apprentices by 50% (although it was intended to decrease absence!)
- 3) The time (vacation) bonus does neither lead to a positive nor a negative effect

APPRENTICES CASE – BONUS PAYMENTS FOR ATTENDANCE

Why? Which signal went wrong?

MECHANISM

Survey: Intrinsic Motivation to Come to Work



With attendance bonus:

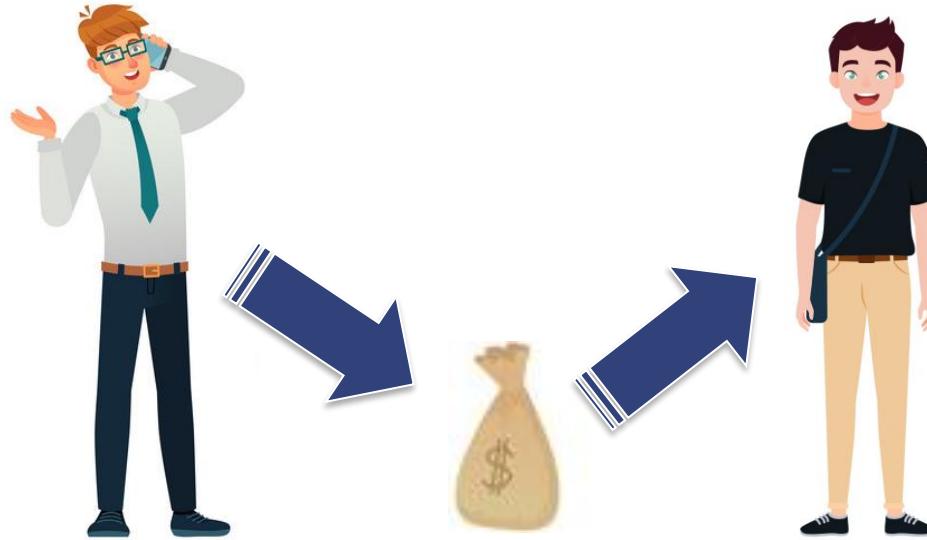
- substantially weaker feeling of obligation to come to work
- weaker guilty conscience when calling in sick when actually being healthy

➤ Lower intrinsic motivation

KEY INSIGHTS:

- 1) The attendance bonus makes apprentices to think that regularly coming to work is extraordinary and worth rewarding
- 2) When updating this (ex-ante unclear) norm they possibly conclude that the costs of coming to work are too high

BONUSES: EMPLOYER – EMPLOYEE RELATIONSHIP



POSSIBLE SIGNALS



Maybe...

- the working task is costly to execute
(Benabou and Tirole 2003, Alfitian et al. 2023)
- it was not expected to execute the task
(Alfitian et al. 2023)
- the KPI is important
(Manthei et al. 2023)
- the KPI might be used for promotion
(Manthei et al. 2023)
- others are behaving differently
(Sliwka 2009)
- forgone Bonus is the worse that can happen
(Gneezy and Rustichini 2001)
- the employer likes to do something good for me
(Vogelsang 2023)

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(*Gneezy and Rustichini 2001*)
- the employer likes to do something good for me
(*Vogelsang 2023*)

A CASE STUDY (2)

THE ENVIRONMENT

- German retail chain (discount supermarket)
- Germany is divided in different regions with independent regional manager
 - Each sales territory manager has 6-8 district managers
 - Each district manager has 6-8 store managers
 - Each store manager has approx. 7 FTEs
- Gross monthly wage store manager: €3000 | Gross monthly wage district manager: €6000
- Only small additional bonus
- 5% of store managers are promoted to district managers (and all district managers are former store managers)

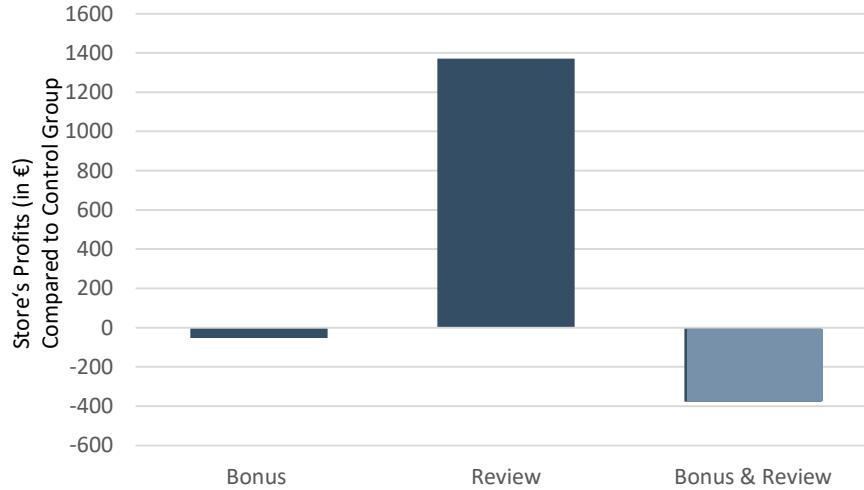
THE INTERVENTION

- Pilot with store managers of a discount retailing organization
- Random allocation of four treatments (all receive product margin information):
 - 1) **Control Group:** only Information
 - 2) **Bonus:** Financial bonus for increases in simplified profits
 - 3) **Performance Review:** Supervisor (district manager) conversations about profits (biweekly)
 - Conversation Guideline: What done to increase profits? What were problems? What are next steps?
 - 4) **Bonus and Performance Reviews:** A combination of 2) and 3)

	Bonus	No Bonus
Performance Review	63 store managers	51 store managers
No Performance Review	50 store managers	60 store managers

TREATMENT EFFECTS

Changes in Store Profits Compared to the Control Group



All receive additional information on new KPI

KEY INSIGHTS:

