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03_Cost assignment methods

Eva Švandová

Direct v. indirect costs

direct costs

- can be traced easily and accurately to a cost object

indirect costs

- cannot be traced to cost objects
- estimate must be made of the resources consumed by cost objects using **cost allocations**
  - = the process of assigning costs when a direct measure does not exist for the quantity of resources consumed by a particular cost object

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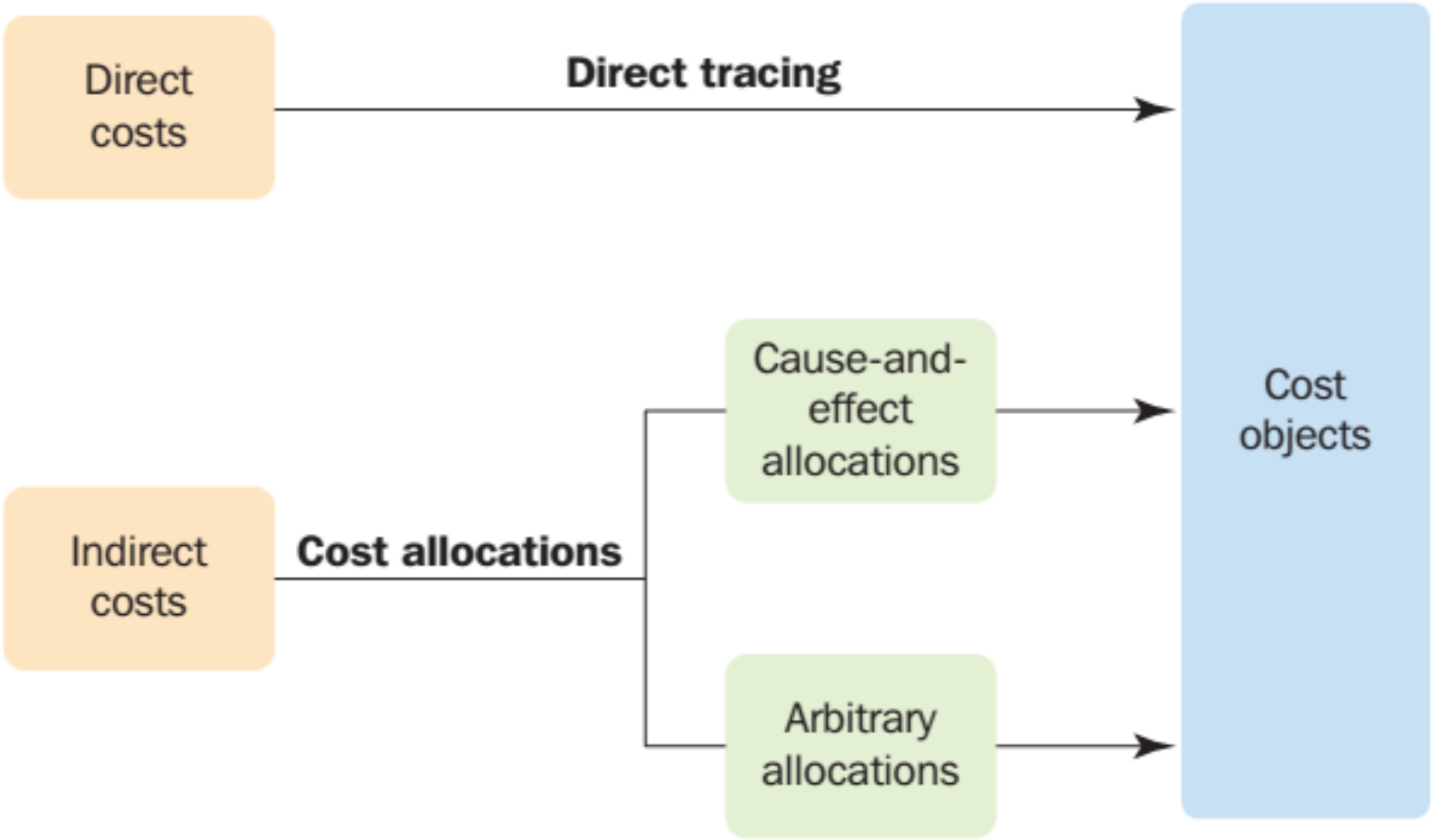
Cost assignment methods



Example
Furniture Inc.

- 3 types of products
  - wardrobes
  - tables
  - drawers
- annual costs: $ 2,791,160

- **How to assign cost to 1 unit of each product?**

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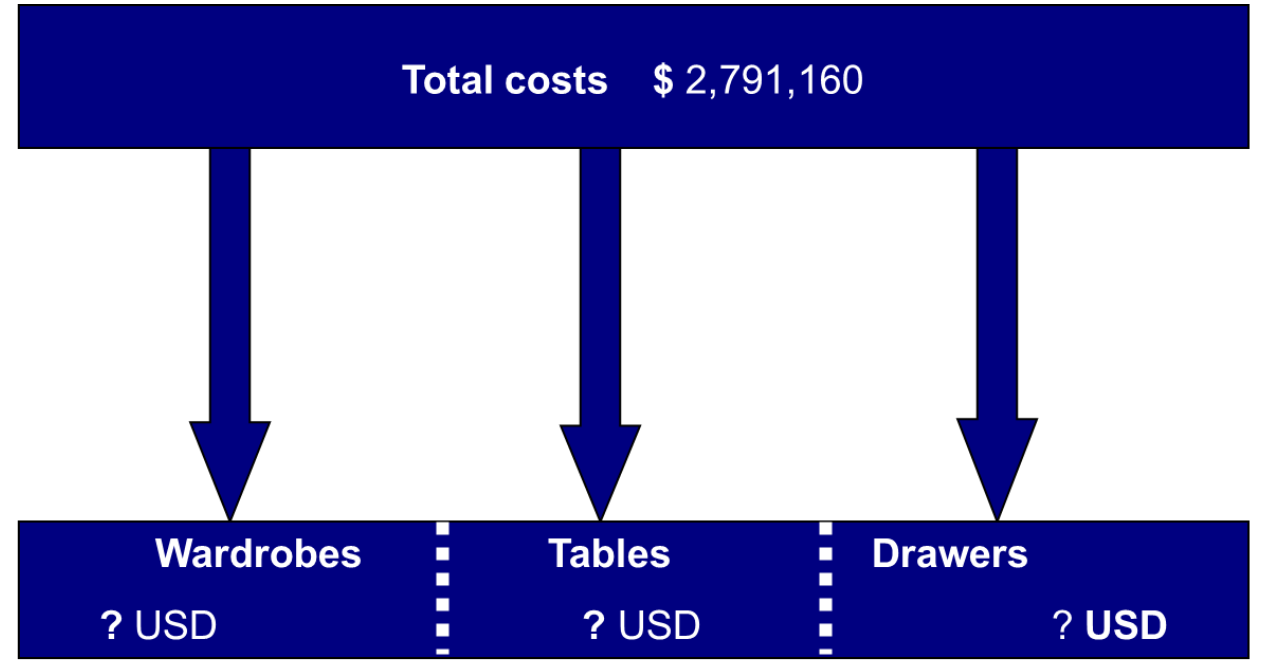
Furniture, s.r.o.

How to assign cost to 1 unit of each product?



per unit: ? USD

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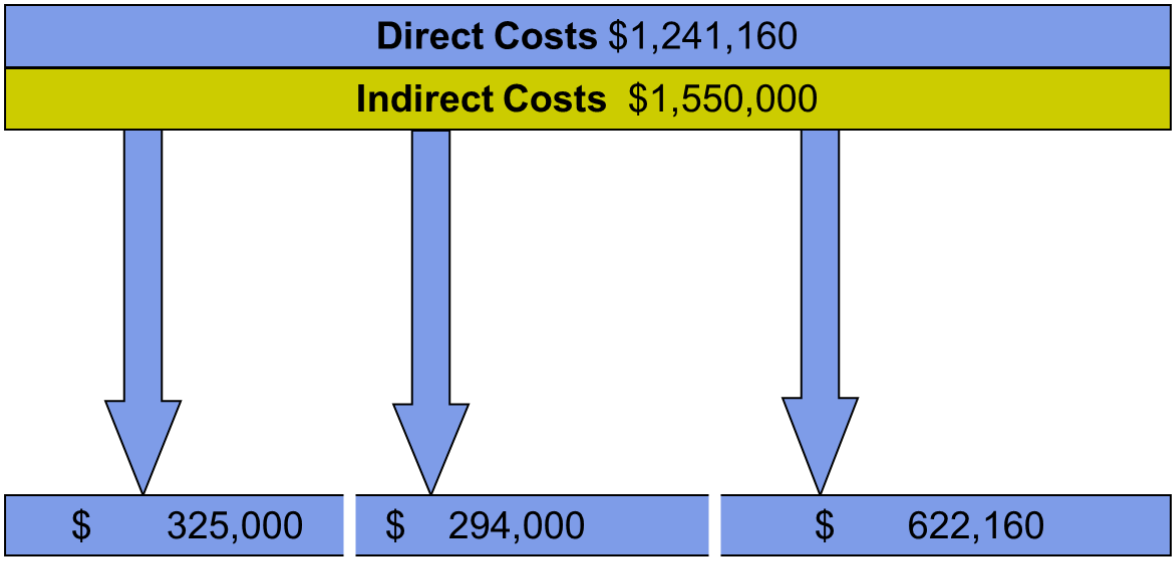
Direct costs

How to assign cost to 1 unit of each product?



