Cost Allocation

Introduction

Cost allocation, which is a problem in nearly every organization and nearly every facet of accounting, provides information needed for both strategic and operating decisions.

There is rarely one "best" way to allocate costs. Cost allocation requires judgment, and reasonable people may differ in their judgments. Job costing and ABC in units 4 examined topics related largely to the allocation of indirect costs to individual products. As we saw then, finding answers to cost-allocation questions is often difficult. The answers are seldom clearly right or wrong.

Cost allocation issues

- Macro issues: allocating costs to divisions, plants, and customers.
- Micro issues: allocating support costs to operating departments and allocating common costs to various cost objects.

The question now why do managers allocate indirect costs to these cost objects? Now we will illustrates four purposes of cost allocation then introducing four criteria used to guide cost allocation decisions.

Four purposes of cost allocation

1. To provide information for **economic decisions**
2. To **motivate** managers and employees
3. To **justify** costs or compute reimbursement
4. To measure income and assets for reporting to **external parties**

Different costs are appropriate for different purposes

(allocate or not according to management decision purpose)

Consider costs of a product in terms of the business functions in the value chain (research and development, marketing, distribution, and customer service costs).

For some decision related to the **economic-decision purpose**

- (for example, long-run product pricing), the costs in all six functions should be included.

For the **motivation purpose**, costs from more than one business function are often included to emphasize to managers how costs in different functions are related to each other.

- For example, product designers in some Japanese companies incorporate costs of other functions in the value chain - such as production, distribution, and customer service into their product-cost estimates. The aim is to focus attention on how different product design options affect total costs.

For the **cost-reimbursement purpose**, the particular contract will often stipulate whether all six of the business functions or only a subset of them are to be reimbursed.

- For instance, cost-reimbursement rules for U.S. government contracts explicitly exclude marketing costs.

For the **purpose of income and asset measurement** for reporting to external parties, inventoriable costs under GAAP include only manufacturing costs (and product design costs in some cases). In the United States, R&D costs in most industries are a period cost when they are incurred, as are marketing, distribution, and customer-service costs

Cost allocations can be used to motivate managers to consume less or more of the company's resources

- To *discourage* use, the cost of a department's services could be allocated according to the amount of services used.
- To *encourage* use of a department's services (for example, internal audit). Top management might
  - not allocate any of the cost of that department's services or
  - allocate a fixed amount of the cost of that department to other departments regardless of how much of those services are used by those other departments (the other departments may feel obligated to use the services to get their "money's worth")

CRITERIA TO GUIDE COST-ALLOCATION DECISIONS

These decisions affect both the number of indirect-cost pools and the cost-allocation base for each indirect-cost pool. Managers must first identify the purpose for a particular cost allocation and then select the criteria, to allocate costs.

1. Cause and Effect (most preferred). It identifies variables that cause cost objects to incur costs.

Using this criterion, managers identify the variables that **cause** resources to be consumed. For example, managers may use hours of testing as the variable when allocating the costs of a quality-testing area to products. Cost allocations based on the cause-and-effect criterion are likely to be the most credible to operating personnel.

The cause-and-effect criterion is the primary one used in activity-based costing (ABC) applications. ABC systems use the concept of a cost hierarchy to identify the cost drivers that best demonstrate the cause-and-effect relationship between each activity and the costs in the related cost pool. The cost drivers are then chosen as cost allocation bases.

2. Benefits Received.(most frequently used alternative when a cause-and-effect relationship cannot be determined.)

Using this criterion, managers identify the beneficiaries of the outputs of the cost object. The costs of the cost object are allocated among the beneficiaries in proportion to the benefits each receives. Consider a corporate wide advertising program that promotes the general image of the corporation rather than any individual product. The costs of this program may be allocated on the basis of division revenues; the higher the revenues, the higher the division's allocated cost of the advertising program. The rationale behind this allocation is that divisions with higher revenues apparently benefited from the advertising more than divisions with lower revenues and, therefore, ought to be allocated more of the advertising costs.

We emphasize the superiority of the cause and-effect and the benefits-received criteria, especially when the purpose of cost allocation is economic decisions or motivation.

3. Fairness or Equity. (Least preferred) This criterion is often cited in government contracts when cost allocations are the basis for establishing a price satisfactory to the government and its suppliers. Cost allocation here is viewed as a "reasonable" or "fair" means of establishing a selling price in the minds of the contracting parties. For most allocation decisions, fairness is a difficult-to-achieve objective rather than an operational criterion.

4. Ability to Bear.((least preferred)) This criterion advocates allocating costs in proportion to the cost object's ability to bear costs allocated to it. An example is the allocation of corporate executive salaries on the basis of division operating income. The presumption is that the more-profitable divisions have a greater ability to absorb corporate headquarters' costs.
the more profitable divisions have a greater ability to bear costs. It subsidizes poor performers at the expense of the best performers. It is usually unacceptable because of its negative effect on managerial motivation

Fairness and ability to bear are less frequently used criteria than cause and effect or benefits received. Fairness is a difficult criterion on which to obtain agreement. What one party views as fair, another party may view as unfair.

The following sequential outline gives the "big picture" of cost allocation:
1. Determine the purpose of the allocation, because the purpose defines *what costs* will be allocated.
2. Decide *how* to allocate the costs from step 1. To do so,
   a. Decide *how many indirect- cost pools* to form, and then
   b. Identify an *allocation base* (preferably a cost driver) *for each cost pool*

Service Cost Allocation

Service Cost Allocation

Operating departments vs. service departments

Operating departments

The central purposes of the organization are carried out in the operating departments (ex.: machining and assembly departments.)