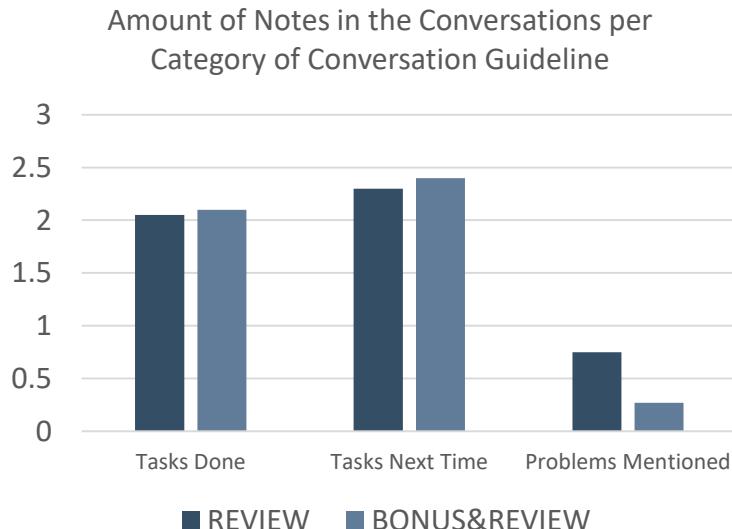
- 1) Performance Reviews increase profits by approx. 7% (highly statistically significant)
- 2) This positive effect completely vanishes when performance reviews are implemented together with a financial bonus (Bonus&Review)

SUPERMARKET CASE – BONUS PAYMENTS AND REVIEWS

Why? Which signal went wrong?

CASE: TALKING

MECHANISM

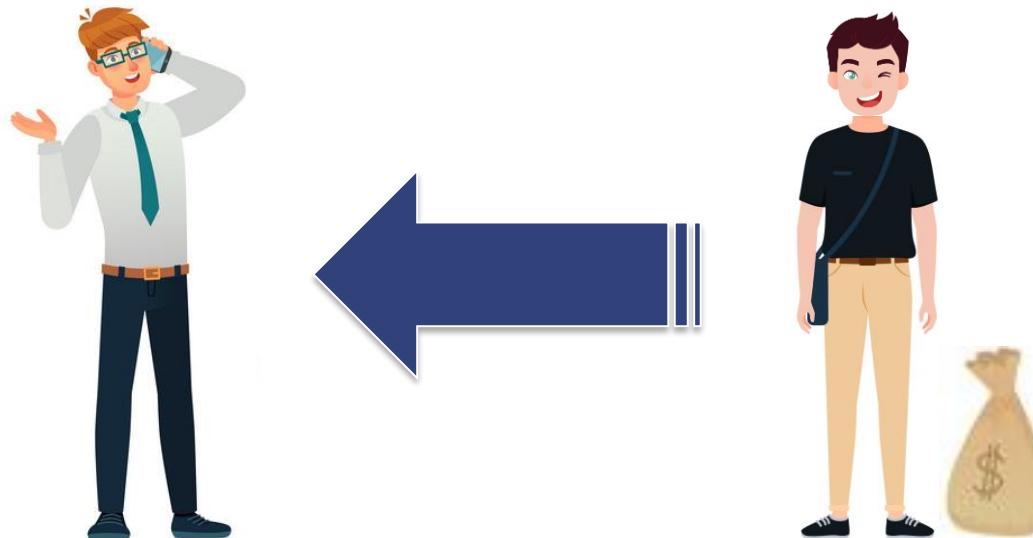


- Key difference “problems” and “tasks done/planned”: Reporting a problem leads to a stronger involvement of the supervisor
- The bonus thus shifted the nature of conversations towards stronger self-reliance
- „If I mention a problem (ask for help) and also receive a bonus this shows my supervisor that I cannot work on my own“

KEY INSIGHTS:

- 1) The detrimental effect of the financial bonus results from a change in the nature of the review conversations
- 2) With a financial bonus, store managers are less open to talk about problems with their supervisors (this can be interpreted in a way that they are less willing to ask for help)

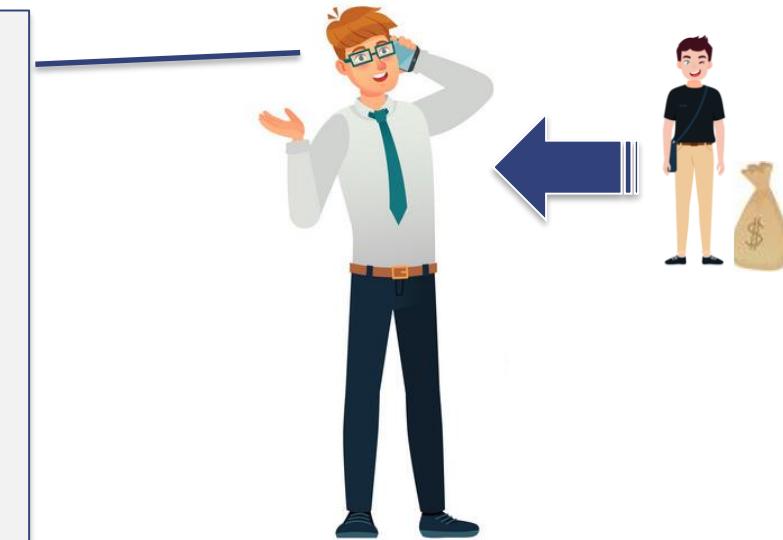
BONUSES: EMPLOYEE – EMPLOYER RELATIONSHIP



BONUSES: EMPLOYEE – EMPLOYER RELATIONSHIP

Maybe...

- he does only care about money
(*Benabou and Tirole 2006, Manthei et al. 2023*)
- he needs money (has money problems)
- ...

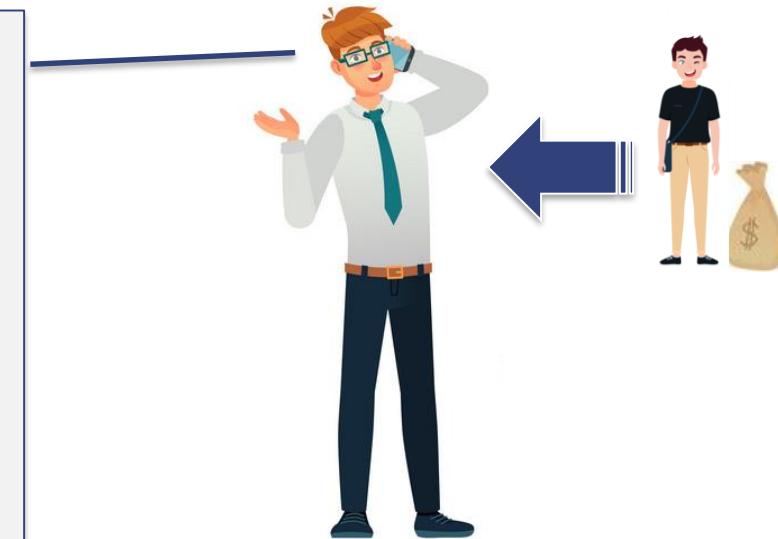


BONUSES: EMPLOYEE – EMPLOYER RELATIONSHIP

Maybe...

