Lecture 05
Corp. Finance
Managerial Cost and Budgeting

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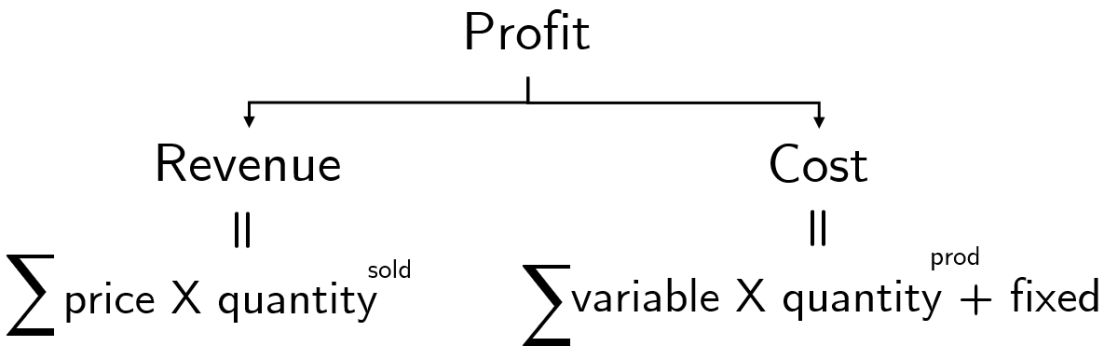
Outline

source: General references [Cha16, LZ11, SCJ10, MG06, Gri12]

Why engineer must care about costing?

Profit = Revenue - Cost



Concern

- **What are 'Fix'?:** various sources, i.e., sale, mkt, executive → mostly difficult
- **Uncertain Revenue:** quality^{sold} $\propto$ mkt, price taker → mostly external
- **Controllable Cost:** decide quality^{prod}, manage fixed cost → mostly internal

Financial Vs Managerial Accounting

	Financial Accounting	Management Accounting
Purpose	Communication of financial position	Decision making
Requirement	Mandatory	Optional
Primary Audience	External	Internal
	Investors, Regulators, Tax authorities, etc.	Management & decision makers
Regulation/guidelines	GAAP, IFRS, IAS	None
Frequency	Quarterly, Annual or per period	As needed and ongoing
External review	Auditors, Regulators	None
Focus	Past transaction	Information to aid decisions for the future
Scope	Company wide	Narrow per segment, product, etc. as needed.

- **Financial Accounting:** standardizing regularly statement, required auditing
- **Managerial Accounting:** internal operation report and prediction within a company, no regulation

Basic concept in financial accounting

- **Conservative measurement:** business activities with conservative → money, no quantity
- **Dual aspect:** every transaction → gain & lose of benefit
- **Full Disclosure Principle:** all relevant information must be noted → footnote

$$\text{Asset} = \text{Equity} + \text{Liability}$$

- **Asset:** What you own, e.g., cash, IOU, RM, FG, land, machine, building
- **Equity:** What you stake, e.g., profit/lost, share,
- **Liability:** What you borrow, e.g., bank loan, bond, credit card

Basic account entries

Mr.Smith decided to open a semi-automatic car washing company in Atlanta with two groups of customers: retailer customers who pay cash and corporate ones who have 2 month credit. After put aside $50,000 of his own money for initial investment, he kept transactions as follows:

- 03/01 purchase land for $40,0000
- 03/01 purchase business supply in credit for $3,750
- 31/01 total retail monthly earing for $2,500
- 31/01 total cooperate monthly earing for $1,000
- 31/01 pay monthly operation expense $1,100
- 28/02 total retail monthly earing for $2,000
- 28/02 total cooperate monthly earing for $1,000
- 28/02 pay monthly operation expense $900
- 28/02 partial pay supplier for $1,000
- 01/03 sold half of land for $22,000
- 05/03 remodel his home $30,000
- 30/03 total retail monthly earing for $2,500
- 30/03 total cooperate monthly earing for $1,000
- 31/03 collect money from cooperate for $1,000 (Jan)
- 31/03 pay operation expense $1,000
- 31/03 give dividend $2,100 to shareholder

How Mr.Smith records these transactions and do financial accouting ?

Basic account entries

Asset

• cash	11,500
retail rev.	+2,500
expense	-1,000
cooperate	+1,000
land	22,000
	36,000
• acct receivable	2,000
	-1,000
	+1,000
	2,000
• business supply	3,750
• land	40,000
	-20,000
	20,000