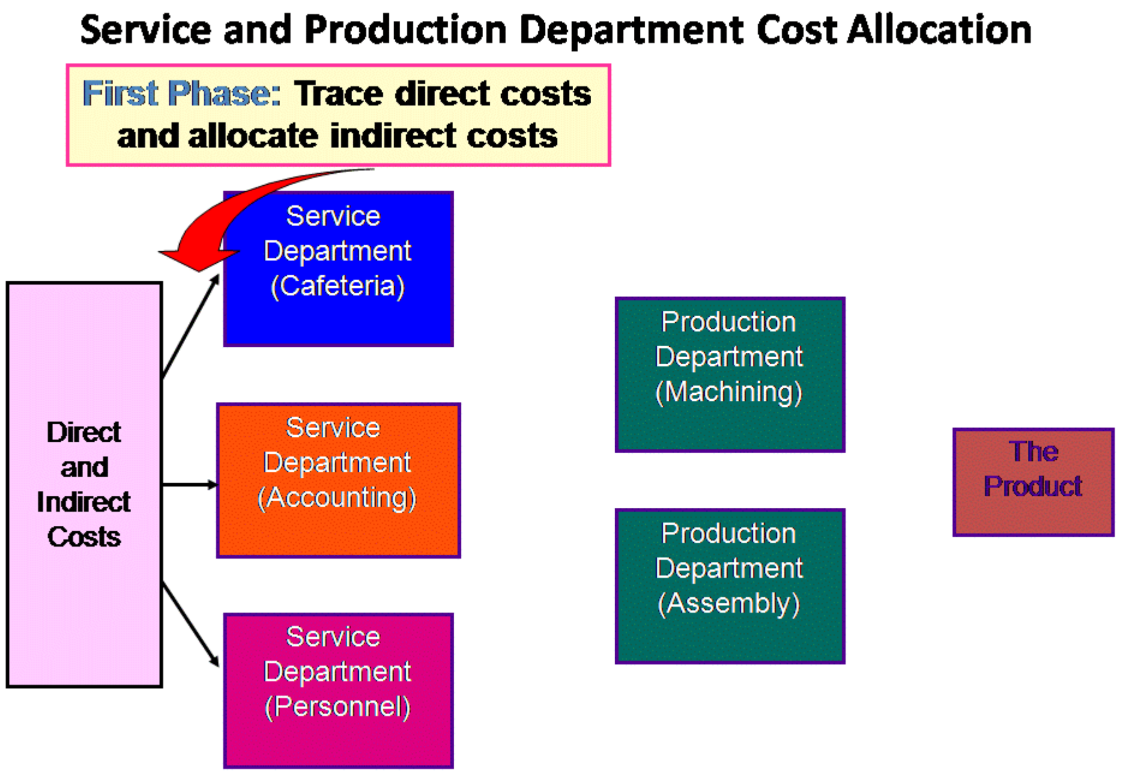
Service departments

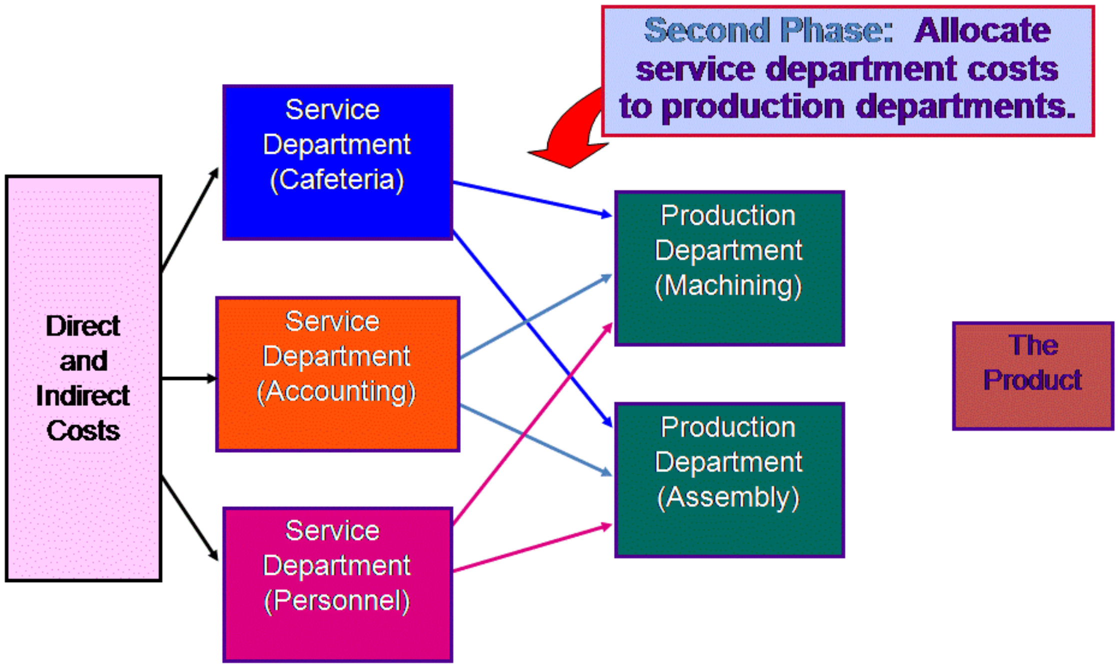
Do not directly engage in operating activities. Instead, they provide services or assistance to the operating departments. (ex.: Cafeteria, Internal Auditing, Human Resources, Cost Accounting, and Purchasing.)

Service Department Costs

The overhead costs of operating departments commonly include allocations of costs from the service departments. For GAAP purposes to the extent that service department costs are classified as production costs, they should be included in unit product costs and thus must be allocated to operating departments in a process costing system.

This is necessary for product costing and financial reporting: all manufacturing costs, whether originating in production departments or in service departments, must be assigned to the goods produced for proper inventory valuation and cost of goods sold determination. When service departments also render services to each other, their costs may be allocated to each other before allocation to operating departments.



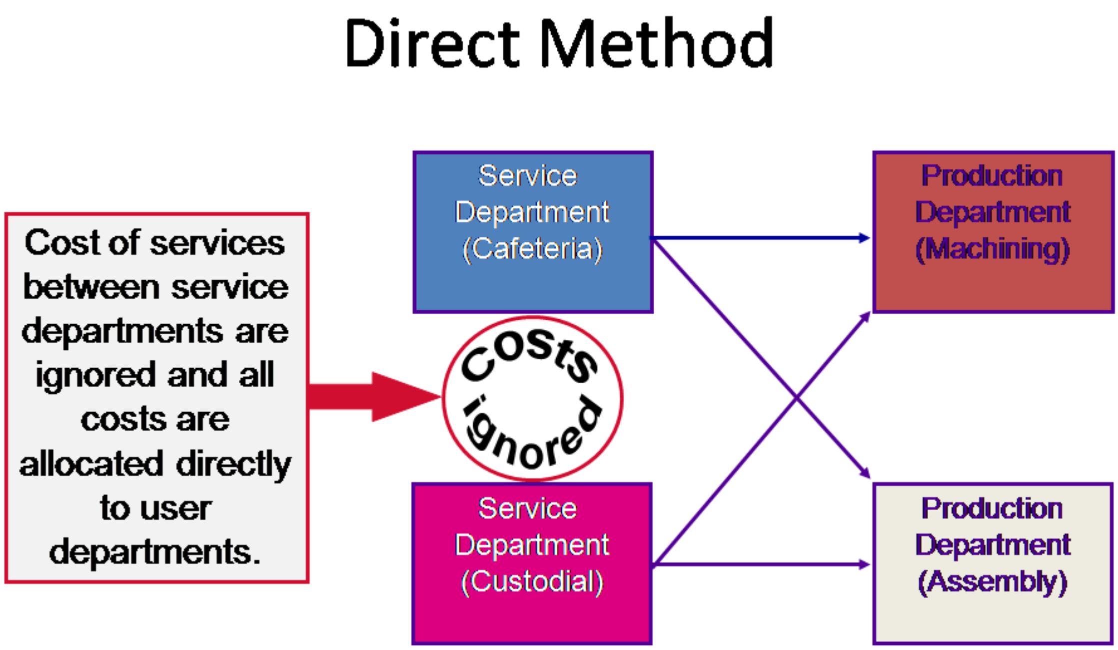


Three approaches are used to allocate the costs of service departments to other departments:

- The direct method,
- The step-down method, and
- The reciprocal method.

The direct method

The direct method is the simplest and most common but least accurate of the methods. All service department costs are allocated directly to production departments. It ignores any service rendered by one service department to another, i.e., no attempt is made to allocate the costs of service departments to other service departments. Thus, no allocation is made of the cost of services rendered to other service departments.



The step-down method

The step-down method is a sequential process. It is slightly more involved than the direct method but is more accurate. The service departments are allocated in order, from the one that provides the most service to other service departments down to the one that provides the least. As each allocation is performed, the costs of the services departments are allocated to both the remaining service departments and the production departments. This method allocates service department costs to other service departments in addition to the producing departments,· i.e. it allows for partial recognition of services rendered by a service departments to another.

Step-down method steps:

Begin Allocation:

• With the service department that provides the highest percentage of its total services to other service departments, or

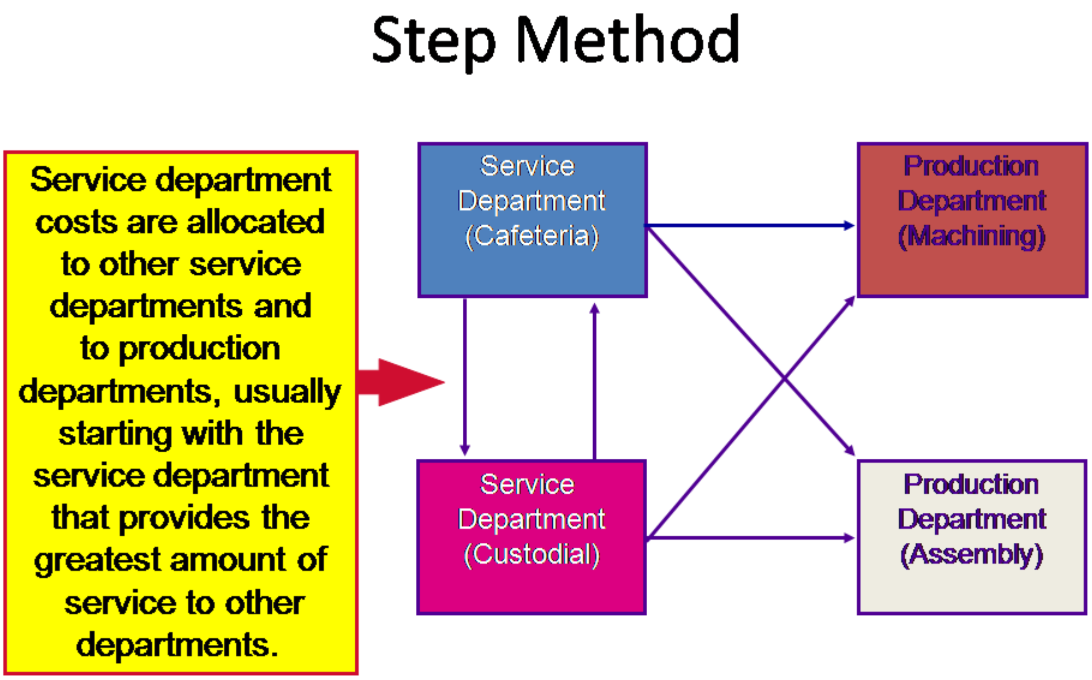
• With the service department providing services to the greatest number of other service departments, or

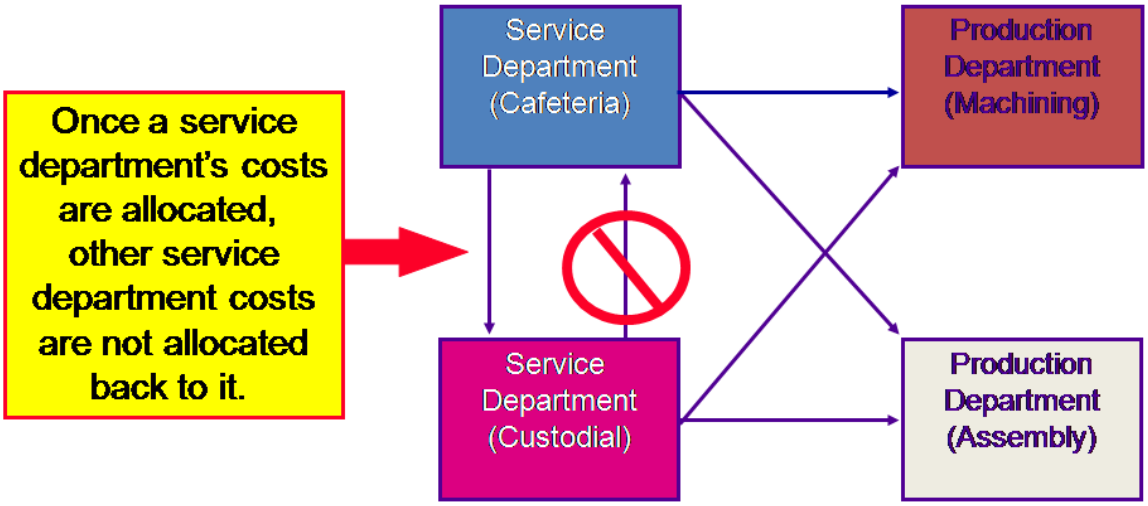
• With the service department having the greatest dollar cost of services provided to other service departments.