- he does only care about money
(*Benabou and Tirole 2006, Manthei et al. 2023*)
- he needs money (has money problems)
- ...

Employee: “If I fear that my supervisor would think about me as someone who is motivated by extrinsic rewards I might be better off in the long run if I decrease my performance and signal that I am rather intrinsically than extrinsically motivated”

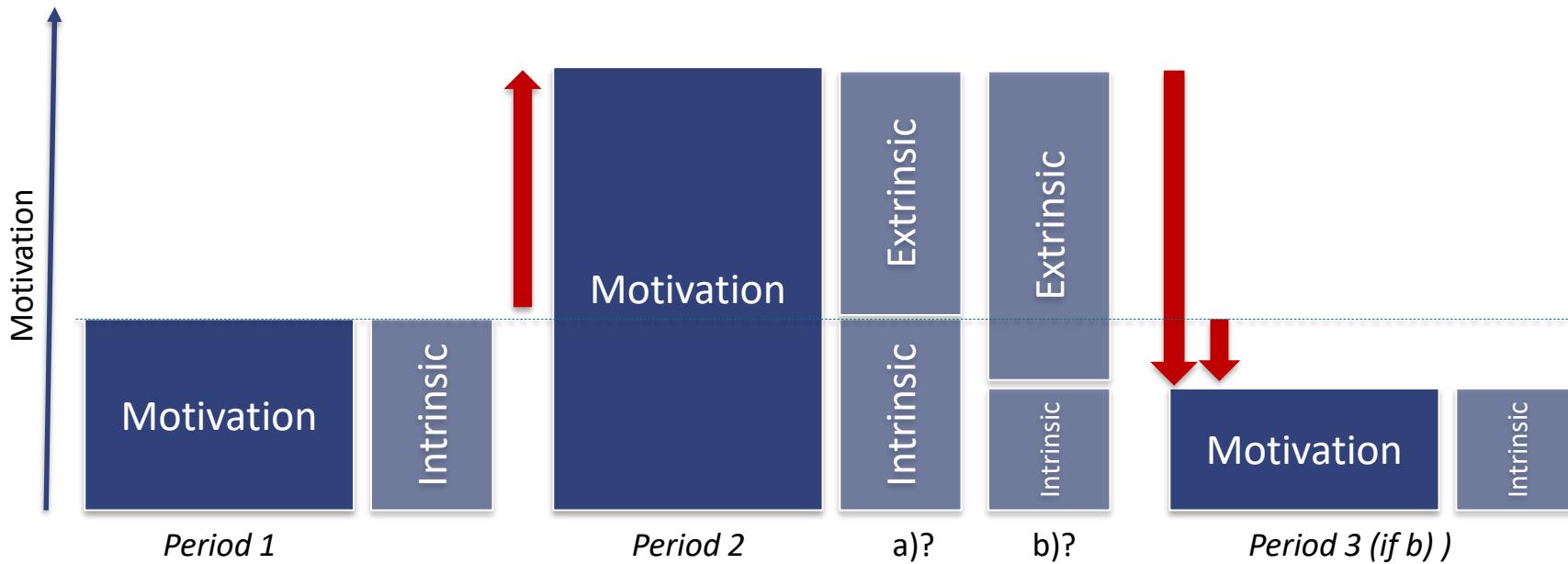


MOTIVATION CROWDING-OUT

- The described effects are commonly referred to as motivation crowding-out (or backfiring)
- Crowding-out can happen immediately in the incentivized period (as described)
- But it can also first happen AFTER the incentivized period
- A classical paper is Deci et al. 1971:
 - *Period 1:* Control Group = no incentive Treatment Group = no incentive
 - *Period 2:* Control Group = no incentive Treatment Group = **incentive**
 - *Period 3:* Control Group = no incentive Treatment Group = no incentive

THE LONG RUN

MOTIVATION CROWDING-OUT



SUSTAINABILITY AND CONTROLLING

SHOULD MANAGERS DO EVERYTHING TO MAXIMIZE SHAREHOLDER WEALTH?



SHOULD MANAGERS DO EVERYTHING TO MAXIMIZE SHAREHOLDER WEALTH?

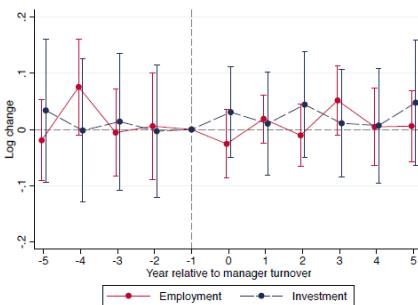
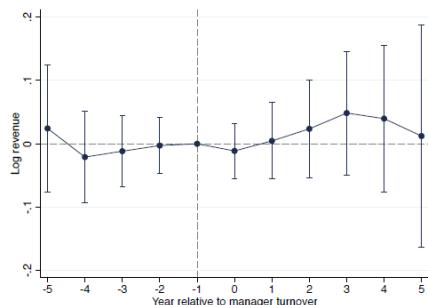
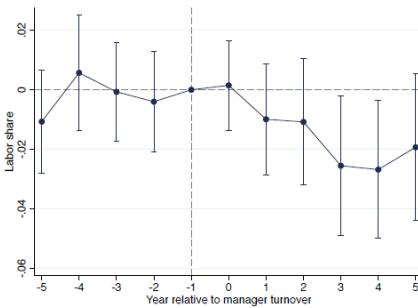
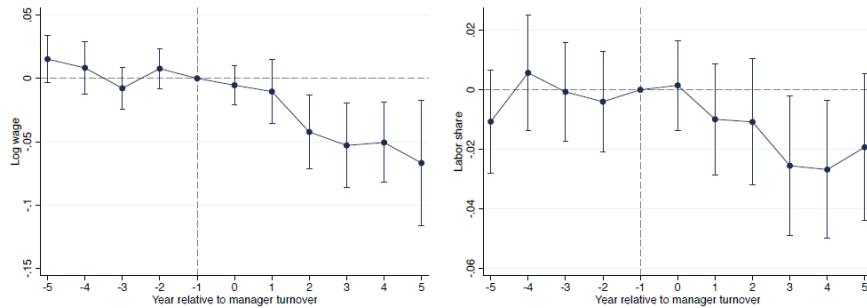
“There is one and only one social responsibility of business – to...increase its profits”