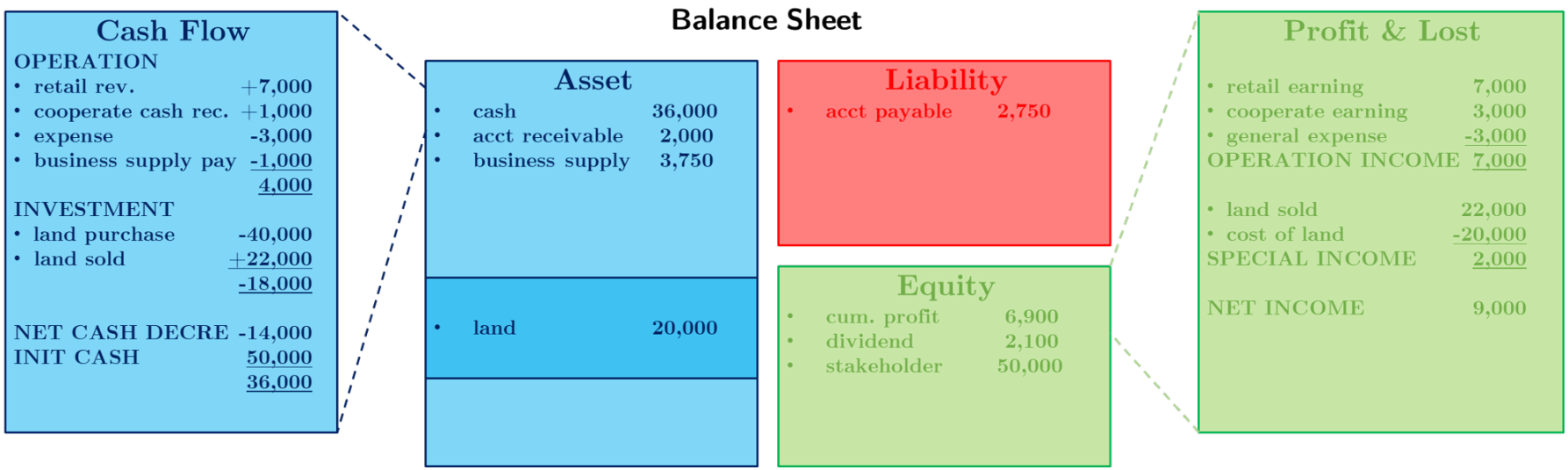
Liability

• acct payable	2,750

Equity

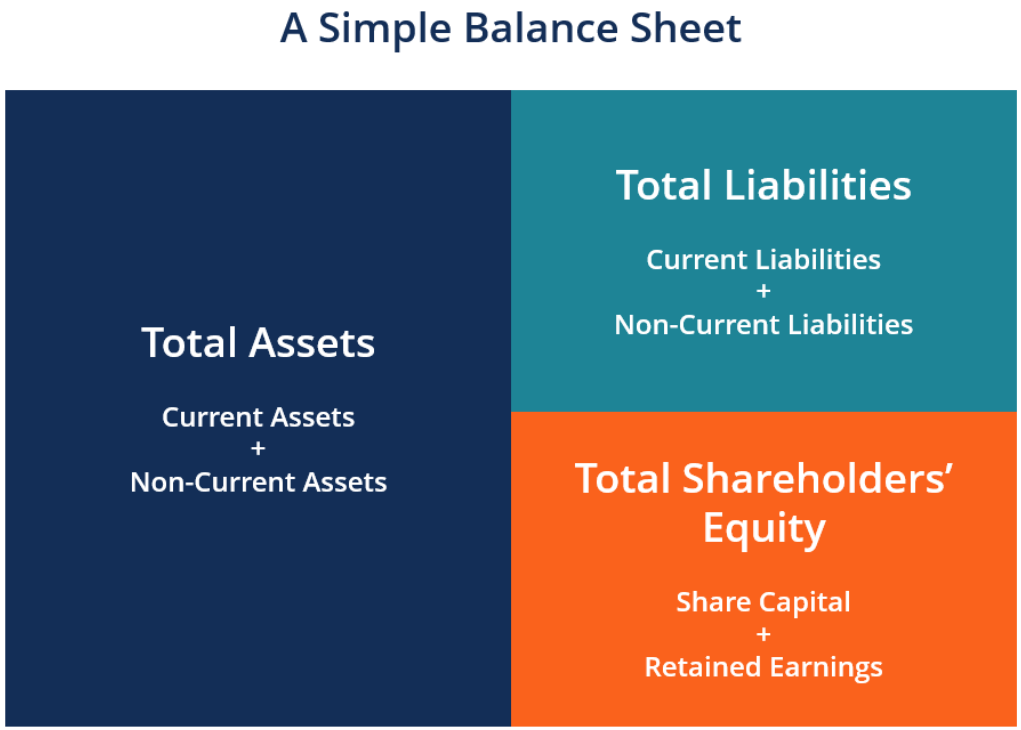
• cum. profit	6,900
• dividend	2,100
• stakeholder	50,000

Three Financial reports



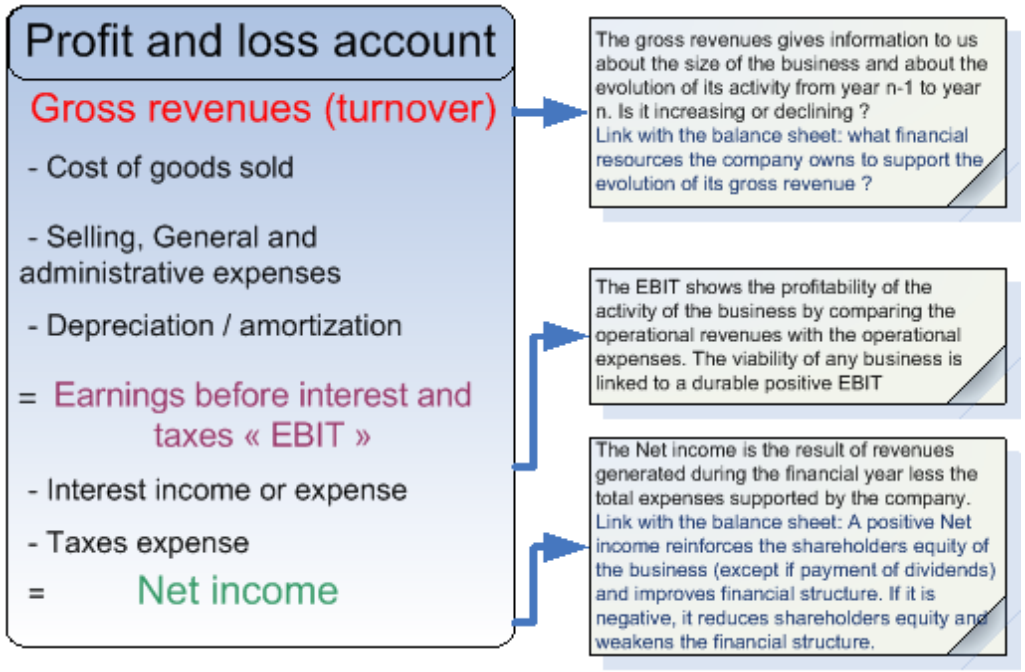
- **Balance Sheet (BS):** snap short of assets → form & quantity
- **Profit & Loss (P&L):** revenue in core business + depreciation → margin
- **Cash Flow (SC):** activities of cash and taxes → liquidity of business

Balance Sheet



- **Current:** can liquidated within 1 year, i.e., cash, inventory, listed cooperate share
- **Non-Current:** cannot liquidated within 1 year, i.e. building, land, bond
- **Fixed Asset:** larger category of non-current asset, including intangible,

Profit and Loss/ Income Stagement



- **Gross Profit:** profit before considering admin, market, general
- **Operating Profit:** profit after considering admin, market, general
- **EBITDA:** profits before considering investment, tax, depreciation, amortization
- **Net Profit:** after pay for everything $\rightarrow$ equality (BS)

Statement of Cash flow

For the *Four Months* Ended April 30, 2017

Operating Activities	
Net income	$ 300
Increase in inventory	(200)
Increase in supplies	(150)
Increase in Accounts payable	150
Cash provided (used) in operating activities	100
Investing Activities	0
Financing Activities	
Investment by owner	2,000
Net increase in cash	2,100
Cash at the beginning of the month	0
Cash at April 30, 2017	$2,100

- **Operation:** cash in/out from main operation activity
- **Investment:** cash in/out from investment and special activity
- **Financial:** cash in/out from bank, including dividend