Wardrobes	Tables	Drawers
5,000 pcs.	7,000 pcs.	8,080 pcs.

per unit: Simple division

$ 65 = 325,000 / 5,000	$ 42	$ 77

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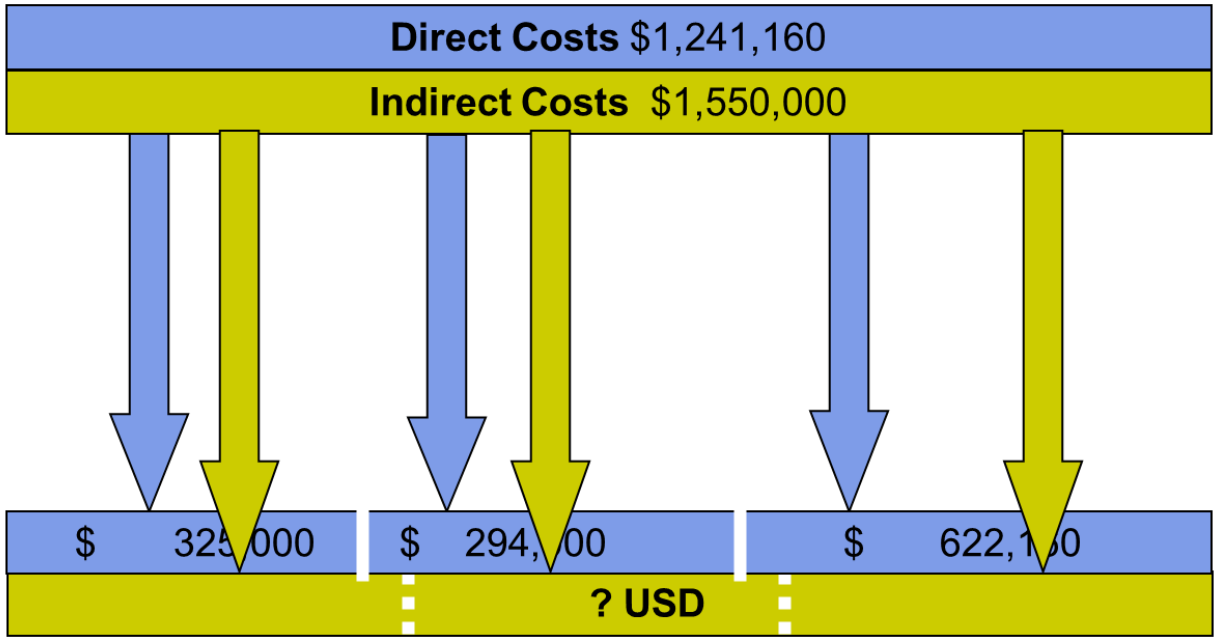
Indirect costs

How to assign cost to 1 unit of each product?



Wardrobes	Tables	Drawers
5 000 pcs.	7 000 pcs.	8 080 pcs.

How to assign indirect cost?

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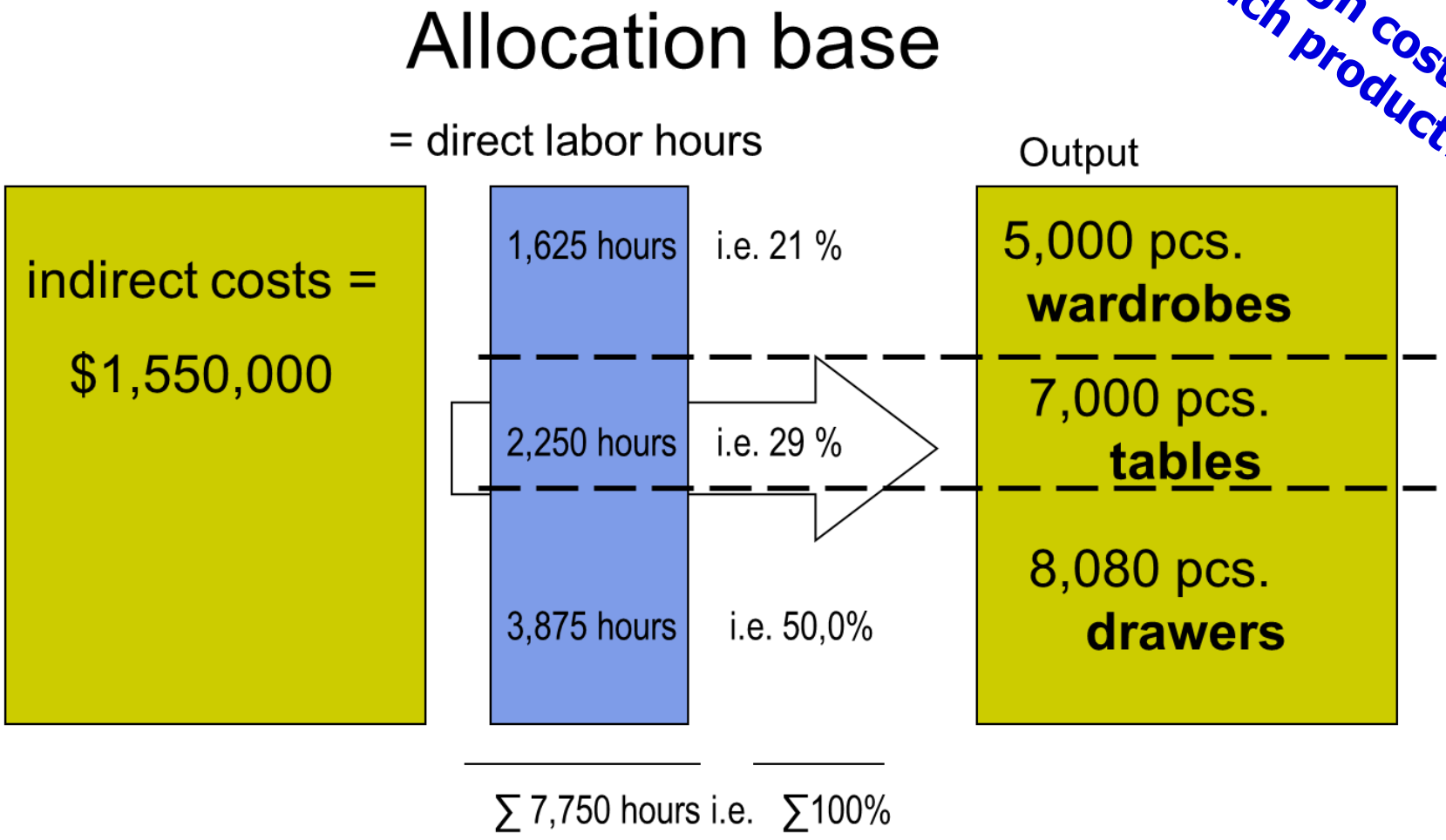
Indirect cost allocation
Plant-wide overhead rate (1/6)

How to assign cost to 1 unit of each product?