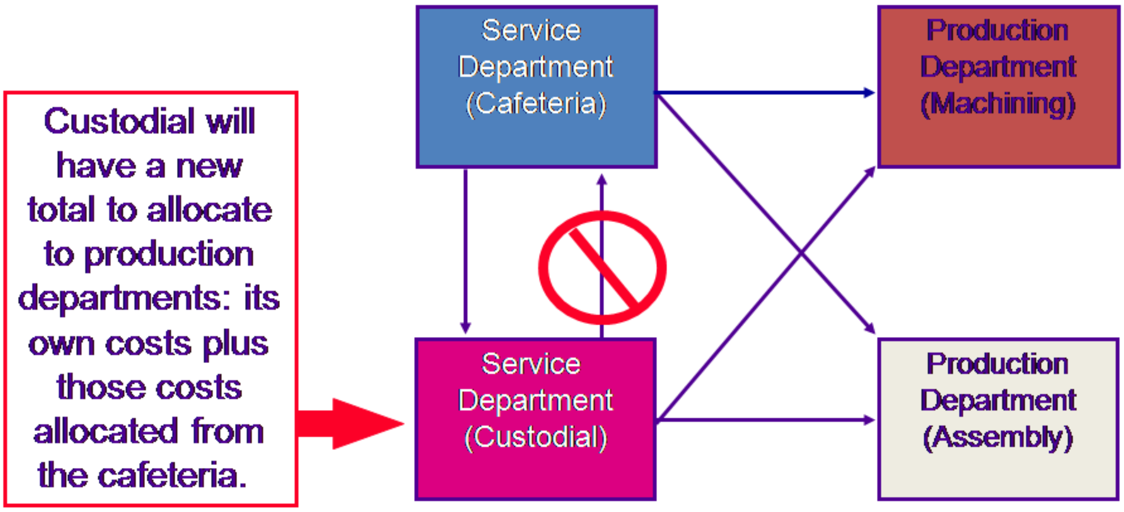
2) The costs of the remaining service departments are then allocated in the same manner.

3) No cost is assigned back to service departments whose costs have already been allocated.

4) The process continues until all service department costs are allocated.







The reciprocal method

a. Theoretically, this method is the most appropriate for allocating service department costs.

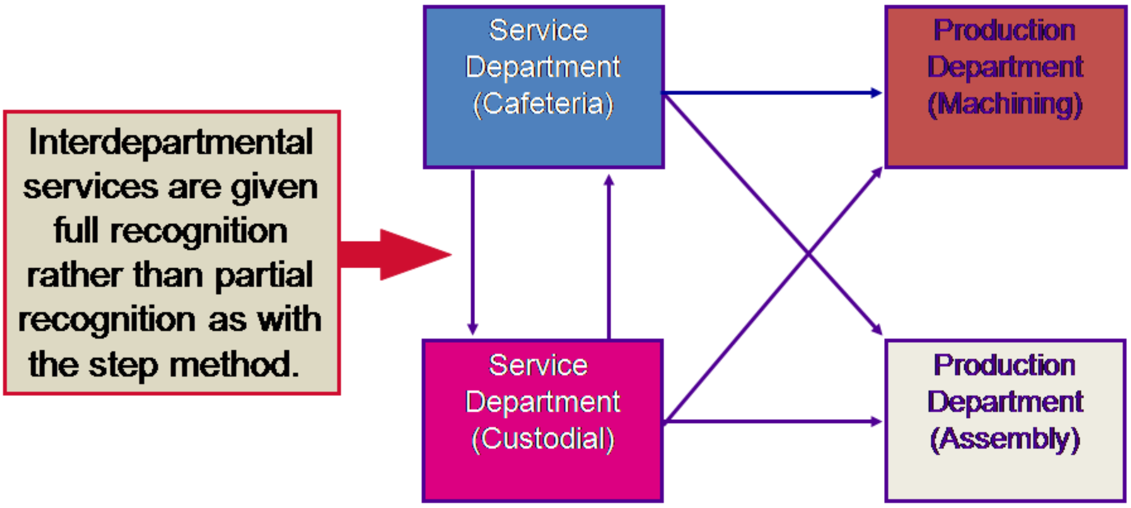
b. It allows reflection of all reciprocal services among service departments.

c. Simultaneous equations are used to compute the completed reciprocated cost.

The reciprocal method is by far the most complex and most accurate of the three methods.

, Simultaneous equations are used to allocate each service department's costs among all other service departments and production departments.

Reciprocal Method



	Service Departments		Production Departments	
	Cafeteria	Custodial	Machining	Assembly
Departmental costs before allocation	$360,000	$ 90,000	$ 400,000	$ 700,000
Number of employees	15	10	20	30
Square feet occupied	5,000	2,000	25,000	50,000

Service Department	Allocation Base
Cafeteria	Number of employees
Custodial	Square feet occupied

The direct method

	Service Departments		Production Departments	
	Cafeteria	Custodial	Machining	Assembly
Departmental costs before allocation	$360,000	$ 90,000	$ 400,000	$ 700,000
Cafeteria allocation	?	?	?	?
Custodial allocation	?	?	?	?
Total after allocation	?	?	?	?

	Service Departments		Production Departments	
	Cafeteria	Custodial	Machining	Assembly
Departmental costs before allocation	$360,000	$ 90,000	$ 400,000	$ 700,000
Cafeteria allocation	(360,000)	0	144,000	?
Custodial allocation	?	?	?	?
Total after allocation	?	?	?	?

$$\$360,000 \times \frac{20}{20 + 30} = \$144,000$$

Allocation base: Number of employees

	Service Departments		Production Departments	
	Cafeteria	Custodial	Machining	Assembly
Departmental costs before allocation	$360,000	$ 90,000	$ 400,000	$ 700,000
Cafeteria allocation	(360,000)	0	144,000	216,000
Custodial allocation	?	?	?	?
Total after allocation	?	?	?	?

$$\$360,000 \times \frac{30}{20 + 30} = \$216,000$$

Allocation base: Number of employees

	Service Departments		Production Departments	
	Cafeteria	Custodial	Machining	Assembly
Departmental costs before allocation	$360,000	$ 90,000	$ 400,000	$ 700,000
Cafeteria allocation	(360,000)	0	144,000	216,000
Custodial allocation	0	(90,000)	30,000	?
Total after allocation	$ 0	$ 0	$ 574,000	?

$$\$90,000 \times \frac{25,000}{25,000 + 50,000} = \$30,000$$

Allocation base: Square feet occupied

	Service Departments		Production Departments	
	Cafeteria	Custodial	Machining	Assembly
Departmental costs before allocation	$360,000	$ 90,000	$ 400,000	$ 700,000
Cafeteria allocation	(360,000)	0	144,000	216,000
Custodial allocation	0	(90,000)	30,000	60,000
Total after allocation	$ 0	$ 0	$ 574,000	$ 976,000

$$\$90,000 \times \frac{50,000}{25,000 + 50,000} = \$60,000$$

Allocation base: Square feet occupied

Step Method

We will use the same data used in the direct method example.

	Service Departments		Production Departments	
	Cafeteria	Custodial	Machining	Assembly
Departmental costs before allocation	$360,000	$ 90,000	$ 400,000	$ 700,000
Cafeteria allocation	?	?	?	?
Custodial allocation	?	?	?	?
Total after allocation	?	?	?	?

	Service Departments		Production Departments	
	Cafeteria	Custodial	Machining	Assembly
Departmental costs before allocation	$360,000	$ 90,000	$ 400,000	$ 700,000
Cafeteria allocation	(360,000)	60,000	?	?
Custodial allocation	?	?	?	?
Total after allocation	?	?	?	?

$$\$360,000 \times \frac{10}{10 + 20 + 30} = \$60,000$$

Allocation base: Number of employees

	Service Departments		Production Departments	
	Cafeteria	Custodial	Machining	Assembly
Departmental costs before allocation	$360,000	$ 90,000	$ 400,000	$ 700,000
Cafeteria allocation	(360,000)	60,000	120,000	?
Custodial allocation	?	?	?	?
Total after allocation	?	?	?	?

$$\$360,000 \times \frac{20}{10 + 20 + 30} = \$120,000$$

Allocation base: Number of employees

	Service Departments		Production Departments	
	Cafeteria	Custodial	Machining	Assembly
Departmental costs before allocation	$360,000	$ 90,000	$ 400,000	$ 700,000
Cafeteria allocation	(360,000)	60,000	120,000	180,000
Custodial allocation	?	?	?	?
Total after allocation	?	?	?	?

$$\$360,000 \times \frac{30}{10 + 20 + 30} = \$180,000$$

Allocation base: Number of employees

	Service Departments		Production Departments	
	Cafeteria	Custodial	Machining	Assembly
Departmental costs before allocation	$360,000	$ 90,000	$ 400,000	$ 700,000
Cafeteria allocation	(360,000)	60,000	120,000	180,000
Custodial allocation	?	(150,000)	?	?
Total after allocation	?	$ 0	?	?

New total = $90,000 original custodial cost
plus $60,000 allocated from the cafeteria.

