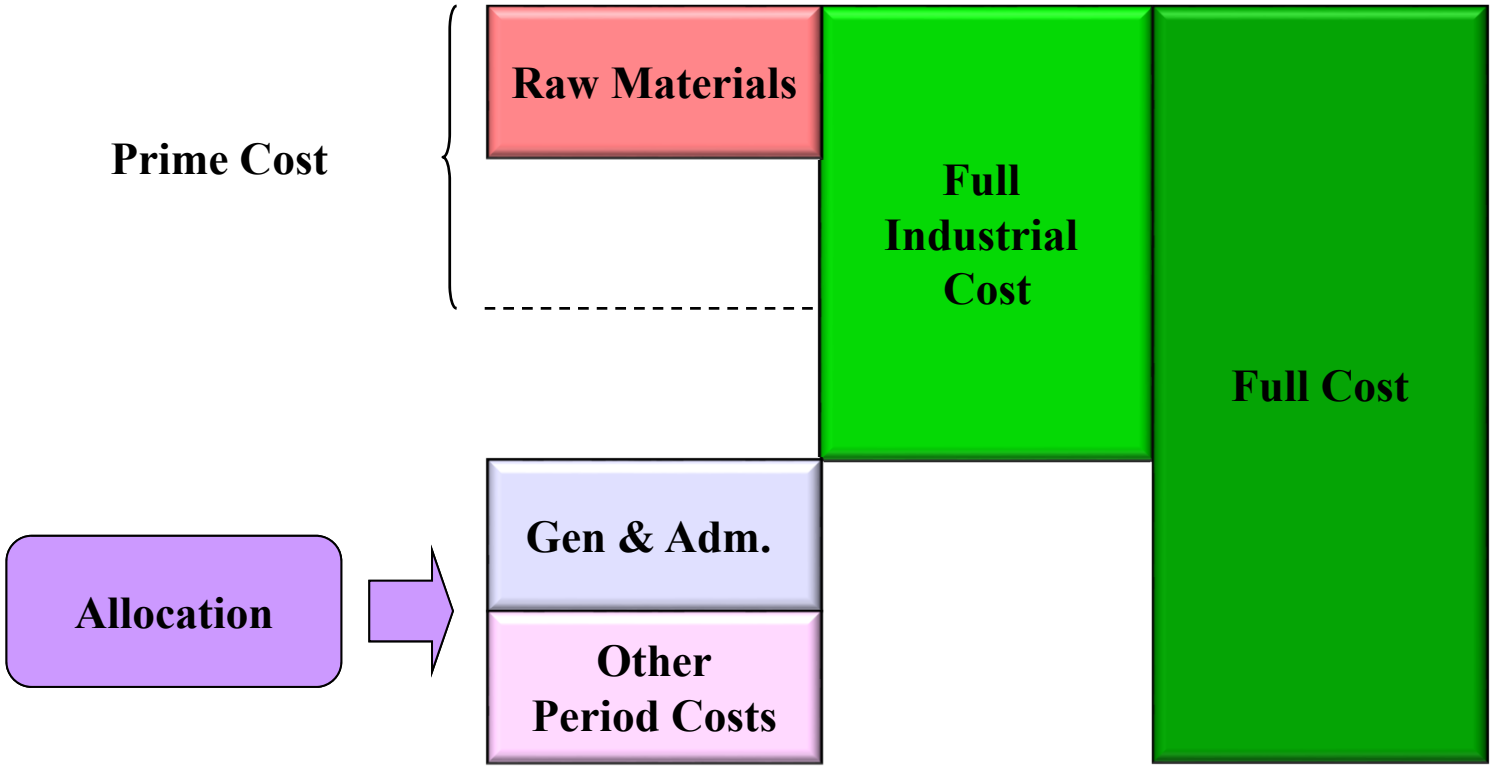
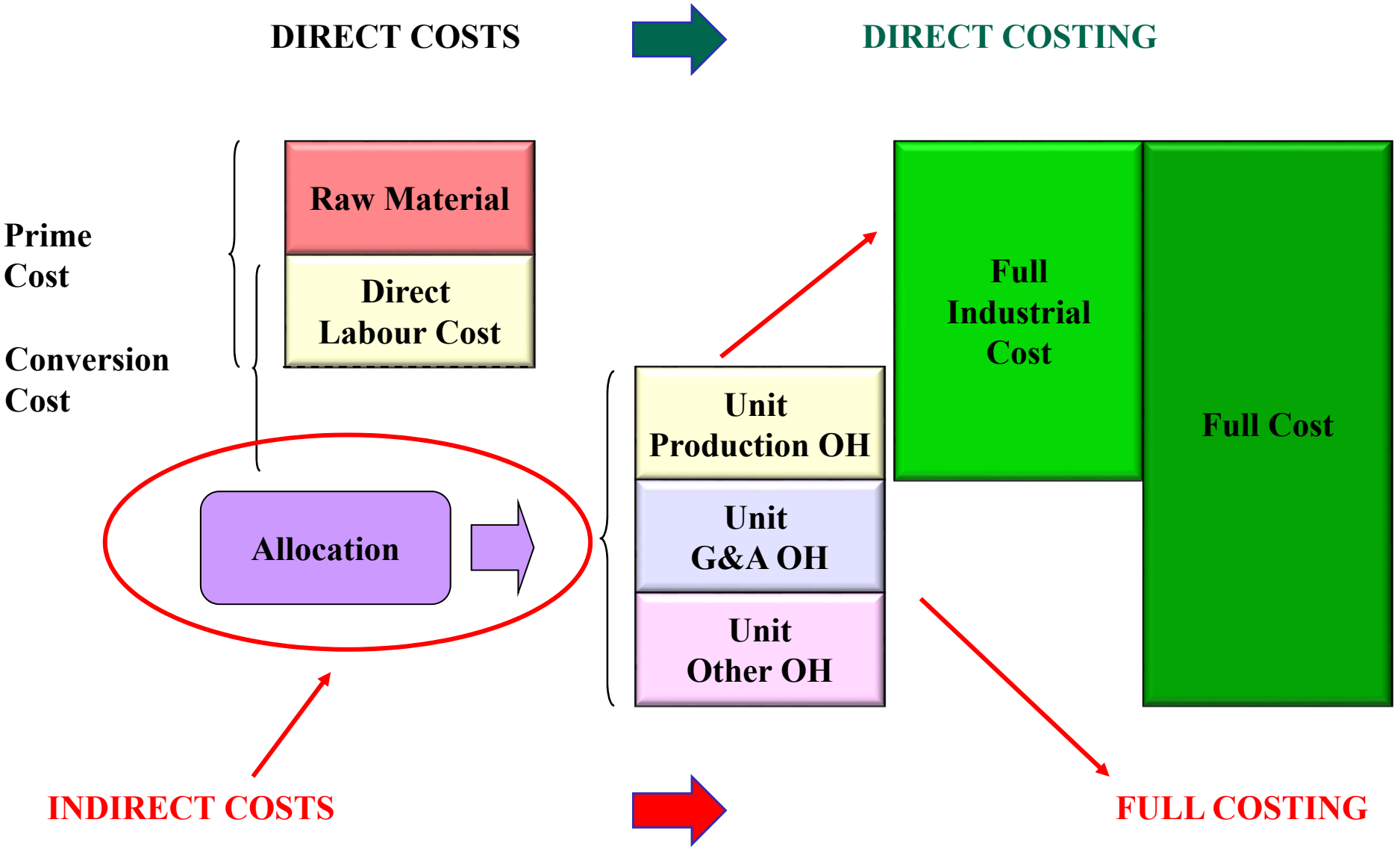
Agenda