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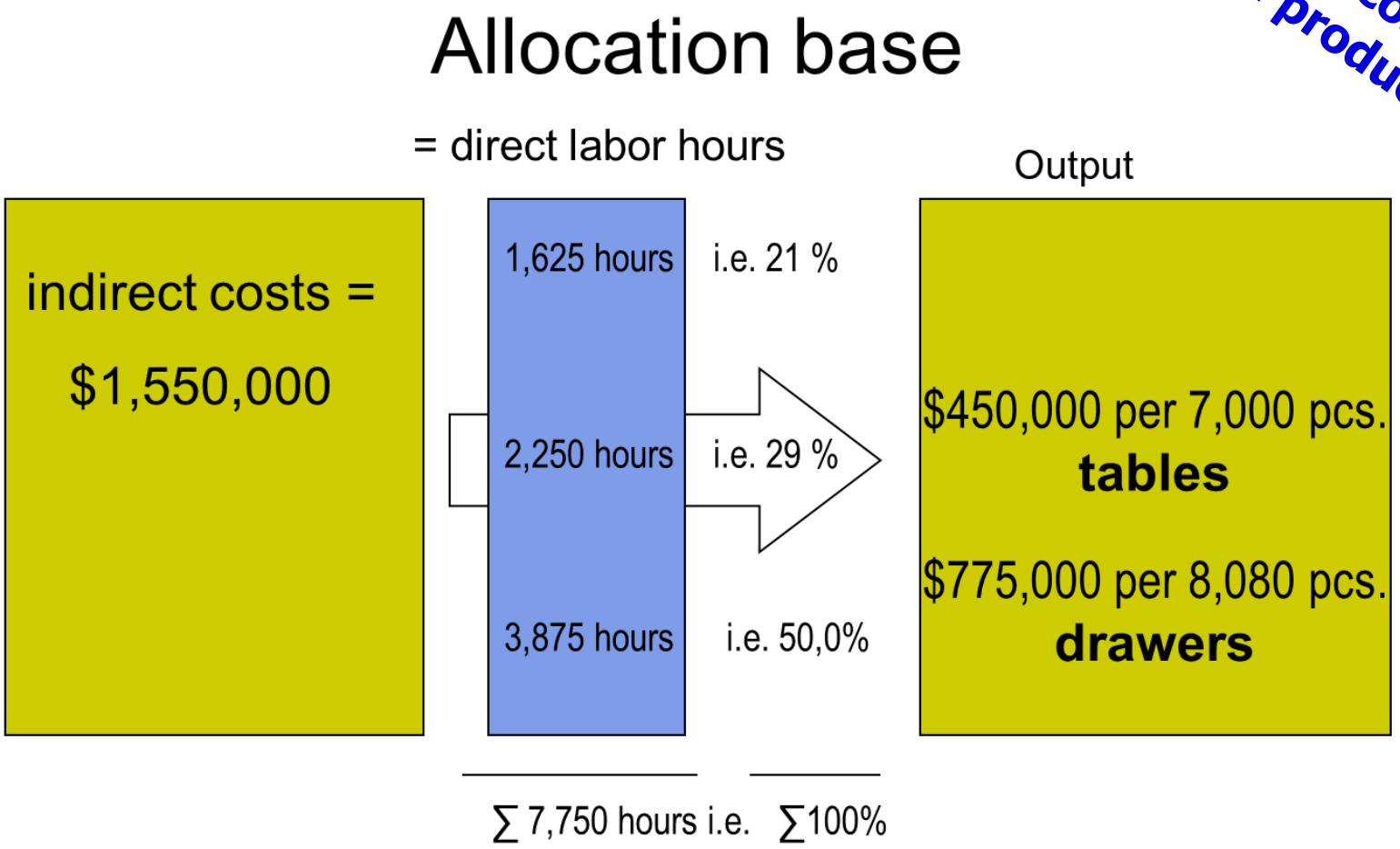
Indirect cost allocation
Plant-wide overhead rate (2/6)

How to assign cost to 1 unit of each product?



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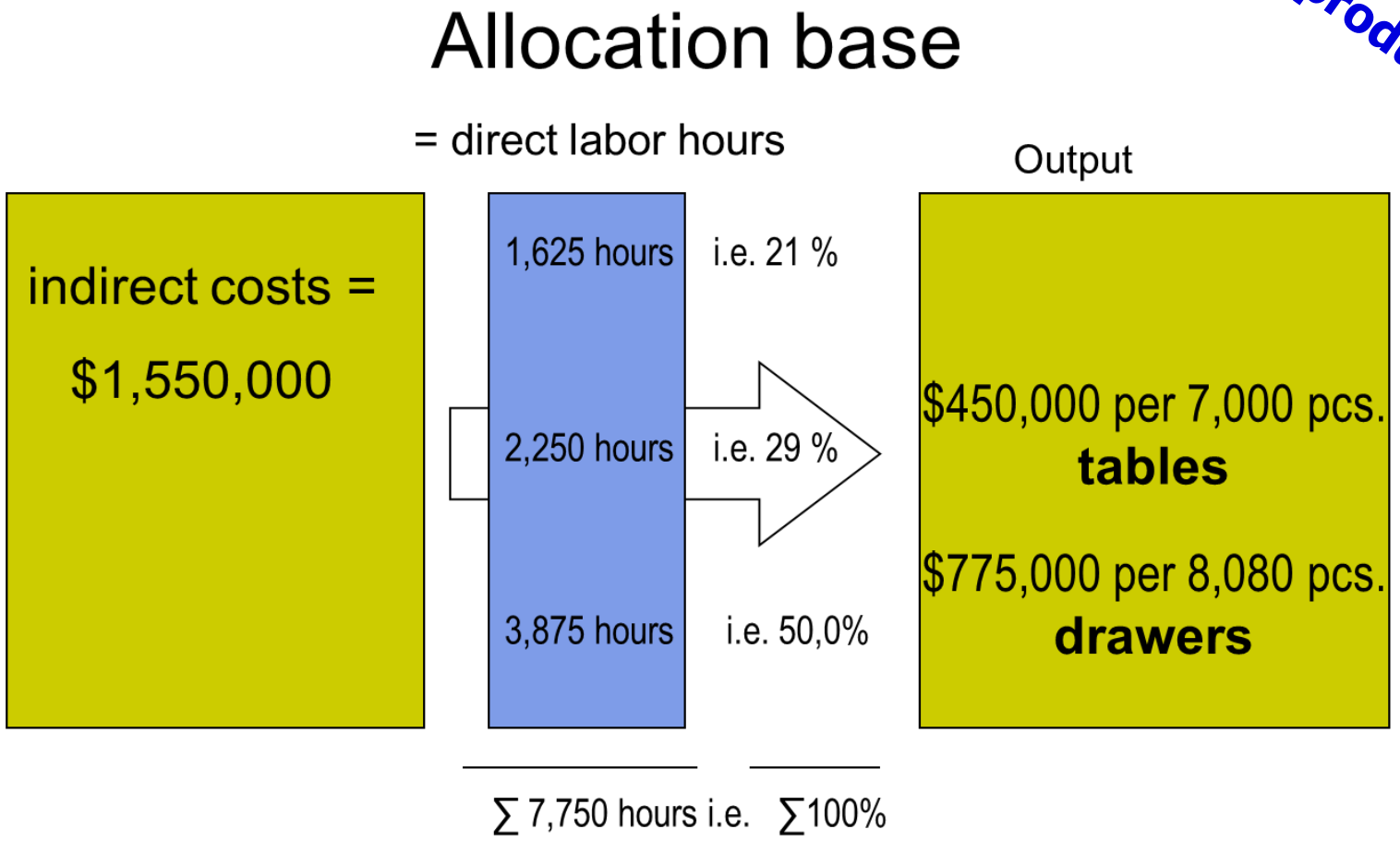
Indirect cost allocation (3/6)

How to assign cost to 1 unit of each product?



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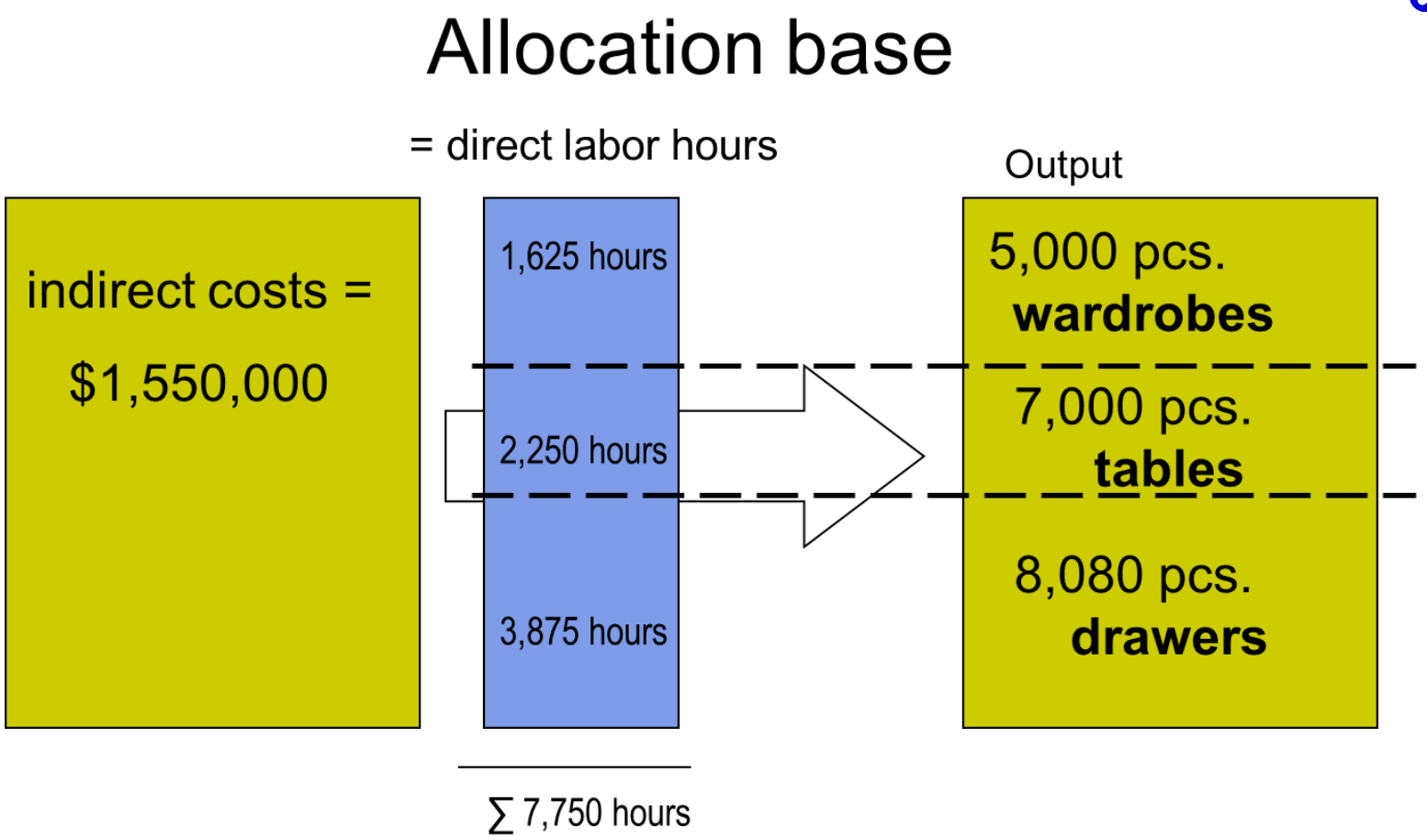
Plant-wide overhead rate (4/6)