Notes on Financial Statements

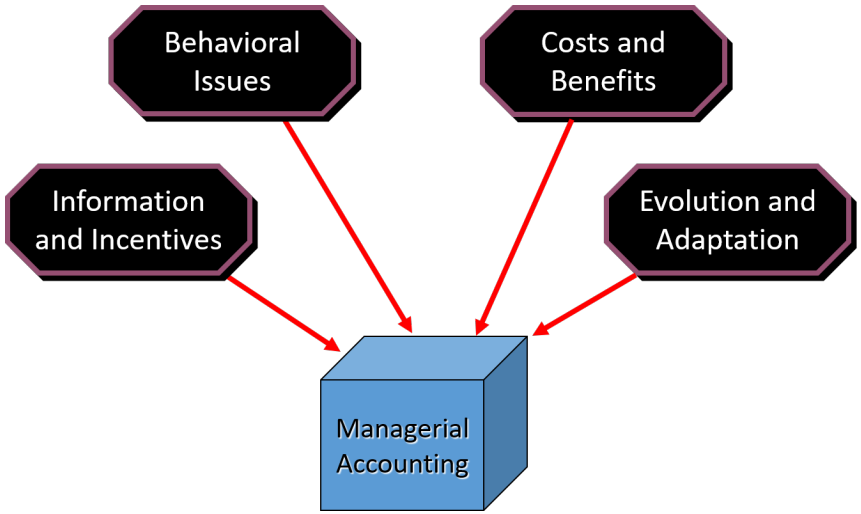
- **Require all, Equally important:** each statement has its own purpose.
- **Aware of practice:** special revenue/expense, inventory at cost/market, deprecation
- **understand business:** compare with similar business, ratio analysis

Where to look?

- **Validation:** over-valuation, non-current asset, unusual inventory
- **Collectability:** debt & credit collectable? $\rightarrow$ low margin

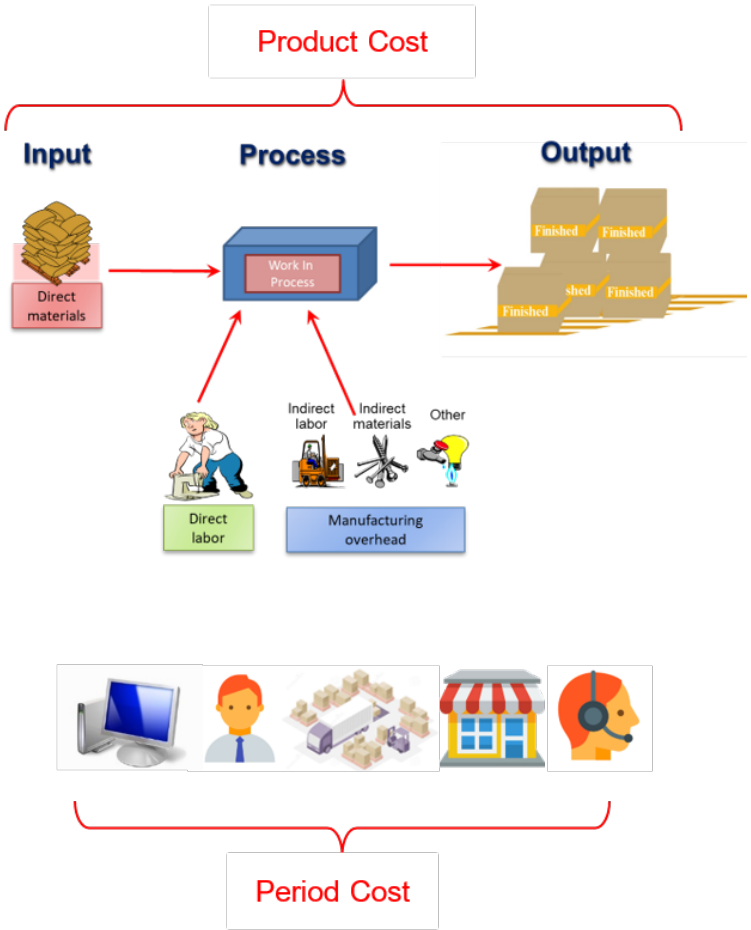
What is Managerial Accounting?

- **What:** internal [past] accounting information for a better decision and control



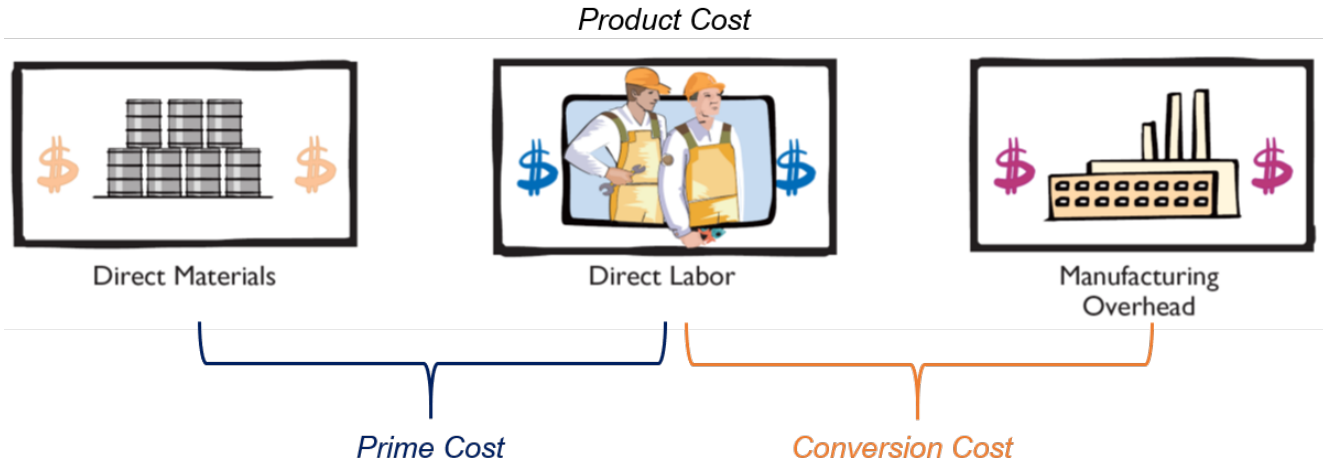
- **Important Concept:** cost classification (nature), budgeting (plan), break-even point (analysis), cost allocation/relationship between cost & activity (driver, e.g, ABC), variance (control)

Cost Classification



- **Function:** R&D, Production, Marketing, Distribution
- **Elements:** Direct Material (DM), Direct Labor (DL), Factory Overhead (FOH)
- **Assigning:** Direct cost and Indirect cost
- **Behavior:** Variable cost and Fixed cost
- **Aggregate or Average:** Total cost and Unit cost
- **Asset or Expense:** Product cost and Period cost