Milton Friedman, Nobel Laureate in Economics



SUSTAINABILITY

ACEMOGLU ET AL. 2022: ECLIPSE OF RENT-SHARING: THE EFFECTS OF MANAGERS' BUSINESS EDUCATION ON WAGES AND THE LABOR SHARE IN THE US AND DENMARK



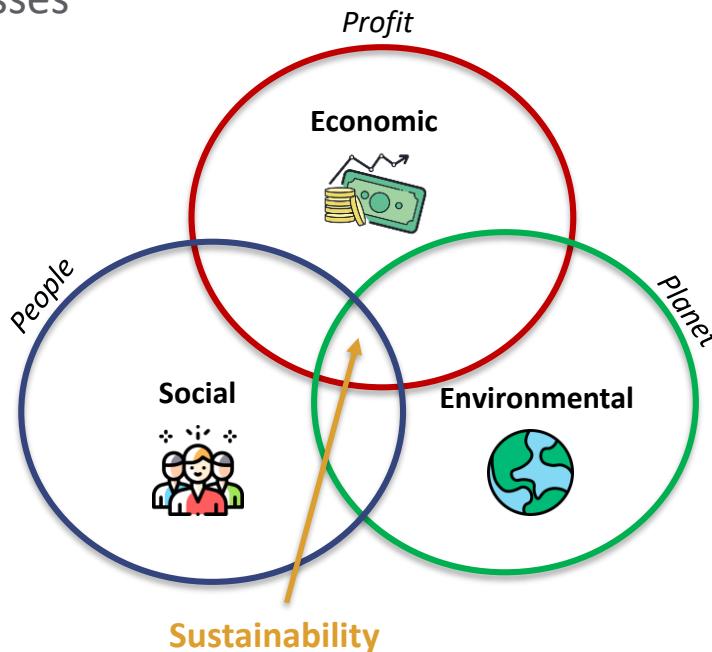
This figure plots event-study estimates and 95% confidence intervals, where events are manager transitions from a non-business manager to a business manager in the US. The sample includes firms that have non-business managers in all years, and firms that have one non-business to business manager transition event during the sample period. Panel (a) uses worker-level data and the matching estimator is described in Section 3. Panels (b), (c), and (d) use firm-level data and include firm fixed effects, industry \times year fixed effects, state \times year fixed effects, and initial size quintile by year fixed effects. Firm-level regressions are weighted by employment. The dependent variables are log hourly wage and log annual income in Panel (a), the labor share in Panel (b), log sales in Panel (c), and log employment and log capital expenditure in Panel (d). The labor share is defined as total wage bill divided by sales. Investment rate is calculated from the Compustat data. All standard errors are clustered at the firm level.

„Within five years of the appointment of a business manager [MBA graduate from a business school] , wages decline by 6% and the labor share by 5 percentage points in the US, and by 3% and 3 percentage points in Denmark.“

SUSTAINABILITY: APPROACHES (1)

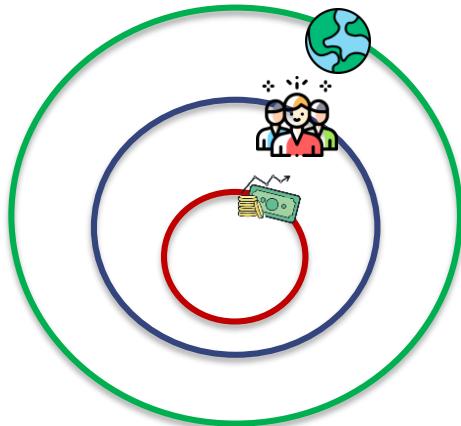
TRIPLE BOTTOM LINE

- John Elkington (1997)
- Sustainability + Businesses



SUSTAINABILITY: APPROACHES (1)

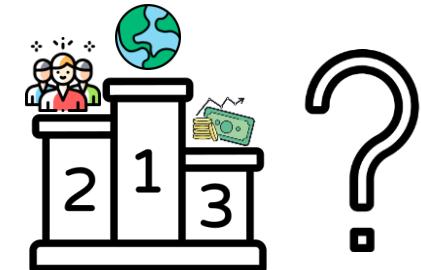
TRIPLE BOTTOM LINE



- Without environment, no society
- Without society, no economy



To achieve sustainability we have to comply with social and environmental conditions



This does NOT mean that businesses have to put financial gains last!

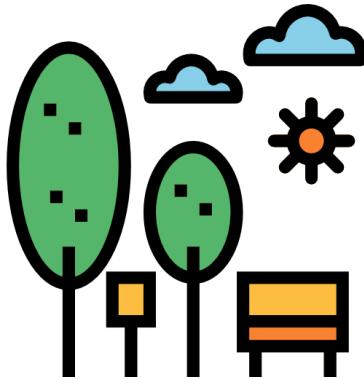
BUT: Economic decisions are part of a strategy to make more money while getting closer to social and ecological sustainability

SUSTAINABILITY: APPROACHES (1)

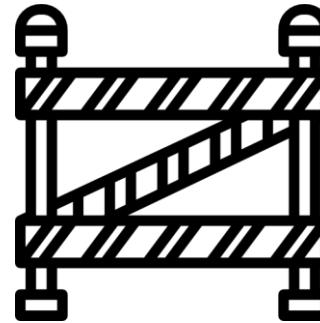
WHY CARE ABOUT ENVIRONMENT AS A COMPANY?