How to assign cost to 1 unit of each product?

Alternative method of computation



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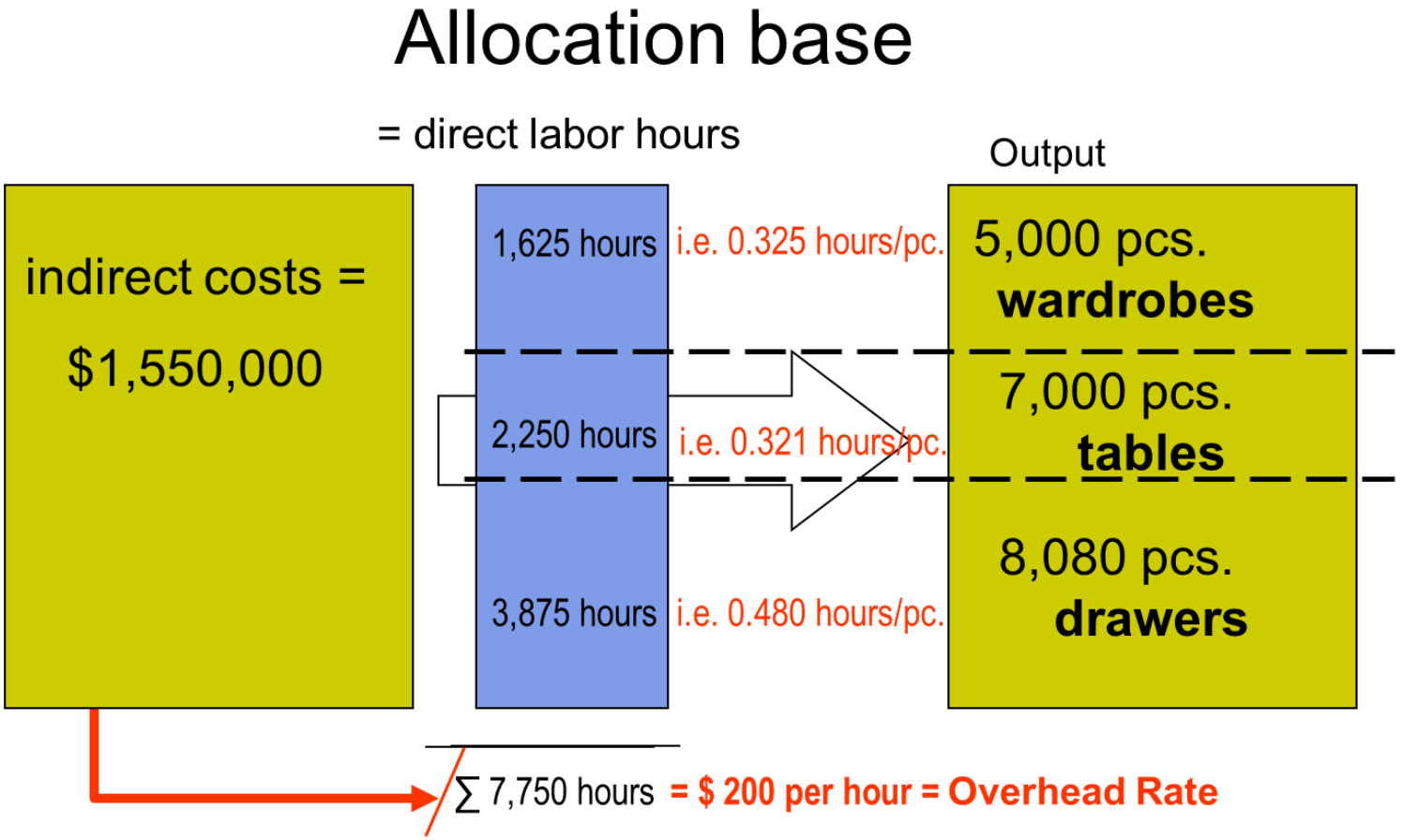
Plant-wide overhead rate (5/6)

How to assign cost to 1 unit of each product?

Alternative method of computation



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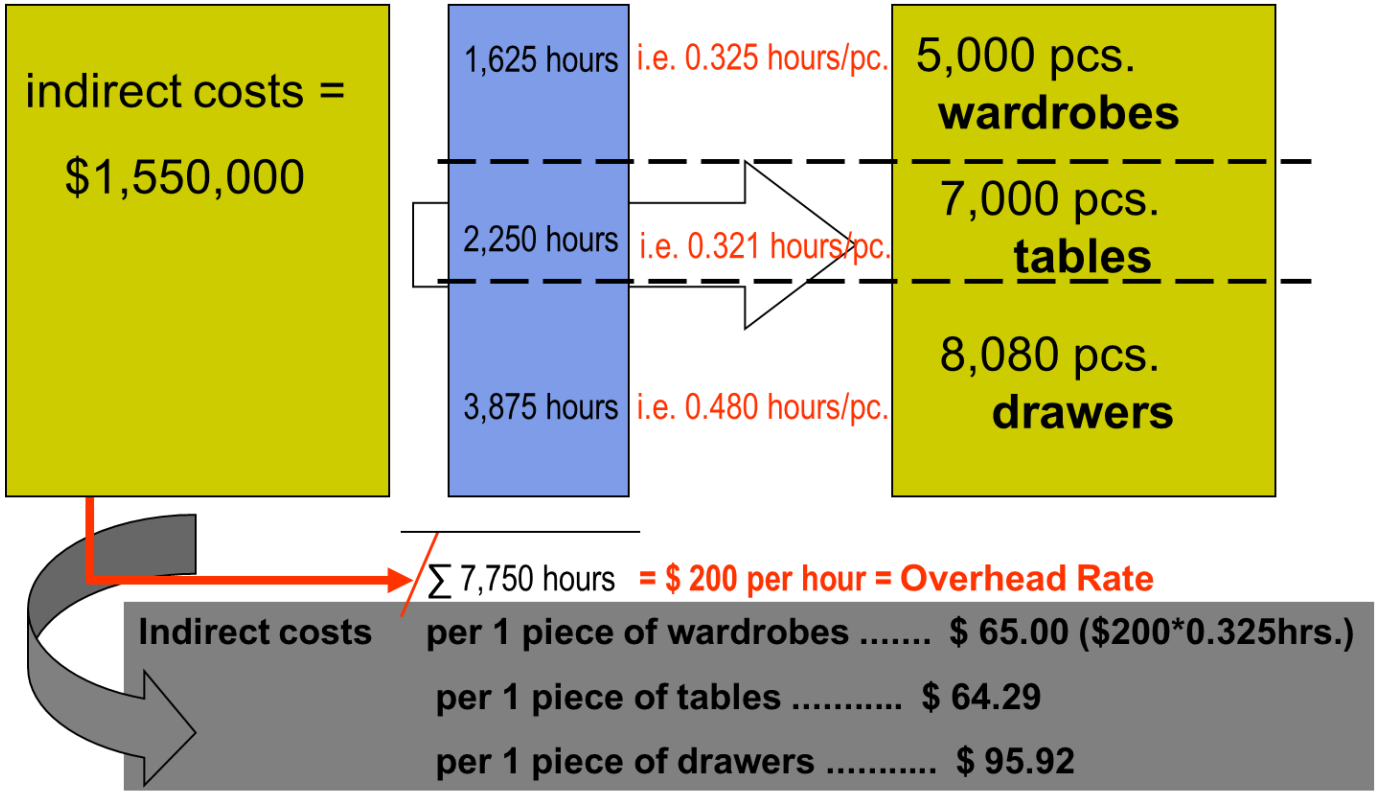
Plant-wide overhead rate (6/6)

How to assign cost to 1 unit of each product?