	Service Departments		Production Departments	
	Cafeteria	Custodial	Machining	Assembly
Departmental costs before allocation	$360,000	$ 90,000	$ 400,000	$ 700,000
Cafeteria allocation	(360,000)	60,000	120,000	180,000
Custodial allocation	0	(150,000)	50,000	?
Total after allocation	$ 0	$ 0	$ 570,000	?

$$\$150{,}000 \times \frac{25{,}000}{25{,}000 + 50{,}000} = \$50{,}000$$

Allocation base: Square feet occupied

	Service Departments		Production Departments	
	Cafeteria	Custodial	Machining	Assembly
Departmental costs before allocation	$360,000	$ 90,000	$ 400,000	$ 700,000
Cafeteria allocation	(360,000)	60,000	120,000	180,000
Custodial allocation	0	(150,000)	50,000	100,000
Total after allocation	$ 0	$ 0	$ 570,000	$ 980,000

$$\$150{,}000 \times \frac{50{,}000}{25{,}000 + 50{,}000} = \$100{,}000$$

Allocation base: Square feet occupied

Reciprocal Method

The Custodial Department receives:

$$\frac{10}{10 + 20 + 30} = \frac{1}{6} \text{ f Cafeteria costs.}$$

The Cafeteria Department receives:

$$\frac{5{,}000}{5{,}000 + 25{,}000 + 50{,}000} = \frac{1}{16} \text{ of Custodial costs.}$$

The total cost of each service department is equal to:
Direct costs of that department
+ Costs allocated to that department

In equation form:

$$Cu = \$90{,}000 + Ca\,\frac{1}{6}$$

and

$$Ca = \$360{,}000 + Cu\,\frac{1}{16}$$

Cu = Total costs of Custodial Department
Ca = Total costs of Cafeteria Department

In equation form:

$$Cu = \$90{,}000 + Ca\,\frac{1}{6}$$

and

$$Ca = \$360{,}000 + Cu\,\frac{1}{16}$$

Two equations and two unknowns are solved by substitution:

$$Ca = \$360{,}000 + \frac{1}{16}(\$90{,}000 + \frac{1}{6}Ca)$$

$$Ca = \$369{,}474 \text{ (rounded)}$$

and

$$Cu = \$90{,}000 + \frac{1}{6}(\$369{,}474) = \$151{,}579$$

	Service Departments		Production Departments	
	Cafeteria	Custodial	Machining	Assembly
Departmental costs before allocation	$360,000	$ 90,000	$ 400,000	$ 700,000
Cafeteria allocation	?	?	?	?
Custodial allocation	?	?	?	?
Total after allocation	?	?	?	?

	Service Departments		Production Departments	
	Cafeteria	Custodial	Machining	Assembly
Departmental costs before allocation	$360,000	$ 90,000	$ 400,000	$ 700,000
Cafeteria allocation	(369,474)	61,579	?	?
Custodial allocation	?	?	?	?
Total after allocation	?	?	?	?

$$\$369,474 \times \frac{10}{10 + 20 + 30} = \$61,579$$

Allocation base: Number of employees

	Service Departments		Production Departments	
	Cafeteria	Custodial	Machining	Assembly
Departmental costs before allocation	$360,000	$ 90,000	$ 400,000	$ 700,000
Cafeteria allocation	(369,474)	61,579	123,158	?
Custodial allocation	?	?	?	?
Total after allocation	?	?	?	?

$$\$369,474 \times \frac{20}{10 + 20 + 30} = \$123,158$$

Allocation base: Number of employees

	Service Departments		Production Departments	
	Cafeteria	Custodial	Machining	Assembly
Departmental costs before allocation	$360,000	$ 90,000	$ 400,000	$ 700,000
Cafeteria allocation	(369,474)	61,579	123,158	184,737
Custodial allocation	?	?	?	?
Total after allocation	?	?	?	?

$$\$369,474 \times \frac{30}{10 + 20 + 30} = \$184,737$$

Allocation base: Number of employees

	Service Departments		Production Departments	
	Cafeteria	Custodial	Machining	Assembly
Departmental costs before allocation	$360,000	$ 90,000	$ 400,000	$ 700,000
Cafeteria allocation	(369,474)	61,579	123,158	184,737
Custodial allocation	9,474	(151,579)	?	?
Total after allocation	$ 0	$ 0	?	?

$$\$151,579 \times \frac{5,000}{5,000 + 25,000 + 50,000} = \$9,474 \text{ (rounded)}$$

Allocation base: Square feet occupied

	Service Departments		Production Departments	
	Cafeteria	Custodial	Machining	Assembly
Departmental costs before allocation	$360,000	$ 90,000	$ 400,000	$ 700,000
Cafeteria allocation	(369,474)	61,579	123,158	184,737
Custodial allocation	9,474	(151,579)	47,368	?
Total after allocation	$ 0	$ 0	$ 570,526	?

$$\$151,579 \times \frac{25,000}{5,000 + 25,000 + 50,000} = \$47,368 \text{ (rounded)}$$

Allocation base: Square feet occupied

	Service Departments		Production Departments	
	Cafeteria	Custodial	Machining	Assembly
Departmental costs before allocation	$360,000	$ 90,000	$ 400,000	$ 700,000
Cafeteria allocation	(369,474)	61,579	123,158	184,737
Custodial allocation	9,474	(151,579)	47,368	94,737
Total after allocation	$ 0	$ 0	$ 570,526	$ 979,474

$$\$151{,}579 \times \frac{50{,}000}{5{,}000 + 25{,}000 + 50{,}000} = \$94{,}737 \text{ (rounded)}$$

Allocation base: Square feet occupied

Comparison of Methods

	Totals after allocation	
Method	Machining Department	Assembly Department
Direct	$ 574,000	$ 976,000
Step	570,000	980,000
Reciprocal	570,526	979,474

- The reciprocal method is superior because:
  - It considers all services provided to other service departments.
  - The total cost of operating a service department is computed.
- The reciprocal method requires the use of matrix algebra with three or more service departments.

Cost Allocation and SBU evaluation

A pervasive issue when using cost SBUs is how to allocate the jointly incurred costs of service departments, such as IT, engineering, human resources, or maintenance, to the departments using the service.

The choice of method affects the amount of cost allocated to each cost SBU and therefore is critical in effective cost SBU evaluation.

For example, if the cost of maintenance is allocated based on the square feet of space in each production department, the departments with more space have higher costs. The incentives of such an allocation method are not clear because the production departments likely cannot control the amount of space they occupy. Alternatively, if maintenance costs are allocated on the basis of the number of maintenance jobs requested, the production departments can control their allocated maintenance costs by controlling usage.

The criteria for choosing the cost allocation method, are the same as the objectives for management control: to

(1) motivate managers to exert a high level of effort,

(2) provide an incentive for managers to make decisions consistent with top management's goals, and

(3) provide a basis for a fair evaluation of managers' performance.

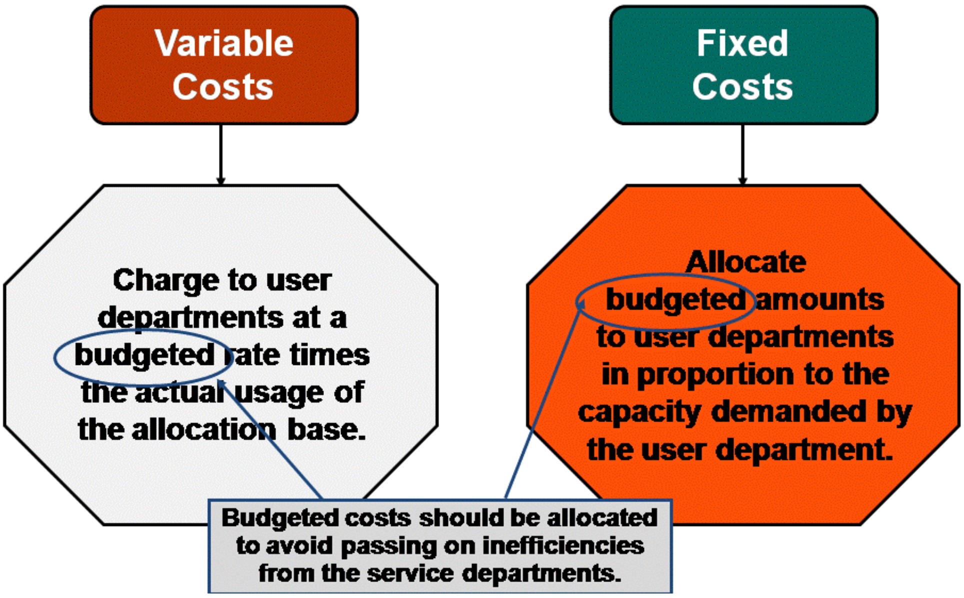
For example, when management wants to encourage production departments to *reduce* the amount of maintenance, allocation based on usage provides the desired incentive. In contrast, if management wants the departments to increase the use of maintenance to improve the serviceability of the equipment, the most effective incentive might be not to allocate the maintenance cost or perhaps to subsidize it in some way.

A useful guide in choosing the cost allocation method, in addition to the three criteria just explained, is to use dual allocation. **Dual allocation** is a cost allocation method that separates fixed and variable costs. Variable costs are directly traced to user departments, and fixed costs are allocated on some logical basis.

For example, the variable costs of maintenance, such as supplies, labor, and parts, can be traced to each maintenance job and charged directly to the user department. This approach is both fair and positively motivating. In contrast, the fixed costs of the maintenance department (training, manuals, equipment, etc.) that cannot be traced to each maintenance job should be allocated to the user departments using a basis that fairly reflects each department's use of the service. For example, those departments whose maintenance jobs require more expensive equipment might be allocated a higher proportion of the maintenance department's fixed costs. To improve on dual allocation, indirect costs could be traced to cost SBUs using activity-based costing.