Important Definitions



Direct Material traceable and constant qty of materials

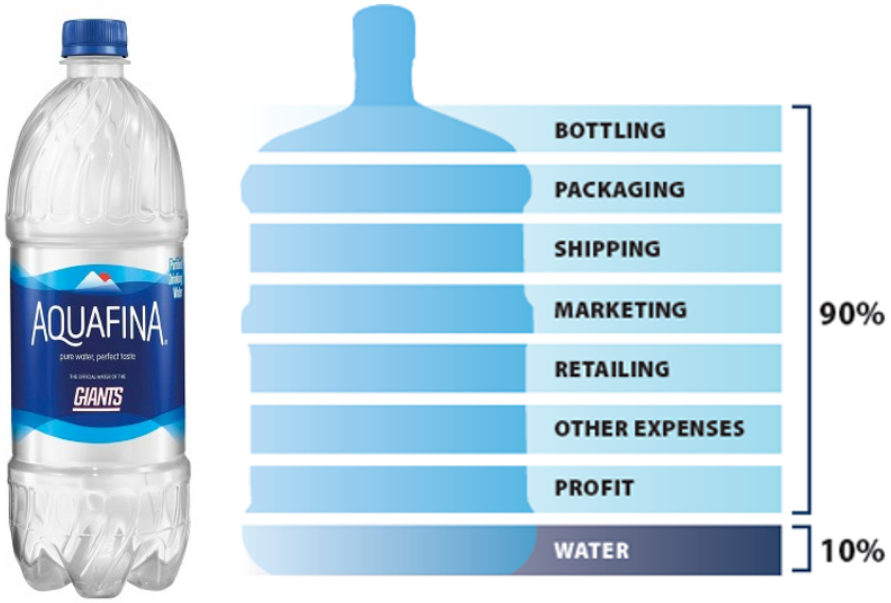
Direct Labor traceable and constant hour of labor

Factory Overhead indirect and difficult to trace resources

- **Indirect Material:** other used materials in factory, e.g., pen, packaging, spar part
- **Indirect Labor:** other used labors in factory, e.g., manager, transporter
- **Others:** stationary, telephone bill, utility, rent, maintenance

Conversion Cost cost related to transformation (DL + FOH)

Example: bottle of water



cost structure

Question

- **What is product cost (DM, DL, FOH)?**
- **What is period cost?**
- **How much we should produced and sold?**

Example: Paint shop

Total costs in the paint shop depends on the number of painted, the sizes distribution, types of surface, and kinds of paint applied.

Paint costs \$16 per gallon. The paining machines setup requires \$500 per setup[1], and using the machine costs \$50 per hour as well as requires one technician whose wage is \$20 per hour to operate. A particular part with 4,000 pieces in the batch requires 10 gallons of paints, 8 hours of the paining machine, and 40 carton box to pack which costs \$40. If the average monthly administrative and utility of the paint shop is \$3,600[2]. Classify all expenses of as DL, DM, FOH per piece? What are the other costs that missing

- **DM:** paint+carton $16 \times 10 + 40 = 200$ or \$0.050 per piece
- **DL:** labor $20 \times 8 = 160$ or \$0.040 per piece

  machine $50 \times 8 = 400$ or \$0.100 per piece
- **FOH:**
  - **Indirect:** setup $500 \rightarrow \frac{500}{4000} = \$.0125$
  - **Other:** admin $120 \rightarrow \frac{120}{4000} = \$.030$

[1] this includes cleaning

[2] assuming 30 working day

CVP analysis

- **Stand for:** Cost-Volume-Profit/ Break Even
- **What:** interaction of sales volume, selling price, cost, and profit
- **Key Question:** What is minimum we should produce?
  - **Variable Costs:** a constant on a per-unit of production.
  - **Fixed Costs:** a change with a respected of level of production.

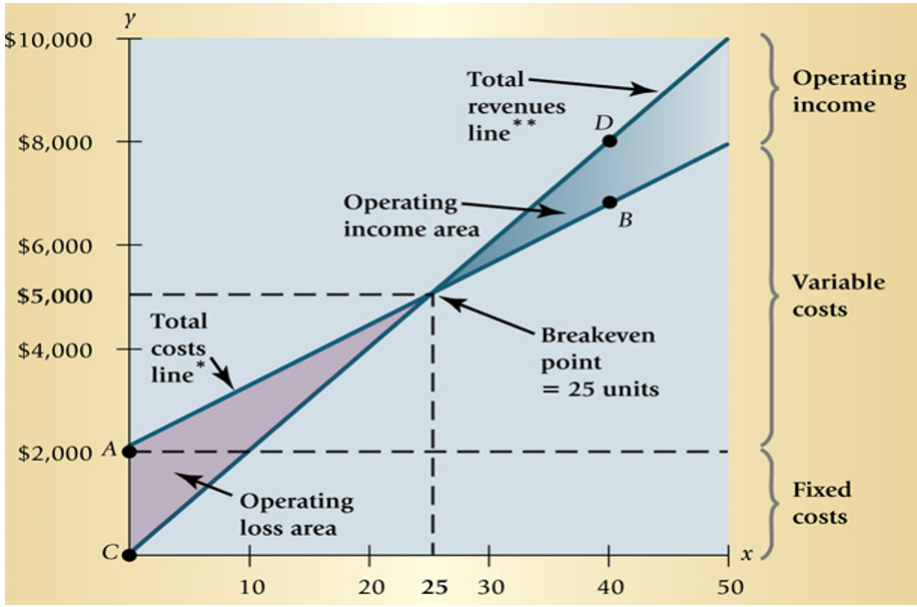
$$\text{profit} = \left(\overbrace{\text{selling price} - \text{unit cost}}^{\text{contribute margin}} \right) \text{qty} - \text{fixed cost}$$

- **Key Concepts**
  - **break-even point:** units sold that make non-profit or non-lost
  - **contribute margin ratio (CM):** ratio of profit yielded by each unit sold

$$CM = \frac{\text{selling price} - \text{unit cost}}{\text{selling price}}$$

Graphic of CVP analysis

A cell phone store rents area at cost USD 2,000 a month. The unit cost of a cell phone is USD 120 and retails for USD 200 per unit.