Alternative method of computation

Allocation base = direct labor hoursOutput



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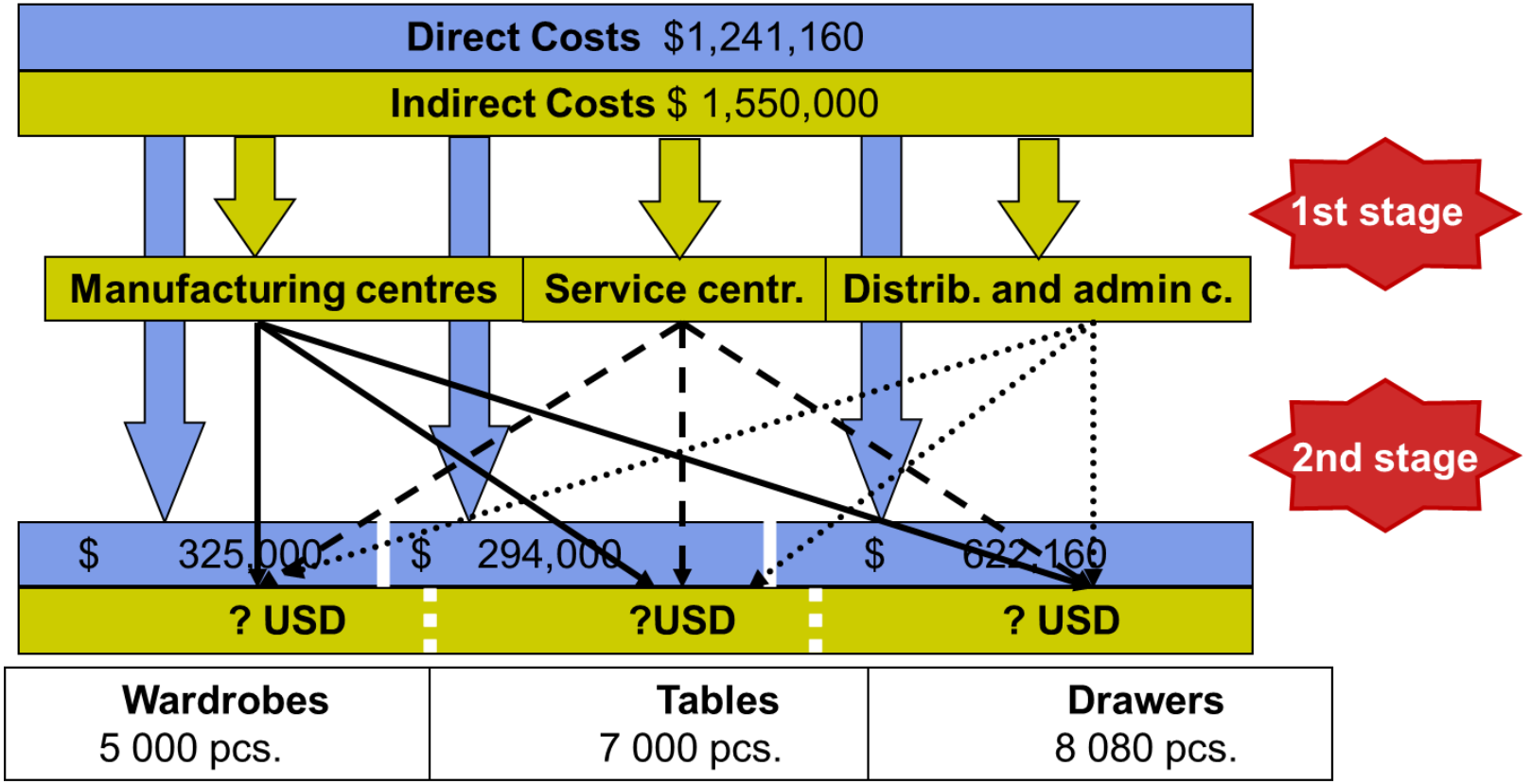
Two-stage Allocation Process

IN general

Indirect costs



Wardrobes	Tables	Drawers
5 000 pcs.	7 000 pcs.	8 080 pcs.

How to assign indirect cost?

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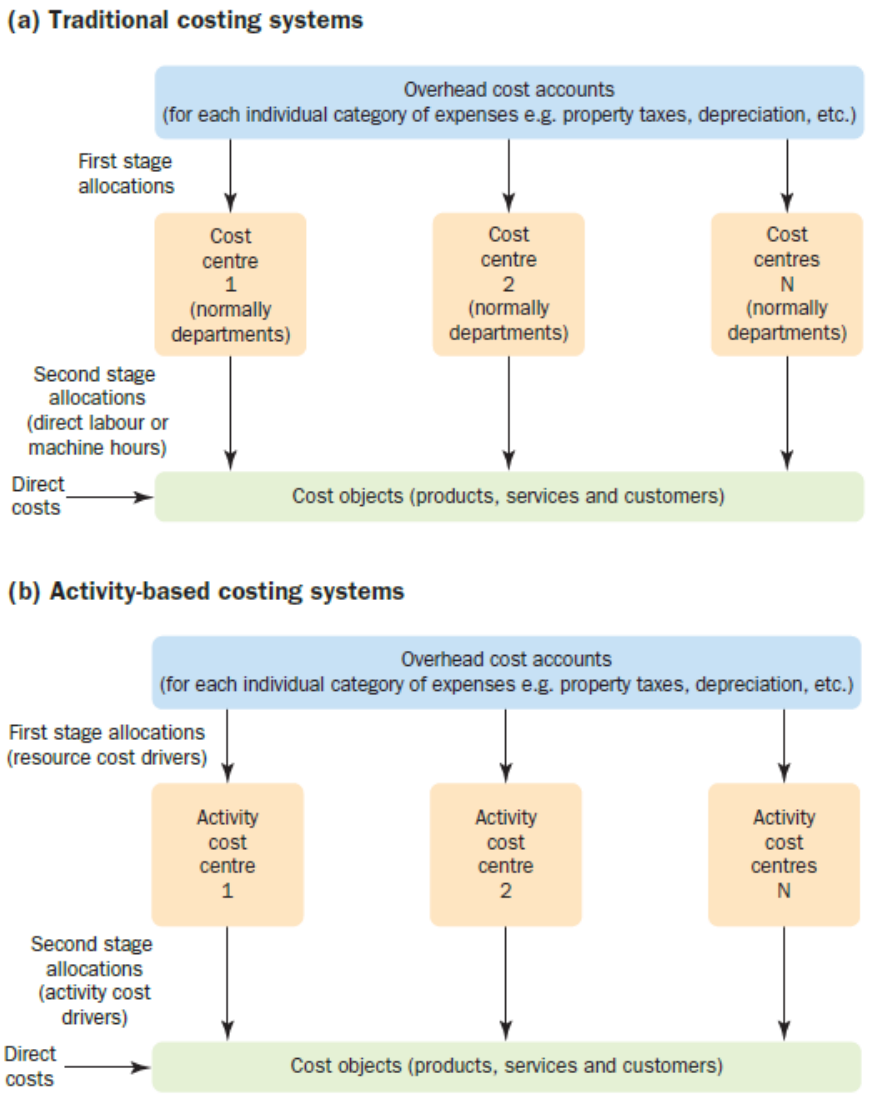
Two-stage allocation process

FIGURE 3.3
An illustration of the two-stage allocation process for traditional and activity-based costing systems



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Allocation bases (=cost drivers)

A survey of 170 companies by Drury and Tayles (2005) reported the following details in terms of the number of cost centres and number of different types of second stage allocation bases/cost drivers used:

Number of cost centres	*Number of different types of cost drivers*
14% used less than 6 cost centres	34% used 1 cost driver
21% used 6–10 cost centres	25% used 2 cost drivers
29% used 11–20 cost centres	31% used 3–10 cost drivers
36% used more than 20 cost centres	10% used more than 10 cost drivers

The percentages below indicate how frequently different cost allocation bases/cost drivers are used. Note that the reported percentages exceed 100 per cent because many companies used more than one allocation base.

	Norway[a]	*Holland*[b]	*Ireland*[c]	*Australia*[d]	*Japan*[d]	*UK*[e]	*UK*[e]
Direct labour hours/cost	65%	20%	52%	57%	57%	68%	73%
Machine hours	29	9	19	19	12	49	26
Direct material costs	26	6	10	12	11	30	19
Units of output	40	30	28	20	16	42	31
Prime cost				1	21		
Other	23	35	9				
ABC cost drivers						9	7

Notes
[a]Bjornenak (1997b)
[b]Boons *et al.* (1994)
[c]Clarke (1995)
[d]Blayney and Yokoyama (1991)
[e]Drury *et al.* (1993) – The first column relates to the responses for automated and the second to non-automated production centres.