This approach tends to produce the most accurate cost assignment and therefore would be the most motivating and fairest to the SBU managers.

Separate Fixed and Variable Costs: Dual Allocation



Separate Fixed and Variable Costs: Dual Allocation

Ace Co. has a maintenance department and two operating departments: cutting and assembly. Variable maintenance costs are budgeted at $0.60 per machine hour. Fixed maintenance costs are budgeted at $200,000 per year. Data relating to the current year are:

User Departments	Percent of Capacity Demanded	Actual Hours Used
Cutting	60%	80,000
Assembly	40%	40,000
Total hours	100%	120,000

Allocate maintenance costs to the two operating departments.

	Cutting Department	Assembly Department
Variable cost allocation:		
$0.60 × 80,000 hours used	$ 48,000	
$0.60 × 40,000 hours used		$ 24,000
Fixed cost allocation		
Total allocated cost		

Variable costs are allocated based on hours used.

	Cutting Department	Assembly Department
Variable cost allocation:		
$0.60 × 80,000 hours used	$ 48,000	
$0.60 × 40,000 hours used		$ 24,000
Fixed cost allocation		
60% of $200,000	120,000	
Total allocated cost	$ 168,000	

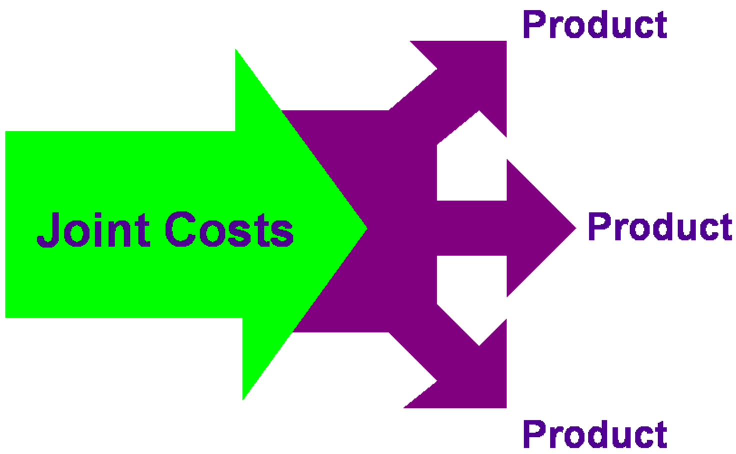
Variable costs are allocated based on hours used. Fixed costs are allocated based on capacity demanded..

	Cutting Department	Assembly Department
Variable cost allocation:		
$0.60 × 80,000 hours used	$ 48,000	
$0.60 × 40,000 hours used		$ 24,000
Fixed cost allocation		
60% of $200,000	120,000	
40% of $200,000		80,000
Total allocated cost	$ 168,000	$ 104,000

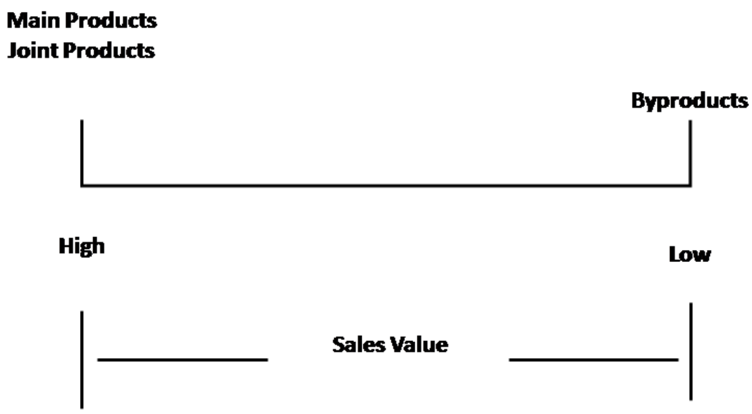
Variable costs are allocated based on hours used. Fixed costs are allocated based on capacity demanded..

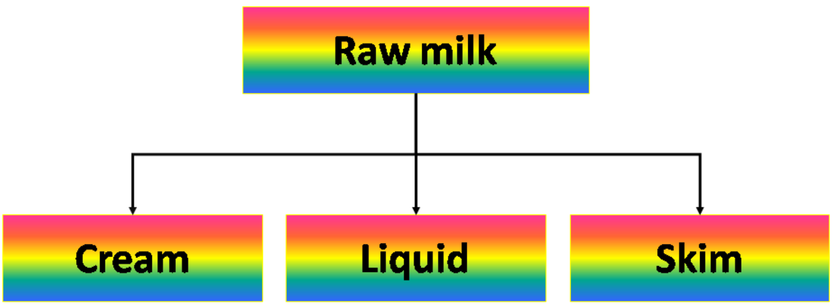
Allocating Joint Costs
Identify the methods used for allocating Joint Costs

In a joint-production process, the juncture where one or more products become separately identifiable is called the splitoff point. Separable costs are all of the costs incurred beyond the splitoff point that are assignable to one or more individual products. For example, the joint-production process of milling timber (logs) yields various grades of lumber as well as sawdust and wood chips. The splitoff point is where individual boards are cut from the timber. The costs of planing these boards into finished lumber are separable costs of the finished lumber.



Joint Products and Byproducts





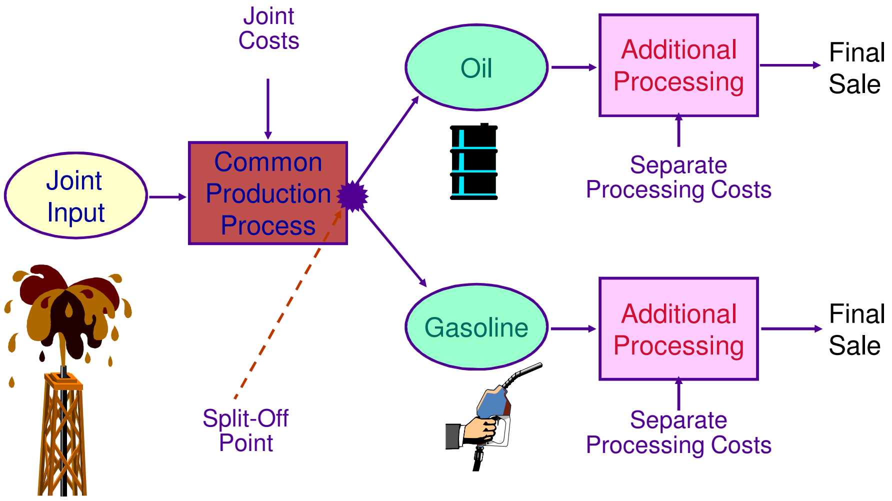
Definitions

a. **Joint products** are two or more separate products produced by a common manufacturing process from a common input.
b. **Joint product costs** are incurred in the production of two or more products simultaneously from processing the same raw material by a single process, They are incurred prior to the split-off point and are not separately identifiable. They may be allocated to the joint products based upon their sales value, net realizable value, or physical measure at the point they become separate.
c. **Split-off point** represents the stage of production at which joint products become identifiable as separate products. These products can be further processed or sold at the split-off point.
d. **Separable costs** are additional costs incurred for a specific product after the split-off point
e**. Net Realizable Value** (NRV) equals sales value less estimated cost to complete and sell.

Allocation of Joint Costs
a. Allocation of joint costs IS essential for valuing inventory and determining cost of goods sold.
b. Joint product cost allocation should not be used in deciding whether to further process or sell the products at the split-off point, i.e., joint costs are irrelevant for that decision.

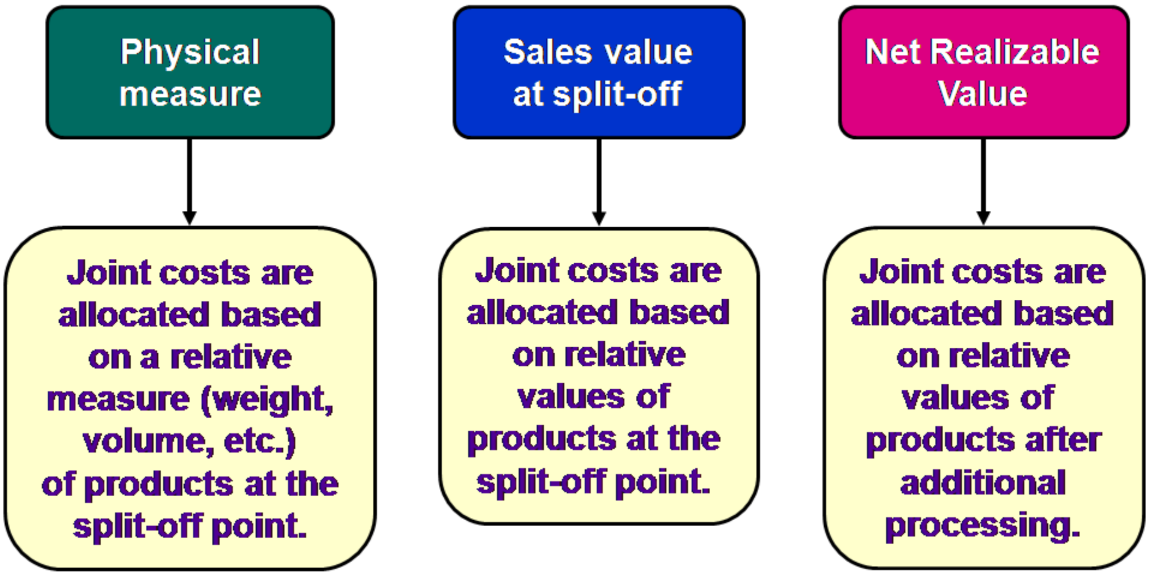
A joint-production process can yield joint products (or a main product) and byproducts. A joint product has relatively high sales value (revenue) compared to the other products yielded by the joint-production process. If a joint-production process yields only one product with a relatively high sales value, that product is called a main product. A byproduct has a relatively low sales value compared with the sales value of a joint or main product. A joint product can become a byproduct (or vice versa) if its market price moves sizably in one direction.