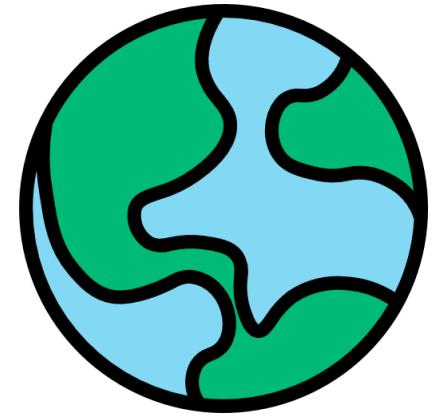
Interest of internal & external stakeholders



Environmental costs can be huge



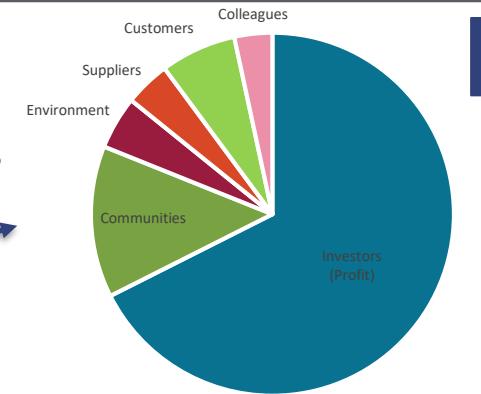
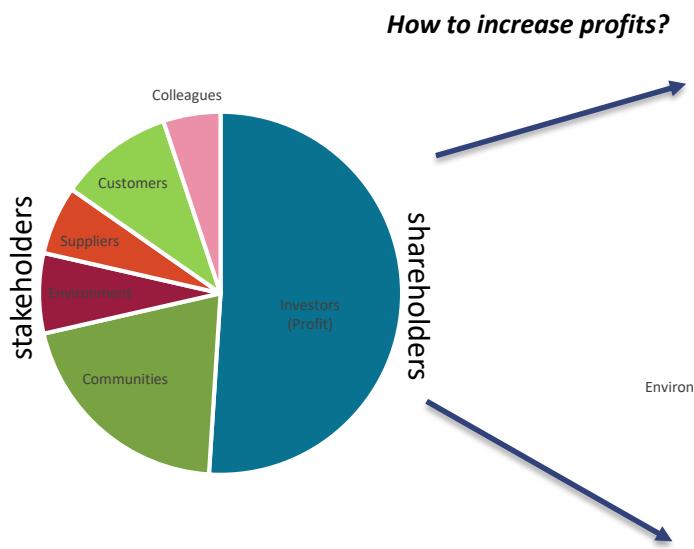
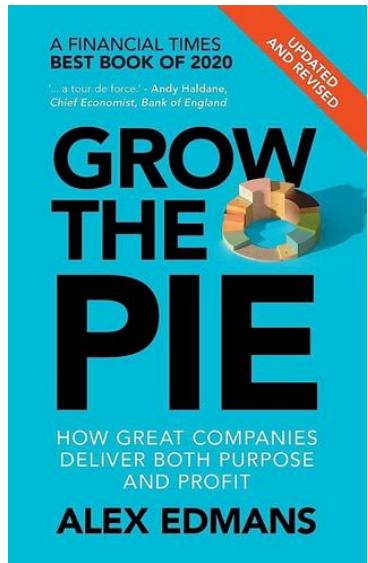
More and more regulations



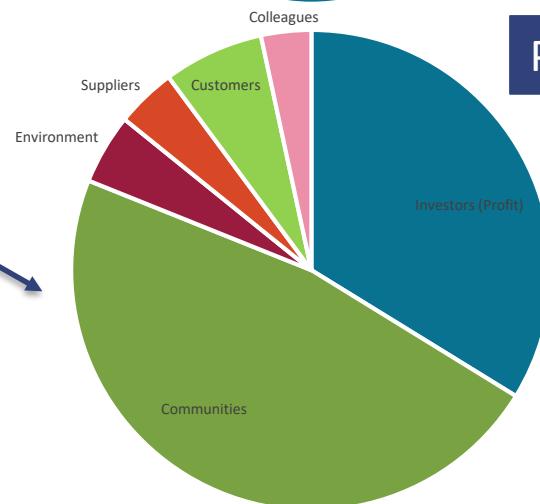
Society becomes more environmentally aware

SUSTAINABILITY: APPROACHES (2)

GROWING THE PIE



Pie-Splitting



Pie-Growing

SUSTAINABILITY: APPROACHES (2)

GROWING THE PIE

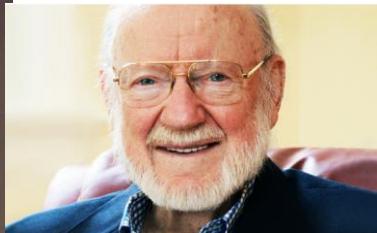


- 1978: William Campbell (scientist at Merck) discovered that a specific drug would also cure onchocerciasis (river blindness)
- 18 million people were infected, 100 million more at risk, 34 developing countries. Some complete villages were infected (by the age of 15 and went blind by 30)
- BUT: \$2 mio. to set up distribution channel + \$20 mio. per year to produce
- AND: Neither the people nor their governments could pay for it

Roy Vagelos (CEO)



William Campbell



SUSTAINABILITY: APPROACHES (2)

RIVER BLINDNESS



<https://www.merck.com/stories/mectizan/>

SUSTAINABILITY: APPROACHES (2)