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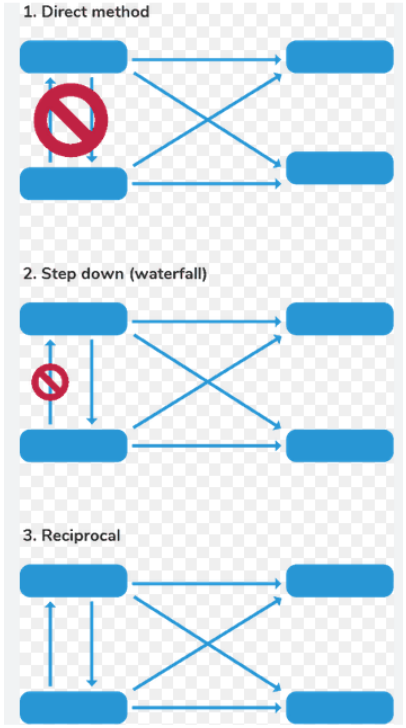
Multistage Allocation Process

(= Reallocation of Service cost centers)

What if the service department provides services not only to the production departments?

- Incorporating service department relations into the allocation
- Repeated distribution method
- Simultaneous equation method
- Step allocation
- Direct allocation



		Production departments			Service departments		
	Line	*X*	*Y*	*Z*	*1*	*2*	*Total*
1	Allocation as per overhead analysis	48000	42000	30000	14040	18000	152040
2	Allocation of service department 1	2808 (20%)	5616 (40%)	4212 (30%)	(14040)	1404 (10%) 19404	
3	Allocation of service department 2	7762 (40%)	3881 (20%)	3880 (20%)	3881 (20%)	(19404)	
4	Allocation of service department 1	776 (20%)	1552 (40%)	1165 (30%)	(3881)	388 (10%)	
5	Allocation of service department 2	154 (40%)	78 (20%)	78 (20%)	78 (20%)	(388)	
6	Allocation of service department 1	16 (20%)	31 (40%)	23 (30%)	(78)	8 (10%)	
7	Allocation of service department 2	4 (40%)	2 (20%)	2 (20%)	—	(8)	
8	Total overheads	59520	53160	39360	—	—	152040

EXAMPLE 3A.1

A company has three production departments and two service departments. The overhead analysis sheet provides the following totals of the overheads analysed to production and service departments:

		(£)
Production department	X	48000
	Y	42000
	Z	30000
Service department	1	14040
	2	18000
		152040

The expenses of the service departments are apportioned as follows:

	Production departments			*Service departments*	
	X	*Y*	*Z*	*1*	*2*
Service department 1	20%	40%	30%	—	10%
Service department 2	40%	20%	20%	20%	—

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Service Departments (Centres)

An **operating department** carries out the central purpose of the organization

Production Department

Service departments do not directly engage in operating activities

Accounting department
Human Resources department
Maintenance
ICT ...

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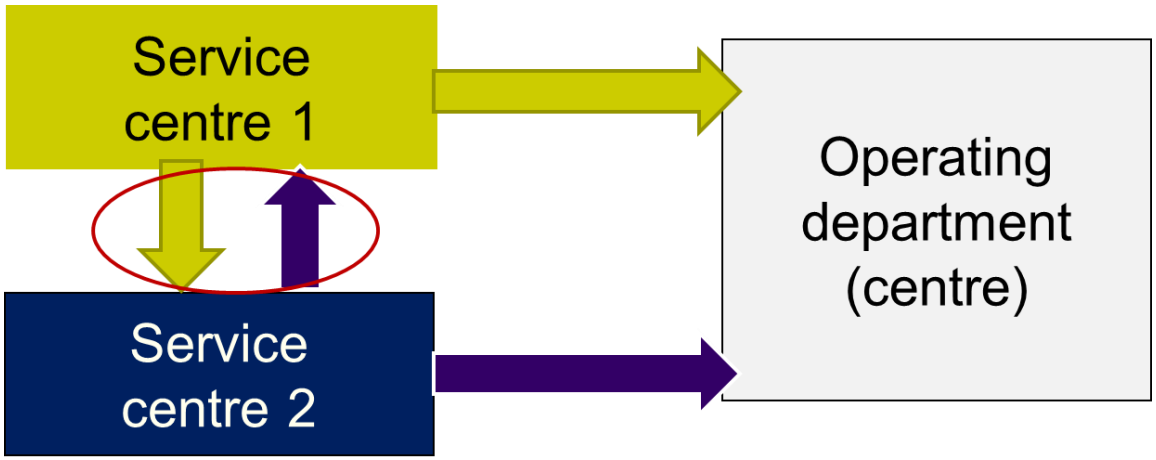
Reciprocal services

– When service departments provide services to each other - see



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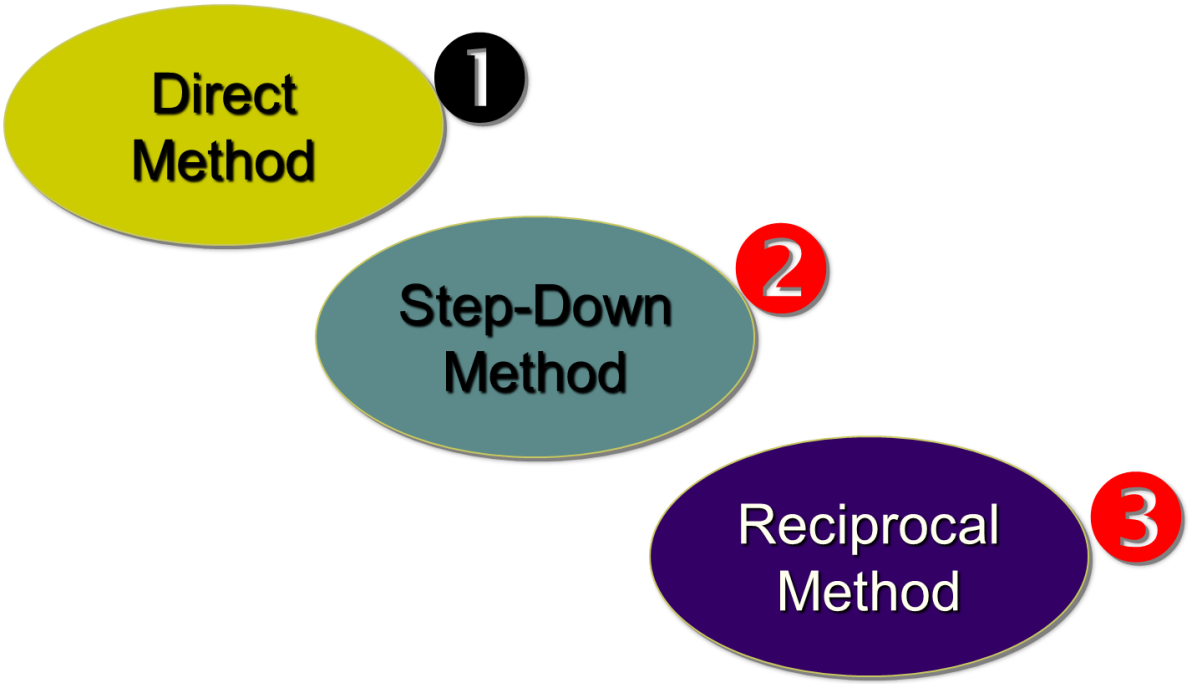
Allocation of service departmental cost



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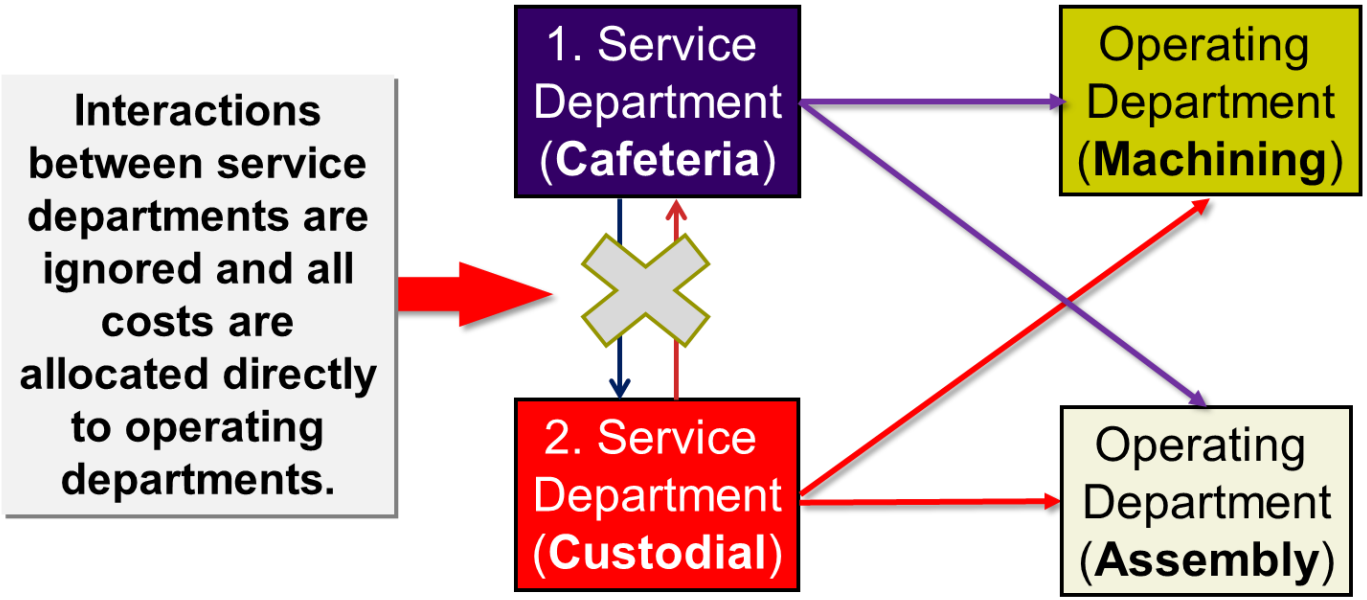
Multistage Allocation Process

using Direct method for reallocation of service cost centers

Direct Method
(An example from a manufacturing company)