Implication

- **how much produce:** minimum 25 unit
- **optimistic:** $\text{quantity}^{sold} = \text{quantity}^{prod}$
- **certain data:** fixed cost, price, variable cost are constant and known

Multiple Unit CVP

A winery manufactures and sells Merlot and Chablis. Each wine has different selling price and unit cost as follows

	Merlot	Chablis
Price per case	USD 30.0	USD 20.0
Variable per cases	20.0	15.0
Margin per cases	10.0	5.0

If company always sell 1 case of Merlot for every 3 cases of Chablis and the annual fixed cost of operating winery is USD 25,000, how many cases of Merlot and Chablis must sold to break even?

- **price bundle:** 90 ($1 \times$ USD 30 $+ 3 \times$ USD 20)
- **unit bundle:** 65 ($1 \times$ USD 20 $+ 3 \times$ USD 15)
- **contributed margin ratio:** $\frac{90-65}{90} = 0.2778$
- **break-even in unit:** $\frac{25{,}000}{25} = 1{,}000$ bundle
- **break-even in sale:** $\frac{25{,}000}{0.2778} = 90{,}00$ USD

InClass Exercise

A company manufactures and sells a specialized telephones with following income statement:

	Total (USD)	Per Unit (USD)
Sales (20,000 unit)	1,200.0k	60.0
CoGS	900.0k	45.0
Gross Profit	300.0k	15.0
SG&A	240.0k	
EBIT	60.0k	

Answer the following questions

- compute contributed margin? $\frac{300.0k}{1{,}200.0k} = 0.25$ or $\frac{15}{60}$
- compute break-even point in units $\frac{240.0k}{.25} = 960.0k$ and $\frac{960.k}{60} = 16.0k$
- if sales increase by \$360.0k next year, how much oper. income increase? $\rightarrow$ 6.0k units

  gross income = 1,560.0k - 1,170.0k = 390.0k

  oper. income = 390.0 - 240.0k = 150.0k (increase 90.0k)
- how to earn EBITDA at least \$90.k if tax rate is 25% and DA = 100.0k

  EBITDA = 90.0k $\equiv$ gross income = 230.0k $\rightarrow$ sale 920.0k USD or 15.3k unit

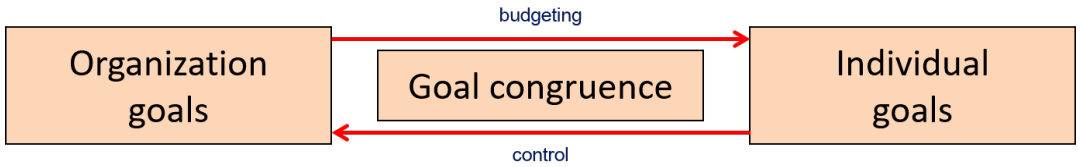
ReCap: Important Costing Concept

- **Cost Classification:** Product Cost (DM, DL, FOH) and Period Cost (SGA& M)
- **FOH Allocation:** allocating factory overhead (common resources) based on:
  - Average, e.g., unit, DM, DL
  - Cost Driver, e.g, # of part/test/setup/order/trans, type of test, machine-hr
- **break-even point:** units sold that make non-profit or non-lost
- **contribute margin ratio (CM):** ratio of profit yielded by each unit sold
- **Actual Cost:** a occurred cost
- **Budgeted Cost:** a predicted cost

What is Budgeting?

*A quantitative expression of a plan for a defined period of time [*to achieve the objective]. It may include planned sales volumes and revenues, resource quantities, costs and expenses, assets, liabilities and cash flows.

CIMA Official Terminology, 2005



Budget is a tool for managers prepared by accountant

Example: Bay View Country Club

Bay View Country Club is a private club with 350 members who pay initial fee $45,000 and $385 monthly fee. The club has 3 departments, particulary restaurant, golf course, and gift shop. The budgeting and actual operating result of the club as well as that of previous year are followed:

	Actual September	*Budget September*	*Favorable (Unfavorable) Variance*		*Last Year Septermber*
Revenues					
Dues	133,350	134,750	(1,400)		129,600
Guest fees	2,900	2,500	400		2,200
Food and bar	46,000	44,500	1,500		45,000
Golf carts	2,200	1,900	300		2,100
Miscellaneous	1,600	1,800	(200)		1,700
Total Revenue	186,050	185,450	600		180,600
Expense					
Food and bar	57,000	51,300	(5,700)		49,700
Golf bourse	79,500	80,000	500		75,000
Admin & maintenance	47,050	45,350	(1,700)		45,600
Interest on dept	8,500	8,500	-		9,000
Total Expense	192,050	185,150	(6,900)		179,300
Net operating suplus (deficit)	(6,000)	300	(6,300)		1,300

Assuming that all inventory is negligible. Analyze and suggest improvement.

Zimmerman, J.L., *Accounting for Decision Making and Control.* pp 219-221

Example: Bay View Country Club II

	Actual September	*Budget September*	*Favorable (Unfavorable) Variance*		*Last Year Septermber*
Revenues					
Parties	8,300	11,500	(3,200)		11,000
Food	24,000	22,000	2,000		21,500
Bar	12,700	10,500	2,200		10,500
Mics.	1,000	500	500		2,000
Total Revenue	46,000	44,500	1,500		45,000
Expense					
Parties	9,000	4,000	(5,000)		5,000
Food	44,000	43,000	(1,000)		40,000
Bar	4,000	4,300	300		4,700
Total Expense	57,000	51,300	(5,700)		49,700
Net operating suplus (deficit)	(11,000)	(6,800)	(4,200)		(4,700)

Zimmerman, J.L., *Accounting for Decision Making and Control.* pp 219-221

Cause of variance?:

- **Party:** under-projected revenue, over-budgeted expense
- **Budgeting process:** cur.budget not consider last.actual, lack of control

Example: Shocker Company

The sale budgeting/forecast of Shocker Company shows quarterly sales for the next year as follows

Quarter	qty	units
1	10,000	EA
2	8,000	EA
3	12,000	EA
4	14,000	EA

If the policy states that the company must prepare 20% of finish goods inventory for the next quarter at the end of previous quarter, and the remaining inventory the beginning of Quarter 1 is 2,200 EA. Calculate budget production quantity in each quarter.