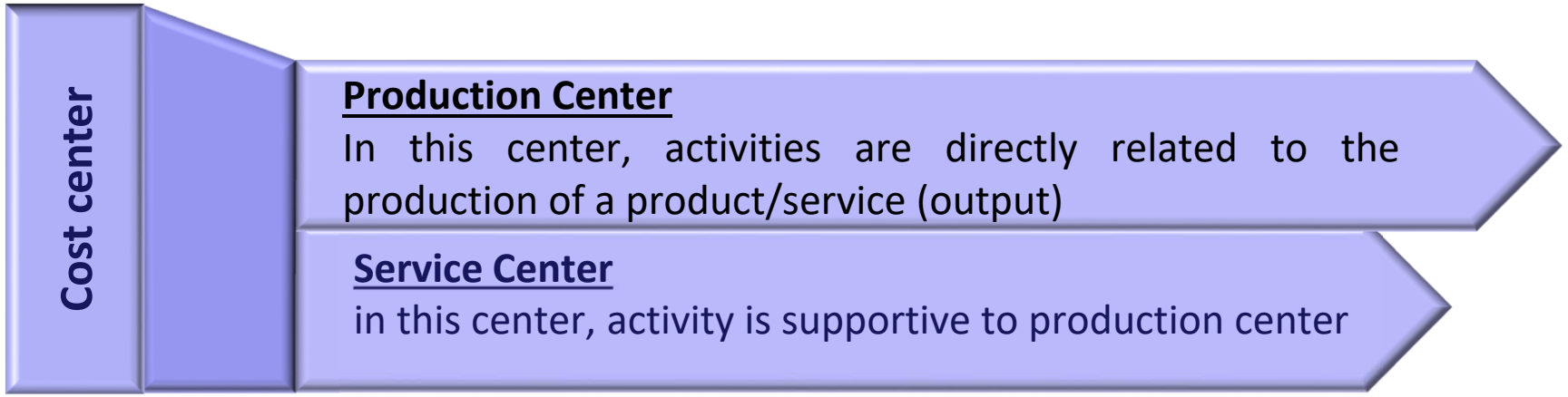
- Introduction
- Costs: definition and classification
- Costing