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Direct Method
(An example from a manufacturing

	Service Departments		Operating 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

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Direct Method
(An example from a manufacturing company)

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

How much of the Cafeteria and Custodial costs should be allocated to each operating department using the direct method of cost allocation?

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Direct Method
(An example from a manufacturing company)

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

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

Allocation base: Number of employees

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Direct Method
(An example from a manufacturing company)

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

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

Allocation base: Number of employees

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Direct method – an example

	Service Departments		Operating Departments	
	Cafeteria	Custodial	Machining	Assembly
Departmental costs before allocation	$ 360,000	$ 90,000	$ 400,000	$ 700,000
Cafeteria allocation	(360,000)		144,000	216,000
Custodial allocation		(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

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Direct method – an example

	Service Departments		Operating Departments	
	Cafeteria	Custodial	Machining	Assembly
Departmental costs before allocation	$ 360,000	$ 90,000	$ 400,000	$ 700,000
Cafeteria allocation	(360,000)		144,000	216,000
Custodial allocation		(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

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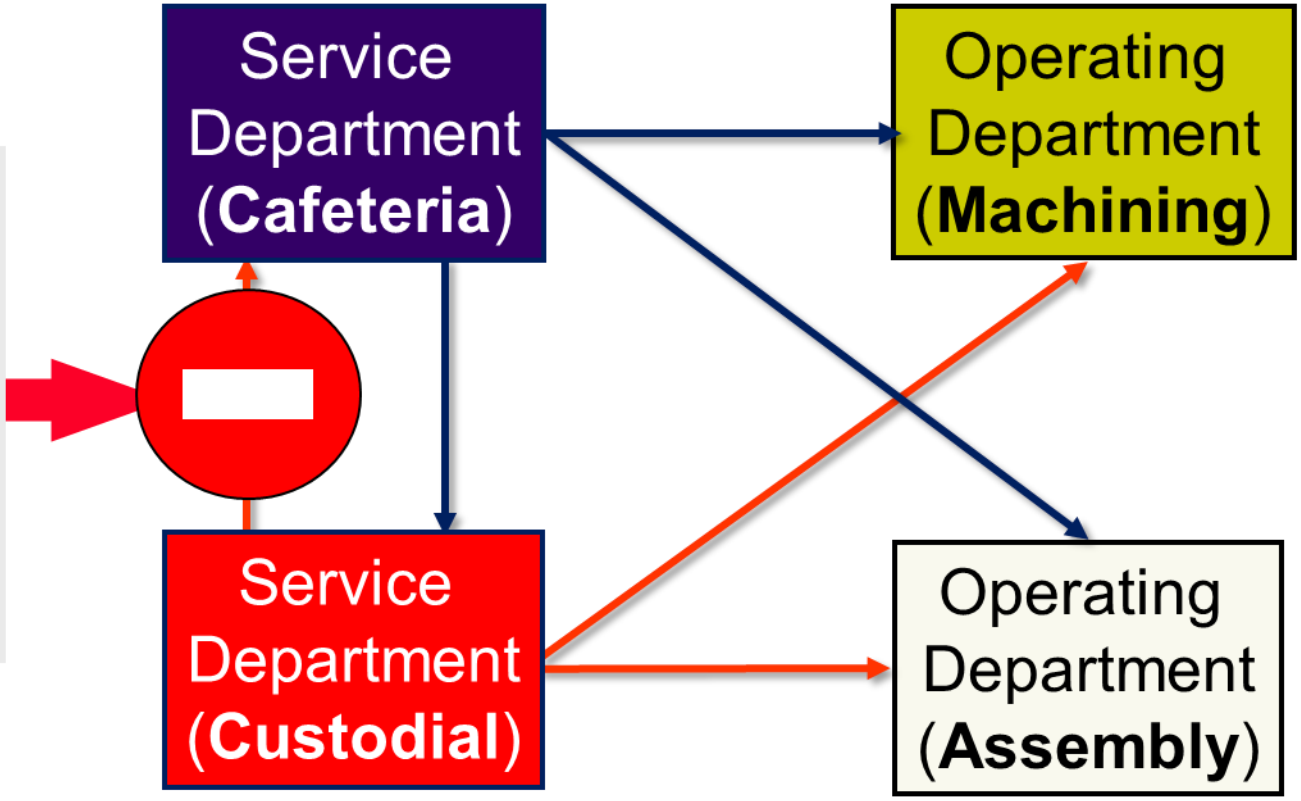
Multistage Allocation Process

using Step-down method for reallocation of service cost centers

Step-Down method

Once a service department's costs are allocated, other service department costs are not allocated back to it.



Step-Down Method – An Example

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

	Service Departments		Operating 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

Step-Down Method – An Example

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

Allocate Cafeteria costs first because it provides more service than Custodial.

Step-Down Method – An Example

	Service Departments		Operating 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	$ 0	?	?	?

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

Allocation base: Number of employees

Step-Down Method – An Example

	Service Departments		Operating 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	$ 0	?	?	?

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

Allocation base: Number of employees

Step-Down Method – An Example

	Service Departments		Operating 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	$ 0	?	?	?

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

Allocation base: Number of employees

Step-Down Method – An Example

	Service Departments		Operating 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	$ 0	?	?

New total = $90,000 original Custodial cost
+ $60,000 allocated from the Cafeteria.

Step-Down Method – An Example

	Service Departments		Operating 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)	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

Step-Down Method – An Example

	Service Departments		Operating 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)	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

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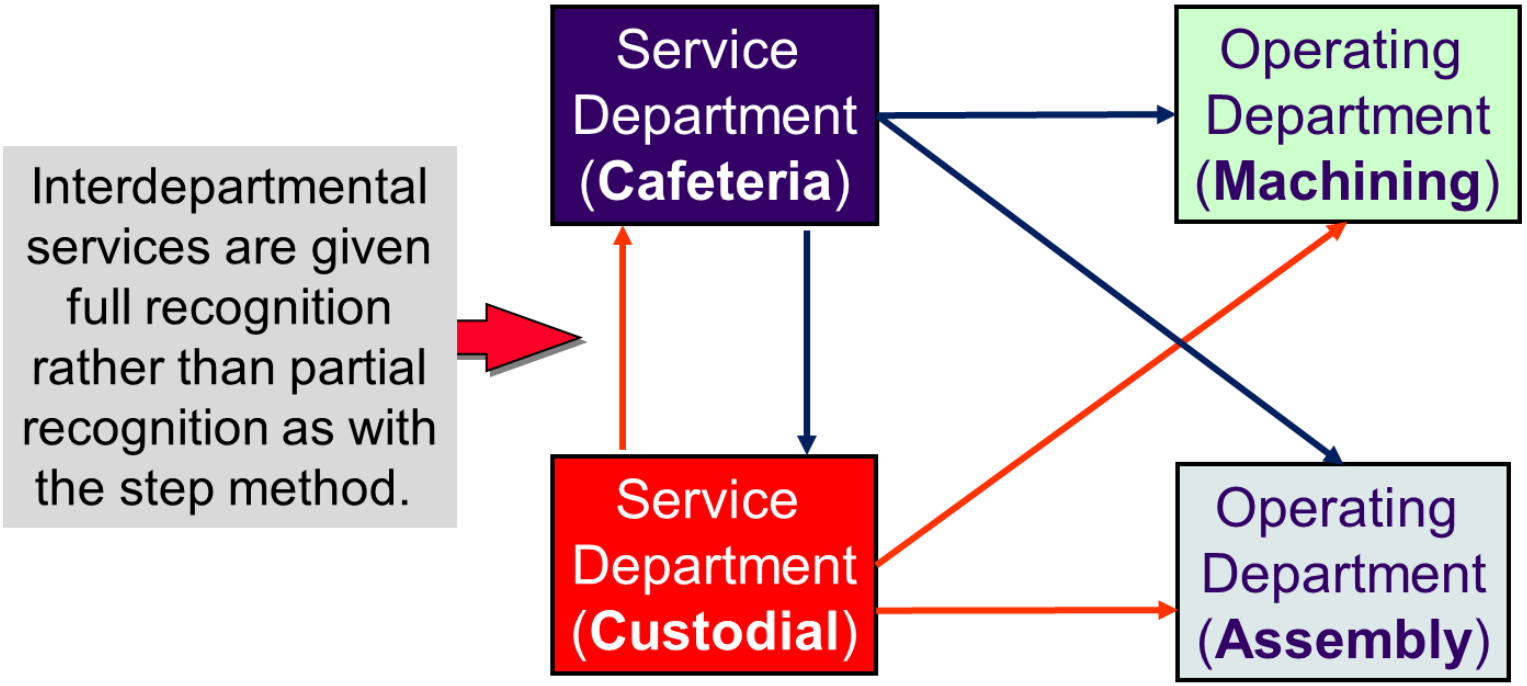
Multistage Allocation Process

using Reciprocal method for reallocation of service cost centers

Reciprocal method



Because of its mathematical complexity, the reciprocal method is rarely used. Why?☹☹☹