Joint Product Costing



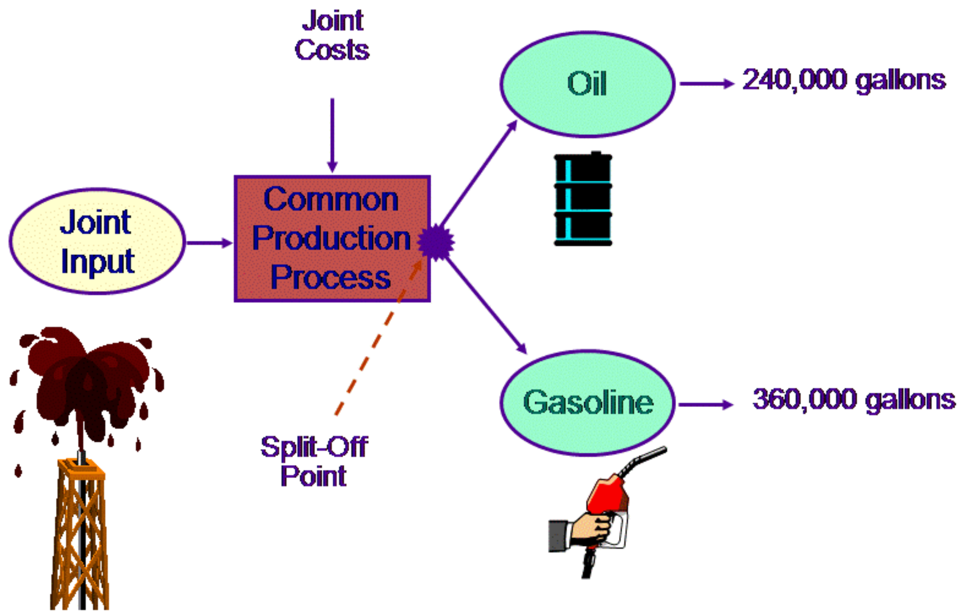
Methods of allocating joint costs

Joint Cost Allocation Methods

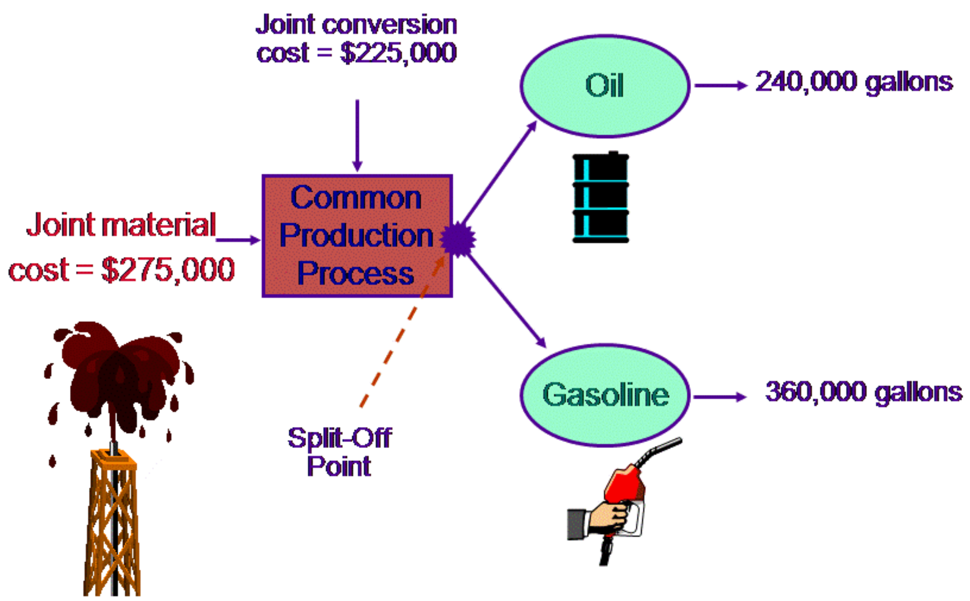


Joint Cost Allocation Methods

Physical Measure Method



Physical Measure Method



Physical Measure Method

	Product		Total
	Oil	Gasoline	
Output quantities in gallons	240,000	360,000	600,000
Proportionate share:			
	?		
		?	
Allocated joint costs:			
	?		
		?	

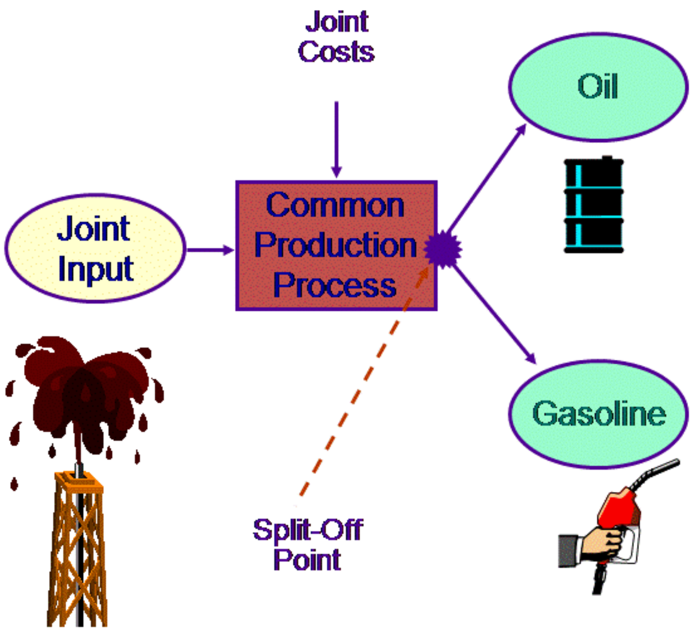
	Product		Total
	Oil	Gasoline	
Output quantities in gallons	240,000	360,000	600,000
Proportionate share:			
240,000 ÷ 600,000	40%		
360,000 ÷ 600,000		60%	
Allocated joint costs:			
	?		
		?	

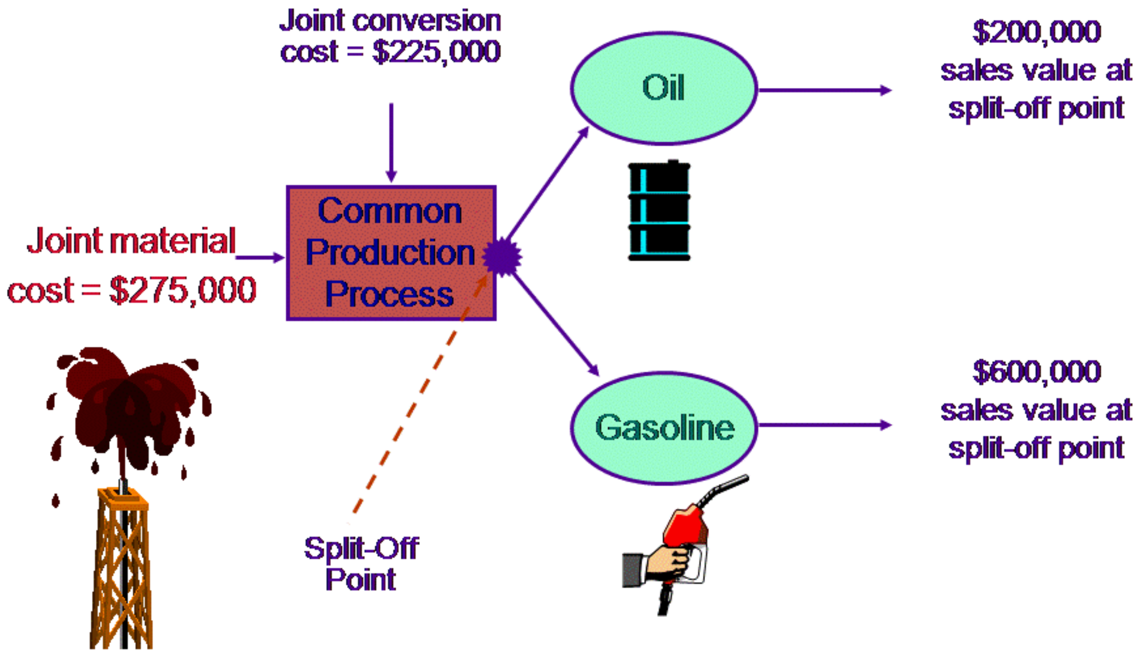
	Product		Total
	Oil	Gasoline	
Output quantities in gallons	240,000	360,000	600,000
Proportionate share:			
240,000 ÷ 600,000	40%		
360,000 ÷ 600,000		60%	
Allocated joint costs:			
$500,000 × 40%	$ 200,000		
$500,000 × 60%		$ 300,000	

The Physical Units Method: Summary

Advantages	Disadvantages
❶ Easy to use	❶ Ignores the revenue-producing capability of individual products
❷ The criterion for the allocation of the joint costs is objective	❷ Each product can have its own unique physical measure

Sales Value at Split-Off Method





Sales Value at Split-Off Method

	Product		Total
	Oil	Gasoline	
Sales value at split-off point	$ 200,000	$ 600,000	$ 800,000
Proportionate share:	?	?	
Allocated joint costs:	?	?	