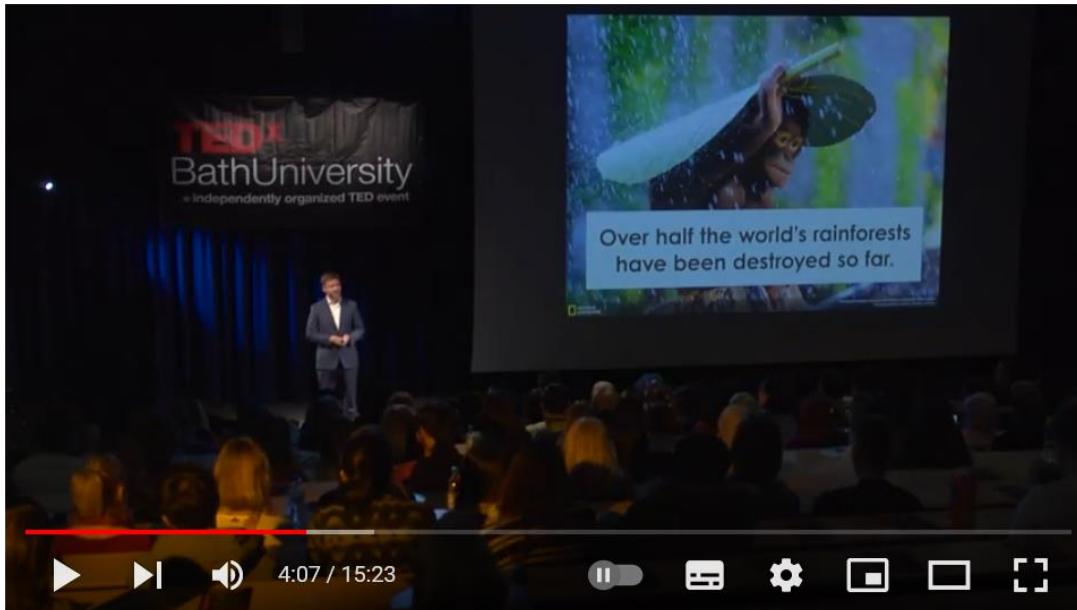
GROWING THE PIE



- 21st of October 1987: Roy Vagelos announced that he would give Mectizan for free
- Established the Mectizan Donation Program (MDP)
- Huge impact!
- + the decision (although against immediate profits) **grew the pie**
 - Most of the pie increases went to the countries, communities and citizens
 - But MDP grew Mercks reputation
 - This attracted both investors and stakeholders
 - Roy reports that many shareholder explicitly stated that they joined Merck because of MDP
- Now: Merck is one of the biggest pharmaceutical companies (worth > \$200bio.)



OK, BUT ... WHY THE MANAGERIAL ACCOUNTANTS?



Can a new way of accounting save our planet? | Richard Mattison |
TEDxBathUniversity

OK, BUT ... WHY THE MANAGERIAL ACCOUNTANTS?

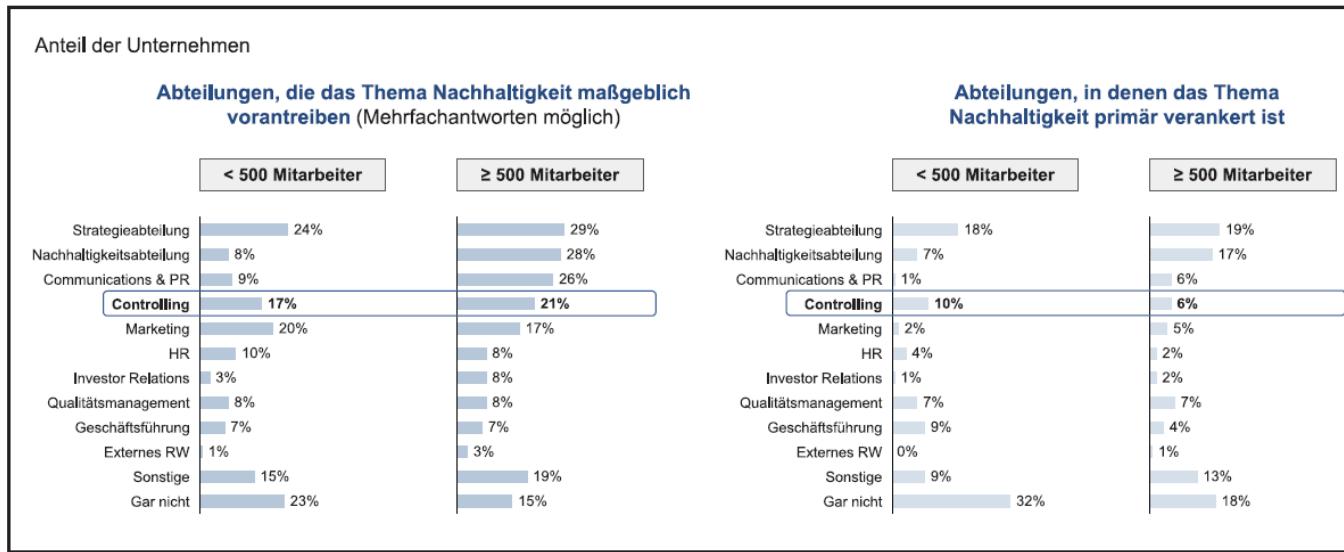


Abb. 2: Organisatorische Verankerung des Nachhaltigkeitsgedankens

SUSTAINABILITY

BALANCED SCORE CARD 2.0

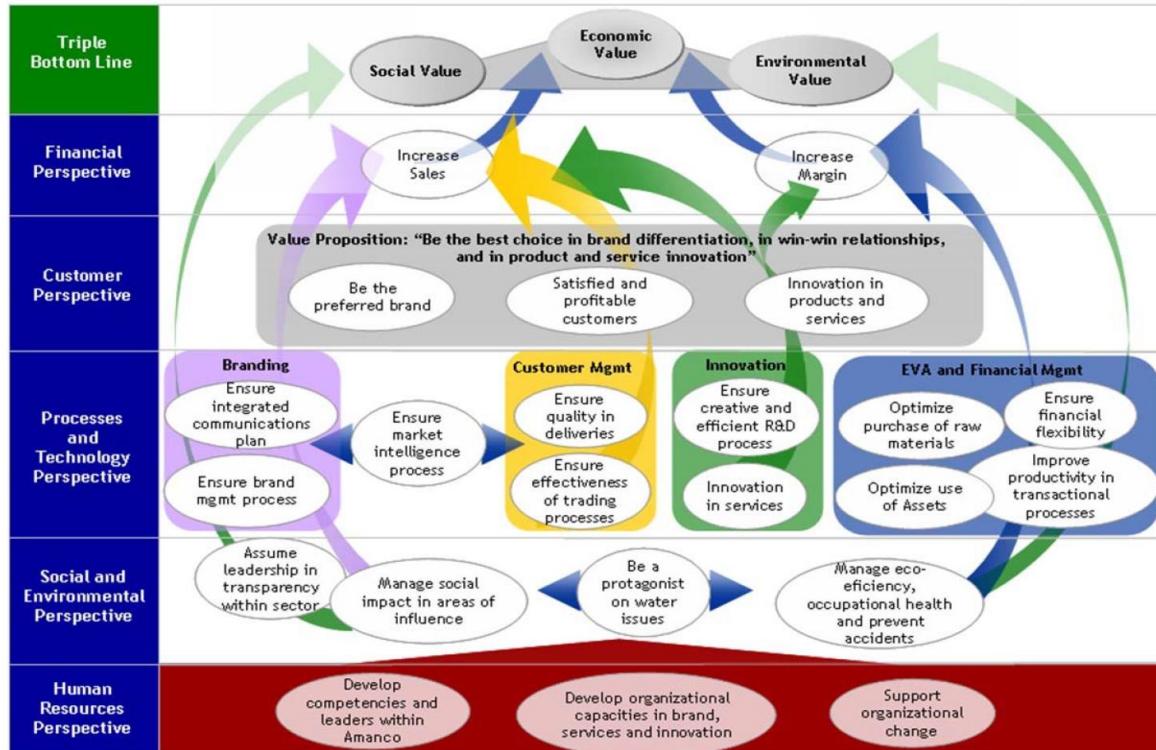


Figure 2: Amanco's strategy map for triple bottom line performance

CASE: CAR PRODUCTION (ILLUSTRATIVE)