Zimmerman, J.L., *Accounting for Decision Making and Control*. pp 225

Inventory of Shocker Company

$$\begin{aligned} \text{inv}_{t-1} + \text{produce}_t &= \text{sell}_t + \text{inv}_t \\ \text{produce}_t &= \text{sell}_t + \text{inv}_t - \text{inv}_{t-1} \end{aligned}$$

	Q1	Q2	Q3	Q4
fore.sell	10,000	8,000	12,000	14,000
prep next	1,600	2,400	2,800	
avail. now	-2,200	-1,600	-2,400	-2,800
produce				

Thinking point:

- **Timing:** when to pay for RM?
- **Production:** value of FG and RM inventory (20% reasonable)
- **Revenue:** sell FG with credit,

Example: Shocker Company I

Shocker Company determines the selling price and standard cost of this FG at $5.00 and $4.00 per EA, respectively. If production and selling quantities follow the plan and the company expects to receive 60% of revenue of within this quarter and the remaining 40% of revenue in the next quarter. What are (1) inventory value of FG, (2) cost of good sold, and (3) budgeted income?

	Q1	Q2	Q3	Q4
fore.sell (EA)	10,000	8,000	12,000	14,000
inventory (EA)	1,600	2,400	2,800	2,400
produced (EA)	9,400	8,800	12,400	13,600
inventory value (1000USD)				
CoGS (1000USD)				
revenue (1000USD)				
income (1000USD)				

Thinking point:

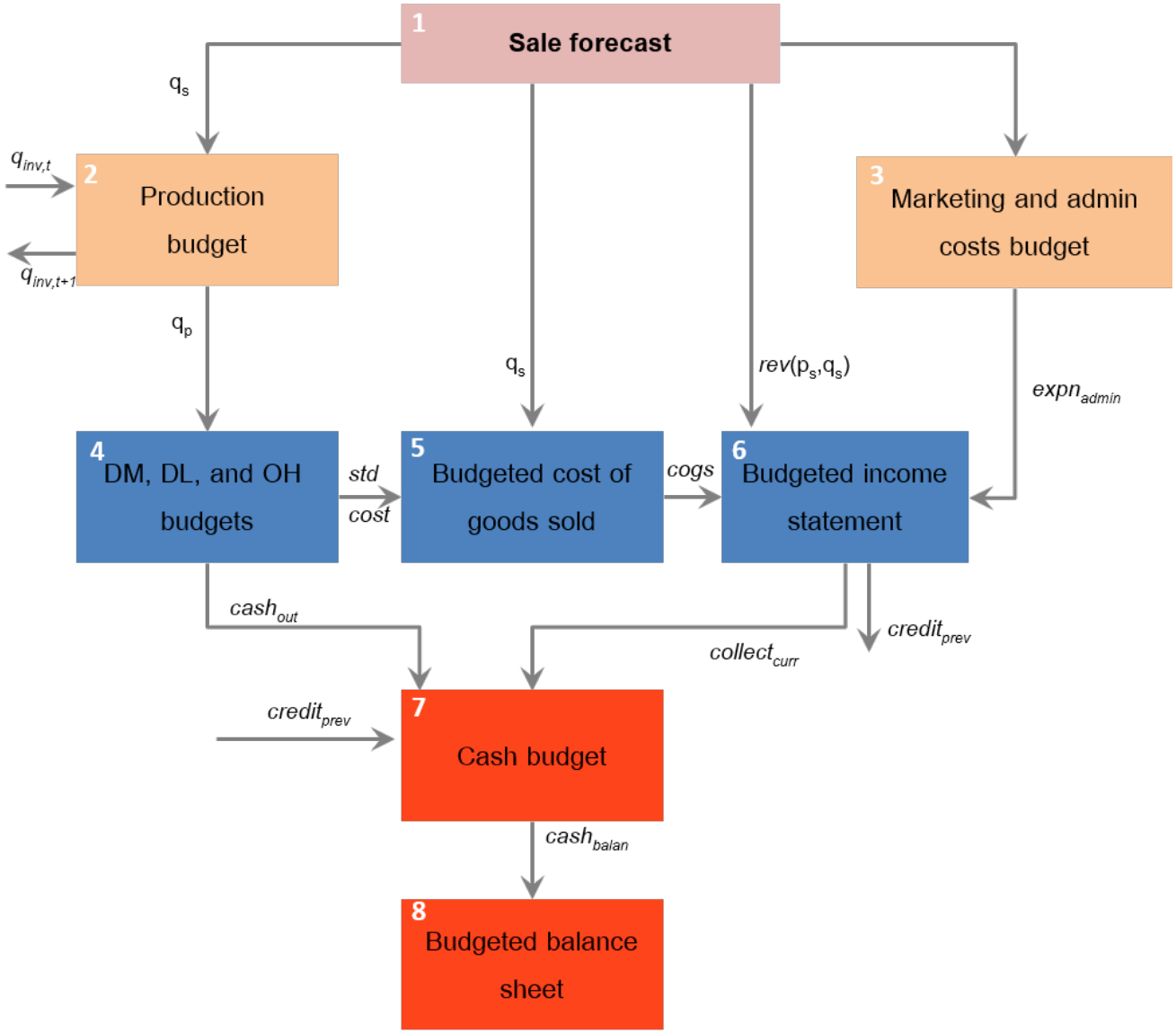
- **Actual :** If the actual selling qualities are 9500, 9500, 11000, and 13000 respectively. How the *actual* value of inventory, CoGS, and income changed?

Important type of Budgets...