	Product		Total
	Oil	Gasoline	
Sales value at split-off point	$ 200,000	$ 600,000	$ 800,000
Proportionate share:			
$200,000 ÷ $800,000	25%		
$600,000 ÷ $800,000		75%	
Allocated joint costs:	?	?	

	Product		Total
	Oil	Gasoline	
Sales value at split-off point	$200,000	$600,000	$800,000
Proportionate share:			
$200,000 ÷ $800,000	25%		
$600,000 ÷ $800,000		75%	
Allocated joint costs:			
$500,000 × 25%	$125,000		
$500,000 × 75%		$375,000	

$275,000 joint conversion cost plus
$225,000 joint material cost

Sales Values at Split-off Point Method: Summary

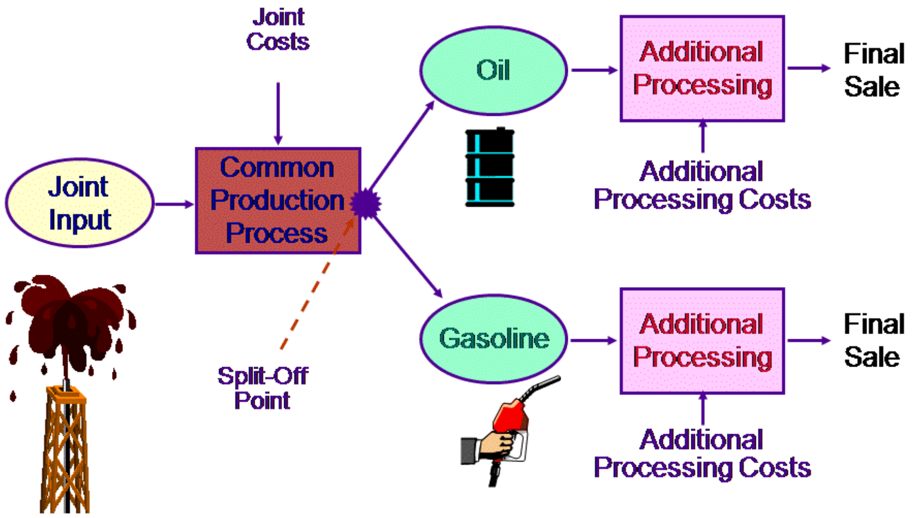
Advantages	Disadvantages
❶ Easy to calculate	❶ Market prices for some industries change constantly
❷ Costs are allocated according to the individual product's revenue	❷ Sales price at split-off might not be available because additional processing is necessary for sale

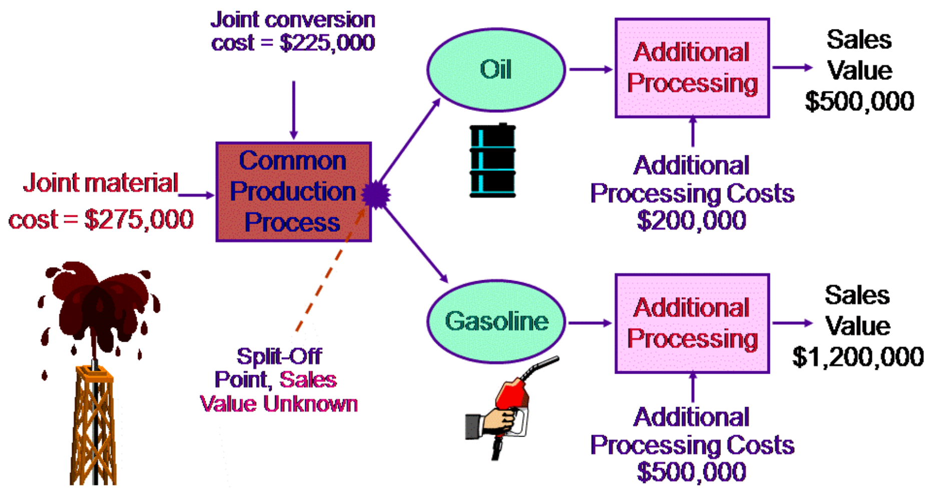
Net Realizable Value Method

If products require further processing beyond the split-off point before they are marketable, it may be necessary to estimate the net realizable value at the split-off point.

Estimated NRV = Final Sales Value – Added Processing Costs

Net Realizable Value Method





Net Realizable Value Method

	Product		Total
	Oil	Gasoline	
Sales value	$ 500,000	$ 1,200,000	$ 1,700,000
Less additional processing costs	?	?	?
Estimated NRV at split-off point	?	?	?
Proportionate share:			
	?		
		?	
Allocated joint costs:			
	?		
		?	

	Product		Total
	Oil	Gasoline	
Sales value	$ 500,000	$ 1,200,000	$ 1,700,000
Less additional processing costs	200,000	500,000	700,000
Estimated NRV at split-off point	$ 300,000	$ 700,000	$ 1,000,000
Proportionate share:			
	?		
		?	
Allocated joint costs:			
	?		
		?	

	Product		Total
	Oil	Gasoline	
Sales value	$ 500,000	$ 1,200,000	$ 1,700,000
Less additional processing costs	200,000	500,000	700,000
Estimated NRV at split-off point	$ 300,000	$ 700,000	$ 1,000,000
Proportionate share:			
$300,000 ÷ $1,000,000	30%		
$700,000 ÷ $1,000,000		70%	
Allocated joint costs:			
$500,000 × 30%	$ 150,000		
$500,000 × 70%		$ 350,000	

The NRV Method: Summary

Advantages	Disadvantages
❶ It produces an allocation that yields a predictable, comparable level of profitability among products	❶ More difficult to calculate than the other two methods
❷ Selling price at split-off does not have to be available	❷ Based on an estimated value

Inventory-costing choices: Absorption (Full) vs. Variable (Direct)

After the cost accumulation method and the cost measurement method have been chosen, the firm must decide how it is going to account for allocating overhead (fixed and variable) to the products. There are two different approaches that can be used to determine which manufacturing costs are to be included in the cost of the product:

I. Absorption (or full) costing and

II.Variable (direct) costing.

A. ABSORPTION (GAAP COSTING)

Absorption costing capitalizes fixed factory overhead expenses as part of the cost of inventory (goods manufactured and not yet sold) in accordance with generally accepted accounting principles (GAAP). Therefore, absorption costing includes direct material, direct labor, and all overhead (variable and fixed) as inventoriable costs. Absorption costing is also referred to as "conventional," "absorption," "full “or” full absorption" costing.

1. Benefits of Absorption Costing

a. Absorption costing is GMP.

b. The Internal Revenue Service requires the use of the absorption method for financial reporting.

Accountants who support absorption costing maintain that inventories should carry a fixed manufacturing cost component. Why? Because both variable manufacturing costs and fixed manufacturing costs are necessary to produce goods. Therefore, both types of costs should be inventoriable, regardless of their different behavior patterns.

2. Limitations of Absorption Costing

a. The level of inventory affects net income because fixed costs are a component of product cost.

b. The net income reported under the absorption method is less reliable (especially for use in performance evaluations) than under the variable method because the cost of the product includes fixed costs and, therefore, the level of inventory affects net income.

Note that; under the absorption method, management was able to show higher income by overproducing. If the manager was being given a bonus for a higher level of income. (s)he could obtain the bonus by producing more units than could be sold. As a result, some fixed costs would be added to the balance sheet as inventories. Thus, the income statement and balance sheet both look good, despite the fact that the production manager has done a bad thing: (S)he has produced excessive inventories. which require the company to incur storage and financing costs. Spoilage may also be a result.

B. VARIABLE* (Direct**) COSTING

Under **variable costing**, only those manufacturing costs that vary with output (Variable manufacturing costs) are treated as product costs (inventory cost). This includes direct materials, variable overhead and ordinarily direct labor. Fixed manufacturing overhead is treated as a period cost and it is expensed on the income statement as incurred.

1. Management Tool

Variable costing is used as a management tool to identify contribution margin calculate breakeven and expedite profit planning (cost volume profit analysis CVP analysis).

2. Benefits of Variable Costing

a. Variable costing attains the objectives of management control systems as the costs are listed separately so that they may be easily traced to and controlled by management.

b. The net income reported under the contribution income statement is more reliable (especially for use in performance evaluations) than under the absorption method because the cost of the product does not include fixed costs and therefore the level of inventory does not affect net income. Under the variable costing method, a production manager cannot manipulate income levels by overproducing. Given the same cost structure every year, the income levels will be based on sales, not the level of production.

c. Variable costing isolates the contribution margins in financial statements to aid in decision-making (the contribution margin is defined as sales price less all variable costs including variable sales and administrative costs and breakeven analysis is often based on contribution margins).

Accountants who favor variable costing for external reporting maintain that the fixed portion of manufacturing costs is more closely related to the capacity to produce than to the actual production of specific units. Hence, fixed costs should be expensed, not inventoried.