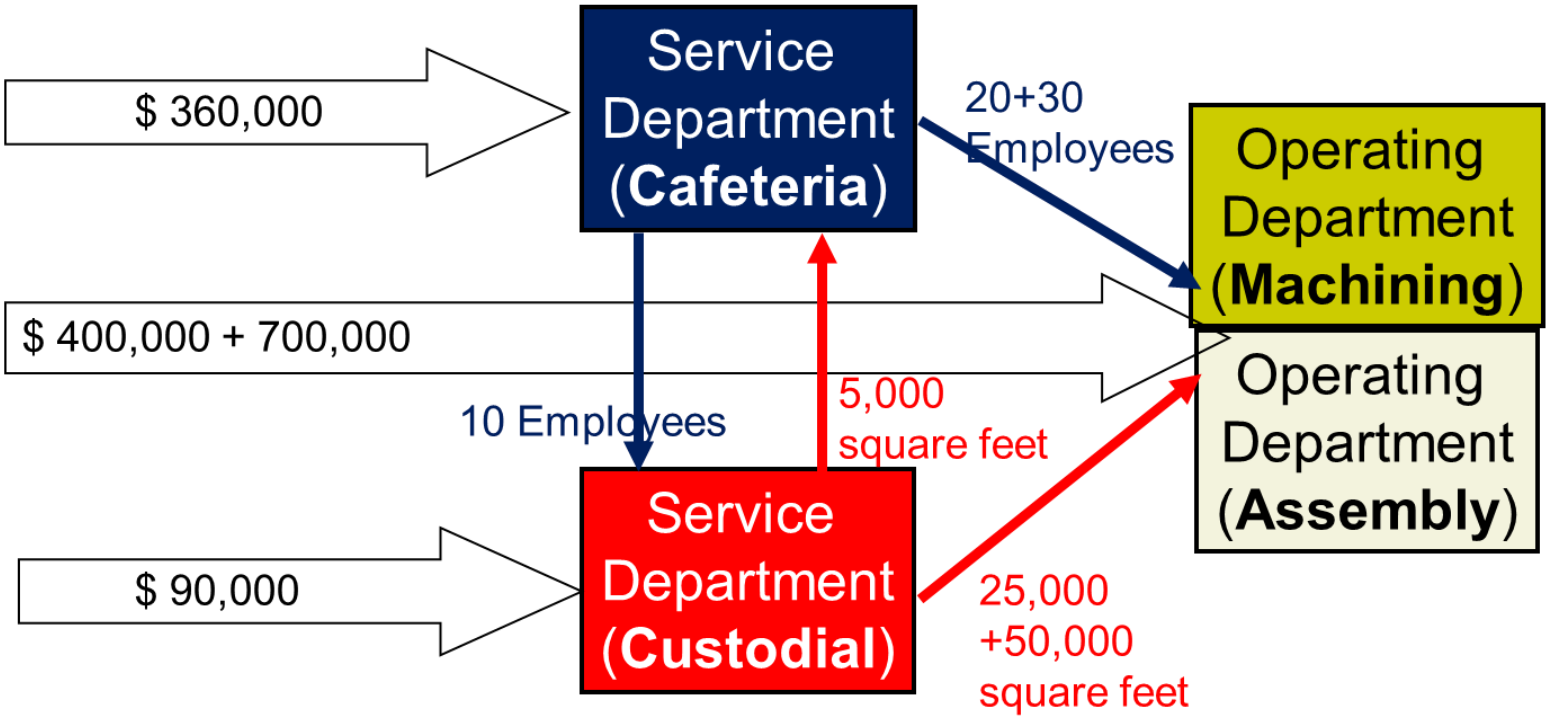
Reciprocal method – an example

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

	Service Departments		Operating 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

Reciprocal method – an example



Cafeteria: $360,000 + 5,000 * RateCustodial = 60 * RateCafeteria

Custodial: $90,000 + 10 * RateCafeteria = 80,000 * RateCustodial

Reciprocal method – an example

Cafeteria: 360,000 + 5,000 * RateCustodial = 60 * RateCafeteria
Custodial: 90,000 + 10 * RateCafeteria = 80,000 * RateCustodial

Cafeteria: -60 * RateCafeteria + 5,000 * RateCustodial = -360,000
Custodial: 10 * RateCafeteria - 80,000 * RateCustodial = - 90,000

$$\begin{pmatrix} -60 & 5{,}000 \\ 10 & -80{,}000 \end{pmatrix} * \begin{pmatrix} RateCafeteria \\ RateCustodial \end{pmatrix} = \begin{pmatrix} -360{,}000 \\ -90{,}000 \end{pmatrix}$$

$$A * r = b$$
$$A^{-1} * A * r = A^{-1} * b$$
$$r = A^{-1} * b$$

RateCafeteria = $ 6,157.895 per Employee
RateCustodial = $ 1.8947 per Square foot

Reciprocal method – an example

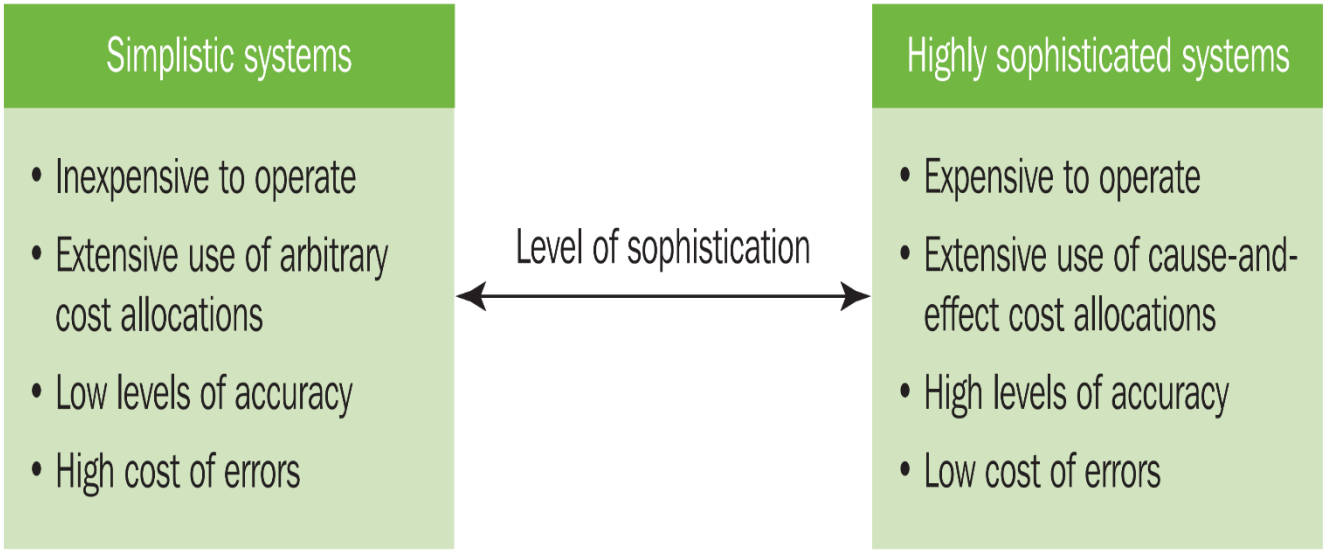
	Service Departments		Operating Departments	
	Cafeteria	Custodial	Machining	Assembly
Departmental costs before allocation	$ 360,000	$ 90,000	$ 400,000	$ 700,000
Cafeteria allocation	(369,474)	61,579	123,158	184,737
Custodial allocation	9,474	(151,579)	47,368	94,737
Total after allocation	$ 0	$ 0	$ 570,526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

$ 1.8947 per Square foot x 25,000

Allocation base: Square feet occupied

CONCLUSIONS

- Pros and Cons
  of more accurate methods



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