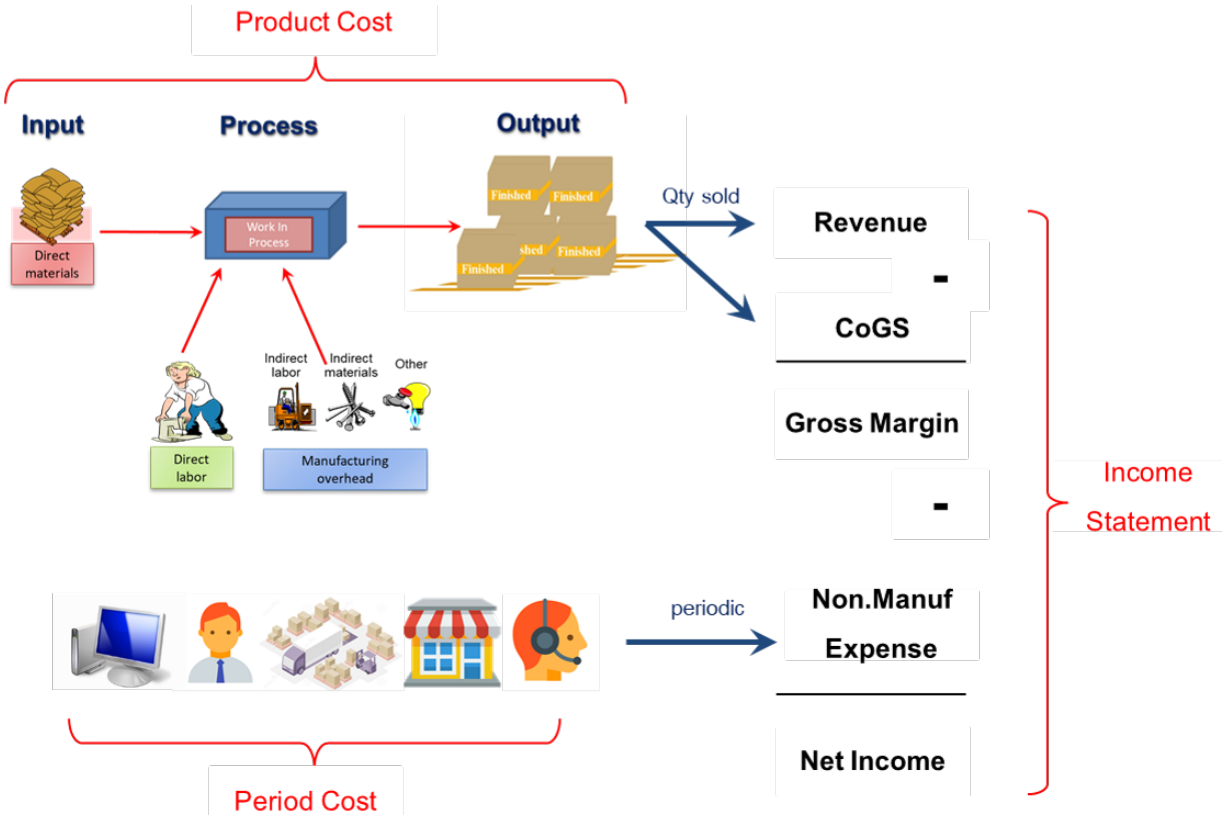
- **Master Budget:** an aggregate of all company's individual budgets, consisting of operating and financial budgets
- **Production Budget:** an operation budgeting that projects production of FG and requirement of RM
- **Cost of Goods Sold Budget:** an operation budgeting that projects standard costs of sold products, exclude period cost
- **Cash Budget:** a financial budgeting that projects channels of cash in/out within a specific period
- **Capital Expenditure Budget:** a decision making related to investment and capital expenditure
- **Budgeted Income Statement:**a operating budget that reports actual earnings and expenses for a given period of time
- **Budgeted Balance Sheet:** a financial budgeting that shows asset, liability and equity at a specific period

source: 'Budgeting Basic and Beyond', Shim *et al.*

Typical Budgeting Step

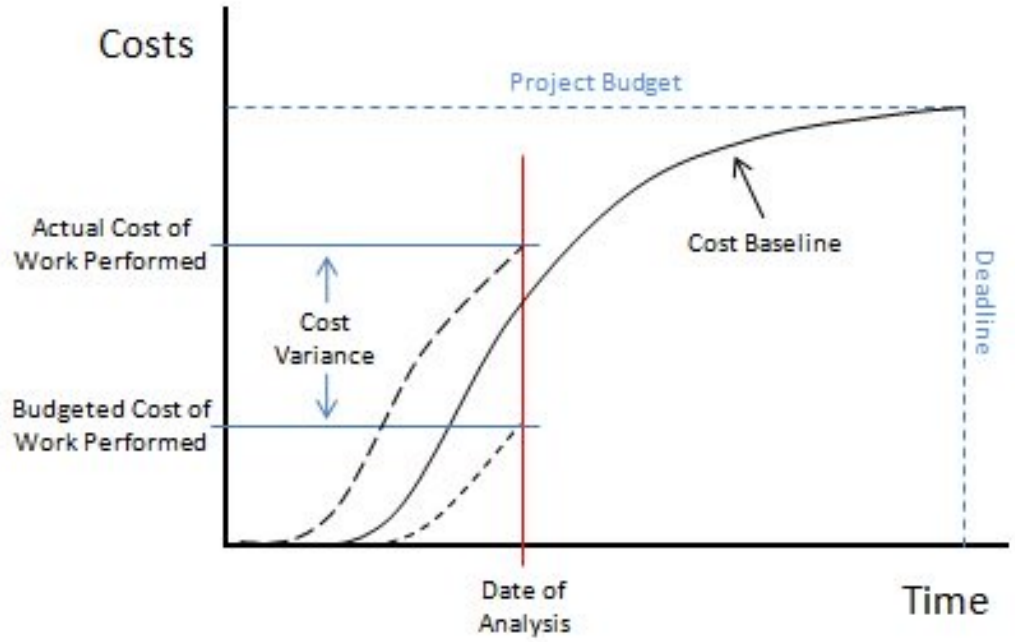


Re-Cap: Cost Classification



- **Product costs:** costs of converting RM into FG, i.e., DL, DM, OH
- **Period costs** other costs in business, i.e., marketing, sell, administrative

What is variance?

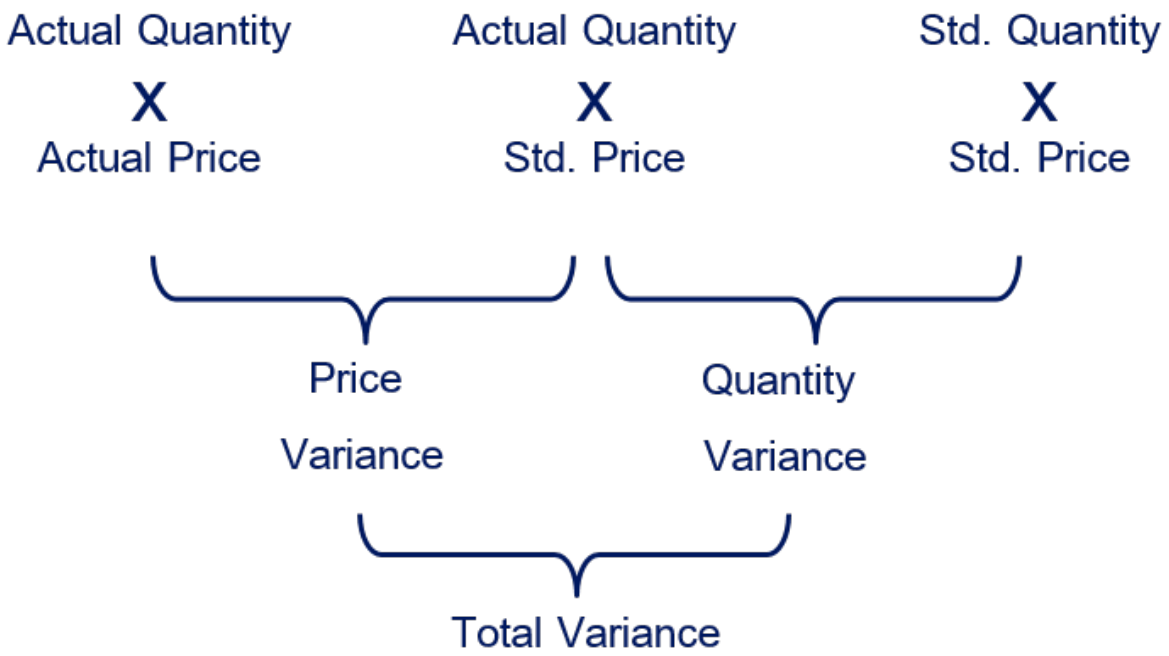


COST VARIANCE

Difference between a cost's actual amount and its budgeted/planned amount

- **Favorable variance:** difference that increases operating profit
- **Unfavorable variance:** difference that reduces operating profit