4. Limitations of Variable Costing

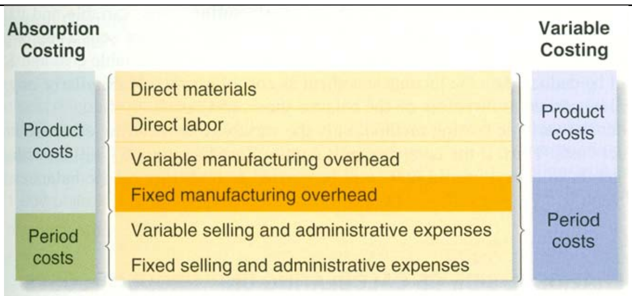
a. Variable costing is not GAAP.

b. The Internal Revenue Service does not allow the use of the variable cost method for financial reporting.

If a company uses VC, it must be in addition to AC.

* *variable costing* is a less than perfect term to describe this inventory-costing method because not all variable costs are inventoriable costs. Only variable manufacturing costs are inventoriable.

** direct costing is not an accurate description for two reasons: (1)Variable costing does not include all direct costs as inventoriable costs. Only direct variable manufacturing costs are included. Any direct fixed manufacturing costs and any direct nonmanufacturing costs are excluded from inventoriable costs. (2)Variable costing includes as inventoriable costs not only direct manufacturing costs but also some indirect costs (indirect variable manufacturing costs).



Absorption costing (or full costing) is an inventory costing system that includes both variable and fixed manufacturing costs. Inventory absorbs all costs of manufacturing.

Variable costing (or direct costing) is an inventory costing method that includes all variable manufacturing costs as inventoriable costs but excludes fixed manufacturing costs. Variable costing expenses fixed manufacturing costs in the period in which the costs are incurred.

Each method expenses all nonmanufacturing costs (both fixed and variable) in the period in which they occur. Therefore, these two methods differ only in how they account for fixed manufacturing costs.

Relation between Production and Sales for the Period	Effect on Inventories	Relation between Absorption and Variable Costing Net Operating Incomes
Production = Sales	No change in inventories	Absorption costing net operating income = Variable costing net operating income
Production > Sales	Inventories increase	Absorption costing net operating income > Variable costing net operating income*
Production < Sales	Inventories decrease	Absorption costing net operating income < Variable costing net operating income†

*Net operating income is higher under absorption costing, since fixed manufacturing overhead cost is *deferred* in inventory under absorption costing as inventories increase.
†Net operating income is lower under absorption costing, since fixed manufacturing overhead cost is *released* from inventory under absorption costing as inventories decrease.

Under variable costing, operating profit is a function of sales. Under absorption costing, it is a function of sales and production.

D. GROSS MARGIN (ABSORPTION COSTING: external reporting) VS. CONTRIBUTION MARGIN (VARIABLE COSTING: internal reporting) INCOME STATEMENTS

The VC income statement uses the contribution-margin format that distinguishes variable costs from fixed costs (based on cost behavior). This format highlights the lump-sum fixed manufacturing overhead (FMOH) costs that are expensed in the period incurred. The AC income statement uses the gross-margin format that distinguishes manufacturing costs from nonmanufacturing costs (functionally based income statement).

Two items distinguish gross margin (GM) from contribution (CM): (1) FMOH costs and (2) variable nonmanufacturing (VNM)costs. AC expenses FMOH costs related to units sold (as part of cost of goods sold) in calculating GM. In contrast, VC expenses total FMOH costs after calculating CM. Also, in AC all nonmanufacturing costs are subtracted from GM; but in VC,VNM costs are subtracted in calculating CM.

ABSORPTION COSTING

Sales Revenues	$XX
Less: Cost of goods sold	(x)
*Gross margin	XX
Less: Variable selling and administrative expenses	(x)
Fixed selling and administrative expenses	(x)
Operating income	$XX

*Gross profit margin may also be stated as a percentage, which is calculated as gross margin (or profit) divided by sales

VARIABLE COSTING

Sales Revenues		$XX
Less: Variable cost of goods sold (excludes fixed overhead)		(x)
Contribution margin from manufacturing		$XX
Less: variable selling and administrative expenses		(x)
Contribution margin		$XX
Less: Fixed expenses:		
Fixed manufacturing overhead	$xx	
Fixed selling and administrative expenses	x	
Total fixed expenses		(XX)
Operating income		$XX

Example:

Units made:	700
Units sold:	500
Variable manufacturing costs per unit:	$30
Variable selling (marketing) costs per unit:	$20
Fixed manufacturing costs per unit:	$25
Fixed selling (marketing) costs:	$14,000

Figure 2-28: Variable Costing vs. Absorption Costing

Variable Costing		
Revenues: $200 × 500 units		$100,000
Variable costs		
Beginning inventory	$0	
+ Variable manufacturing costs: $30 × 700	+21,000	
= Cost of goods available for sale	21,000	
– Ending inventory: $30 × 200	– 6,000	
= Variable cost of goods sold	15,000	
+ Variable marketing costs: $20 × 500	+10,000	
= Total variable costs		–25,000
= Contribution margin		75,000
Fixed costs		
Fixed manufacturing costs: $25 × 700	17,500	
+ Fixed marketing costs	+14,000	
+/– Adjustment for fixed cost variances	0	
= Total fixed costs		– 31,500
= Operating income		$43,500

Absorption Costing		
Revenues: $200 × 500 units		$100,000
Costs of goods sold		
Beginning inventory	$0	
+ Variable manufacturing costs: $30 × 700	+21,000	
+ Fixed manufacturing costs: $25 × 700	+17,500	
= Cost of goods available for sale	38,500	
– Ending inventory: ($30 variable + $25 fixed) × 200	–11,000	–27,500
= Cost of goods sold		
= Gross margin		72,500
Operating costs		
Variable marketing costs: $20 × 500	10,000	
+ Fixed marketing costs	+14,000	
+/– Adjustment for operating cost variances	0	
= Total operating costs		–24,000
= Operating income		$48,500

In summary, when inventory increases, net income under absorption costing will be greater than under variable costing by the amount of the fixed cost of the change in inventory (200 units x $25 = $5,000 in Figure 2-28). When inventory decreases, net income under absorption costing will be less than under variable costing by the amount of the change in inventory fixed cost.

The difference in reported operating income can be calculated :

Absorption-costing operating income	-	Variable-costing operating income	=	Fixed manufacturing cost in ending inventory under Absorption-costing	-	Fixed manufacturing cost in beginning inventory under Absorption-costing

The difference between VC and AC operating incomes is *a matter of timing.* Under VC, FMOH costs are expensed in the period incurred. Under AC, FMOH costs are allocated to output produced and are not expensed until those units are sold. In fact, if a company has zero inventory at the beginning and end of each accounting period, there is no difference between these two methods of costing.

However as methods such as just-in-time production and other inventory reduction methods increase in importance, the differences between variable and absorption costing will grow less material.

ABSORPTION (GAAP COSTING) with standard costing (MEASURMENT SYTEM)

CMA EXAMPLE (TO BE STUDIED AFTER U.7)

Dremmon Corporation uses a standard cost accounting system. Data for the last fiscal year are as follows.

	Units
Beginning inventory of finished goods	100
Production during the year	700
Sales	750
Ending inventory of finished goods	50
Per Unit	
Product selling price	$200
Standard variable manufacturing cost	90
Standard fixed manufacturing cost	20*
Budgeted selling and administrative costs (all fixed)	$45,000

***Denominator level of activity is 750 units for the year.**

There were no price, efficiency, or spending variances for the year, and actual selling and administrative expenses equaled the budget amount. Any volume variance is written off to cost of goods sold in the year incurred. There are no work-in-process inventories. Assuming that Dremmon used absorption costing, the amount of operating income earned in the last fiscal year was

sales rev	150,000
Cost of Goods Sold	
Beginning inventory	11,000
Variable manufacturing costs	63,000
Fixed manufacturing costs	14,000
Cost for goods available for sale	88,000
deduct ending inventory	5,500
Total COGS(at standard costs)	82,500
Adjustment for manufacturing variances	1,000
Total COGS	**83,500**
Gross Margin	66,500
Operating cost	45,000
Operating income	21,500

Dremmon has a production-volume variance because production (700 units) differs from the budgeted level of production of 750 units per year used to calculate the budgeted fixed manufacturing cost per unit.

The $20 fixed manufacturing cost rate is based on a budgeted denominator level of 750 units produced per year ($15,000 ÷ 750 units = $20 per unit). Whenever production - that's the quantity produced not the quantity sold - deviates from the denominator level, there will be a production-volume variance. The amount of the variance here is $20 per unit multiplied by the difference between the actual level of production and the denominator level.

Production was 700 units, 50 lower than the denominator level of 750 units. The result is an unfavorable production-volume variance of $1,000 ($20 per unit x 50 units).

Recall how standard costing works. Each time a unit is manufactured, $20 of fixed manufacturing costs is included in the cost of goods manufactured and available for sale.

When 700 units are manufactured, $14,000 ($20 per unit x 700 units) of fixed costs are included in the cost of goods available for sale. Total fixed manufacturing costs for are $15,000. The production-volume variance of $1,000 U equals the difference between $15,000 and $14,000. Note how, the fixed manufacturing costs included in the cost of goods available for sale plus the production-volume variance always equals $15,000. The production-volume variance, which relates to fixed manufacturing overhead, exists under absorption costing but not under variable costing. Why? Because under variable costing, fixed manufacturing costs of $15,000 are always treated as an expense of the period, regardless of the level of production (and sales).

The PVV is the difference between the lump-sum budgeted FMOH and FMOH allocated to output produced. Because FMOH costs aren't allocated to output produced under VC (FMOH costs are expensed as incurred), there is no PVV under VC.