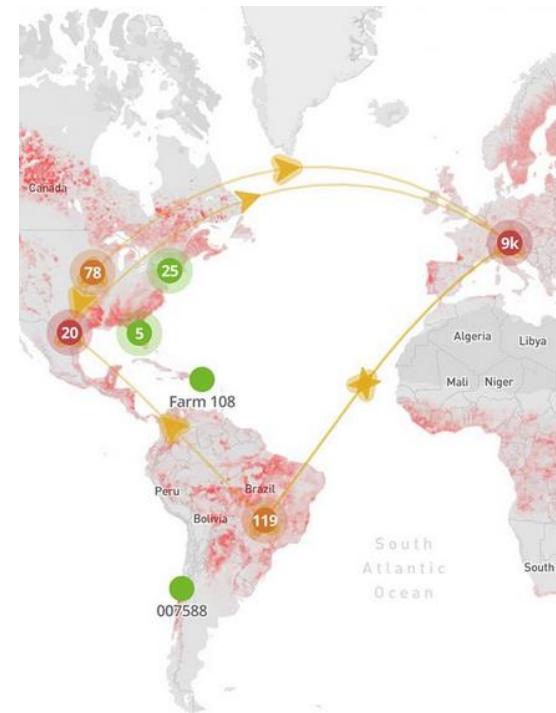


- BMW produces cars in Germany
- But the material needed comes from around the world

Design a measure for the **cost** of
the product that incorporates
sustainability aspects!

Design a measure for the **benefit**
of the product that incorporates
sustainability aspects!

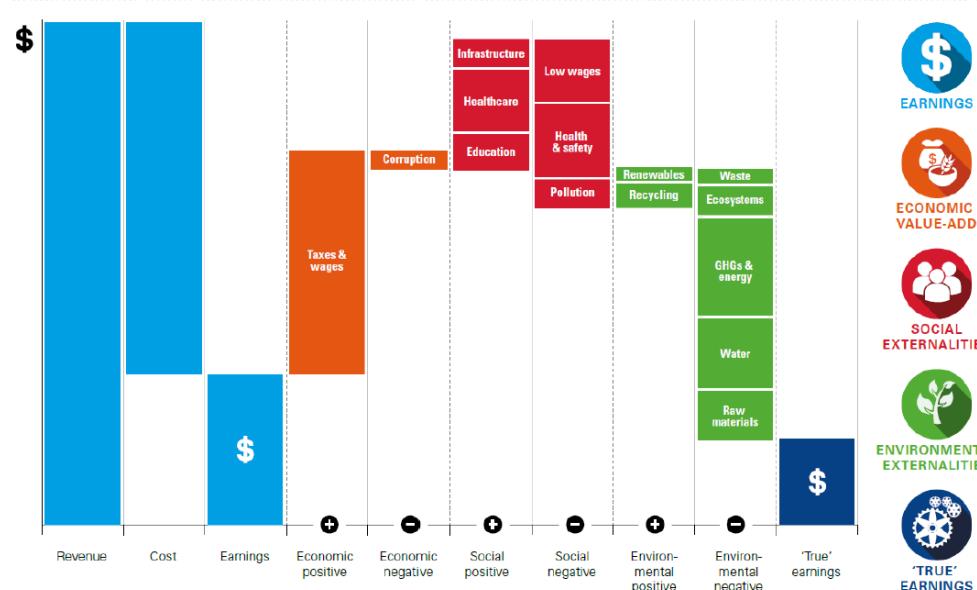
Supply Chain



PRICING & COSTING – FULL COST ACCOUNTING

KPMG True Value

Figure 14 / 'True' earnings bridge for gold mine in South Africa



PRICING & COSTING – FULL COST ACCOUNTING

PWC Total Impact

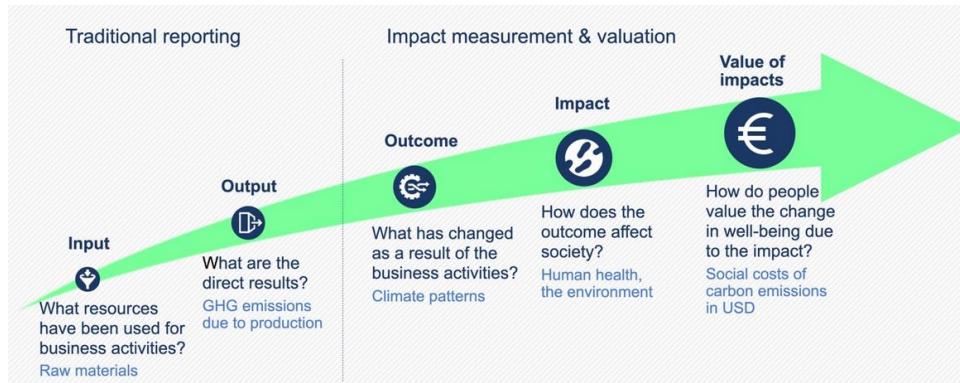


SUSTAINABILITY

VALUE BALANCING ALLIANCE



“We are an alliance of multinational companies coming together with a common goal: to create a way of measuring and comparing the value of contributions made by businesses to society, the economy, and the environment – a metric not previously reflected in a company's balance sheet. **The Alliance translates environmental and social impacts into comparable financial data.** Our members test the methodology to ensure feasibility, robustness, and relevance.”