Direct [Labor & Material] Variance Model

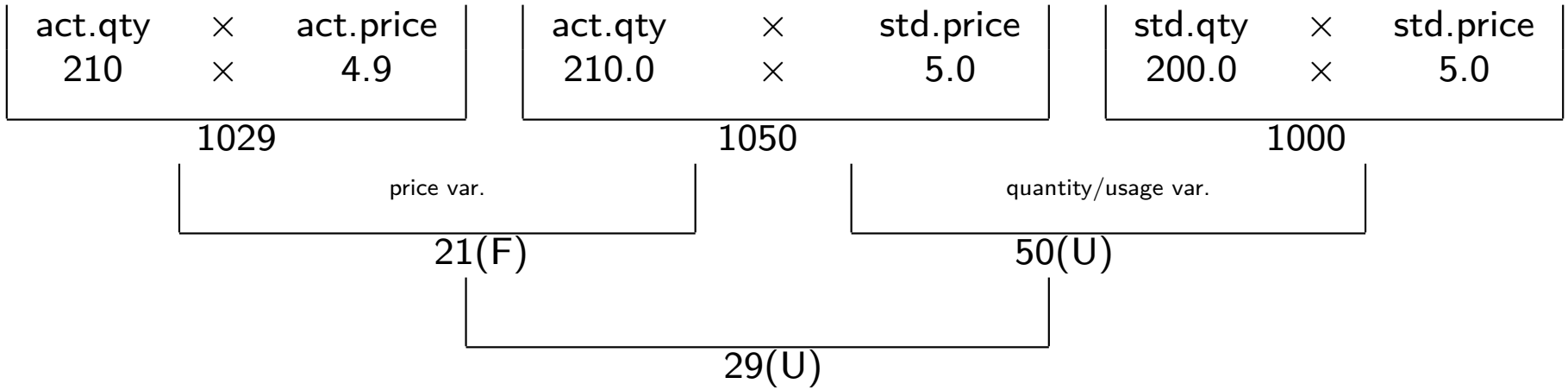


Note

- **given actual:** actual result may include discount/ coupon (Actual Qty $\times$ Actual Price)
- **material warning:** production $\neq$ purchasing

Example of Material Variance

A pillow company has 0.1 kg standard fiberfill per pillow at $5.00 per kg. Last month 210 kgs of fiberfill were purchased and used to make 2,000 pillows. The material cost a total of $1,029. Analyze all variance and recommend solution



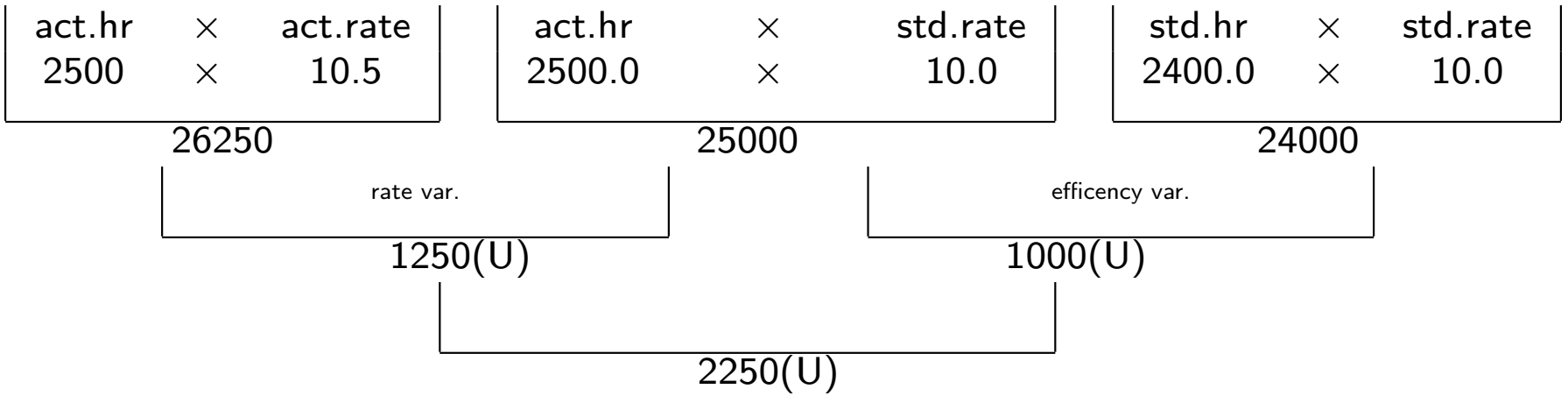
- **Unfavorable Quantity Variance:** Production → waste/spoil?, RM quality issue?
- **What if:** purchased 300 kgs at $1,470 (@ $4.9 per kg), how to reevaluate?

Thinking point:

- If we have inventory, how calculation change? → Raw Material Inventory

Example of Labor Variance

A pillow company uses 1.2 standard hours per pillow at $10.00 per hour. Last month, employees actually worked 2,500 hours at a total labor cost of $26,250 to make 2,000 pillow



- **Unfavorable Rate Variance:** Production → OT, skilled mixed,
- **Unfavorable Efficient Variance:** Production → M/C problem, quality problem, motivation

Cause of Variances

Material Variance

- **Price Variance** purchasing methods, price increase, diff grade → Purchasing
- **Usage Variance** spoil/waste, quality issue, experiment → Production
- **Raw Material Inventory** speculation, yield, order qty. → Purchasing

Labor Variance

- **Rate Variance:** higher wage, incorrect allocation worker → Production
- **Efficiency Variance:** wrong std time, Mixed, Workstation configuration, training → Production

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