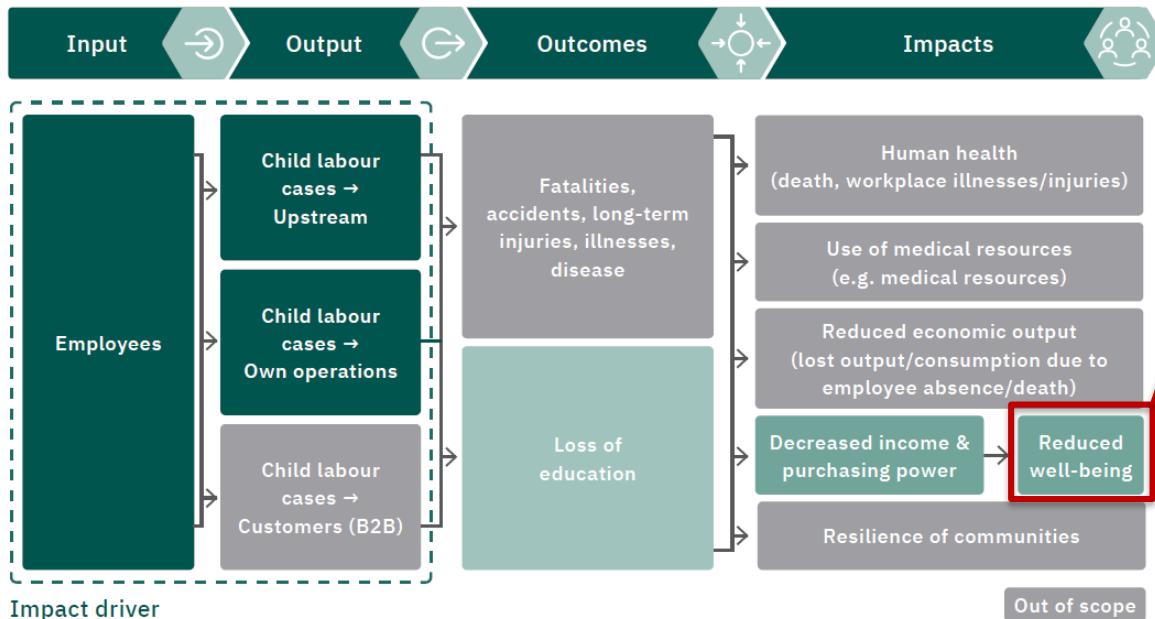


SUSTAINABILITY

VALUE BALANCING ALLIANCE



EXAMPLE: CHILD LABOR



Calculation to derive here is complex and relies on my assumptions....

<https://www.value-balancing.com/en/downloads.html>

But maybe it is the only way....

DISCUSS

Is this the right way? Trying to
quantify everything?

GREENHOUSE GAS EMISSIONS

- Social impact of one ton of CO₂
 - 50\$ (Environmental Defense Fund 2023)
 - 201€ (Umweltbundesamt 2023)
- VBA:

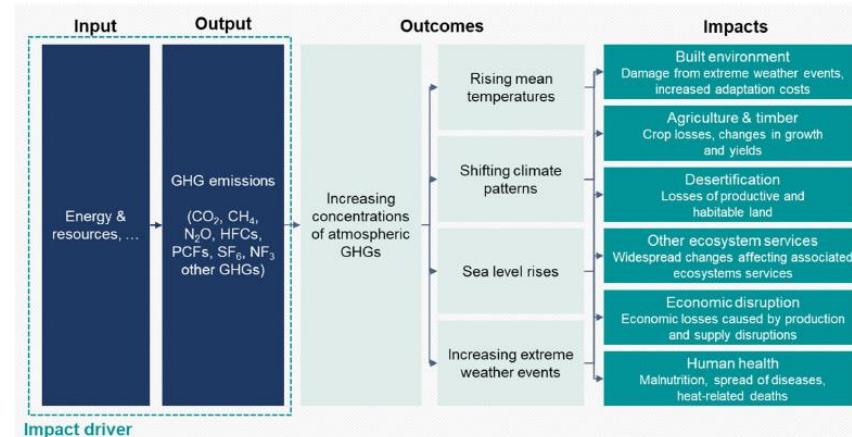
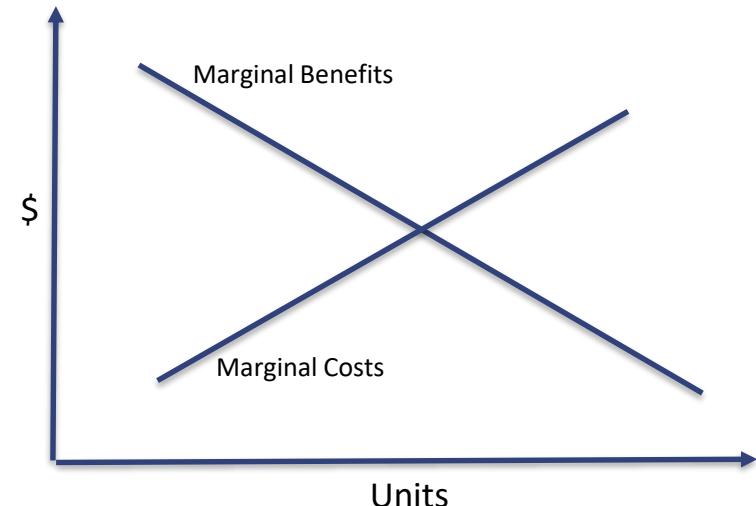


Figure 1: Simplified impact pathway GHGs

GREENHOUSE GAS EMISSION REDUCTION: THE TRADE-OFF

- Top managers usually have financial incentives to increase profits
- These days, managers are also getting financial incentives for, e.g., CO₂ reduction
- This trade-off is very often topic in discussions
- How should they decide?



EU TAXONOMY?

- Yes, the EU is doing a lot in terms of regulation
- ...but we are unable to cover this here

WHAT ARE THE NEW AND EXCITING FIELD IN MANAGERIAL ACCOUNTING?

- Incentives
 - How to add new incentives?
 - How to incentivize potentially intrinsically motivated behavior?
- Optimal Design of Dashboards
 - More KPIs may lead to information overload
- Other Management Controls
 - Do we need new control systems in organizations?
- Product Costing
 - Should we include external costs in our product costs?
- Cost Estimation
 - How do we estimate external costs

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Great topics for bachelor theses ! 😊