Prime Cost
Raw Materials
Full Industrial Cost
Full Cost
Gen & Adm.
Other Period Costs
Allocation


DIRECT COSTS
DIRECT COSTING
Prime Cost
Conversion Cost
Raw Material
Direct Labour Cost
Allocation
Unit Production OH
Unit G&A OH
Unit Other OH
Full Industrial Cost
Full Cost
INDIRECT COSTS
FULL COSTING

Terminology

Cost/Expense Center
is a pool on the basis of which you can accumulate the cost of an activity

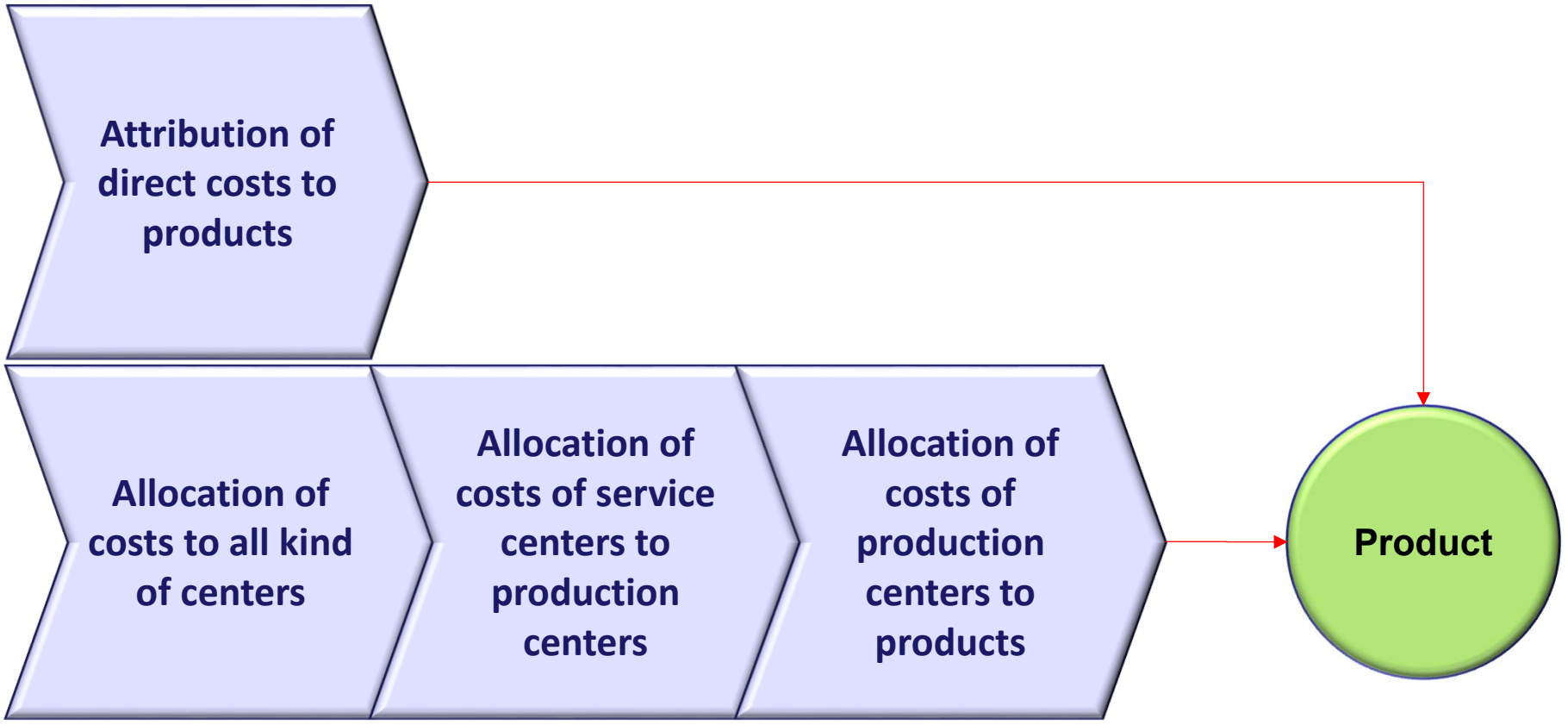


Cost are assigned to cost object but, more correctly, they are:
Attributed (direct costs)
Allocated (indirect costs);

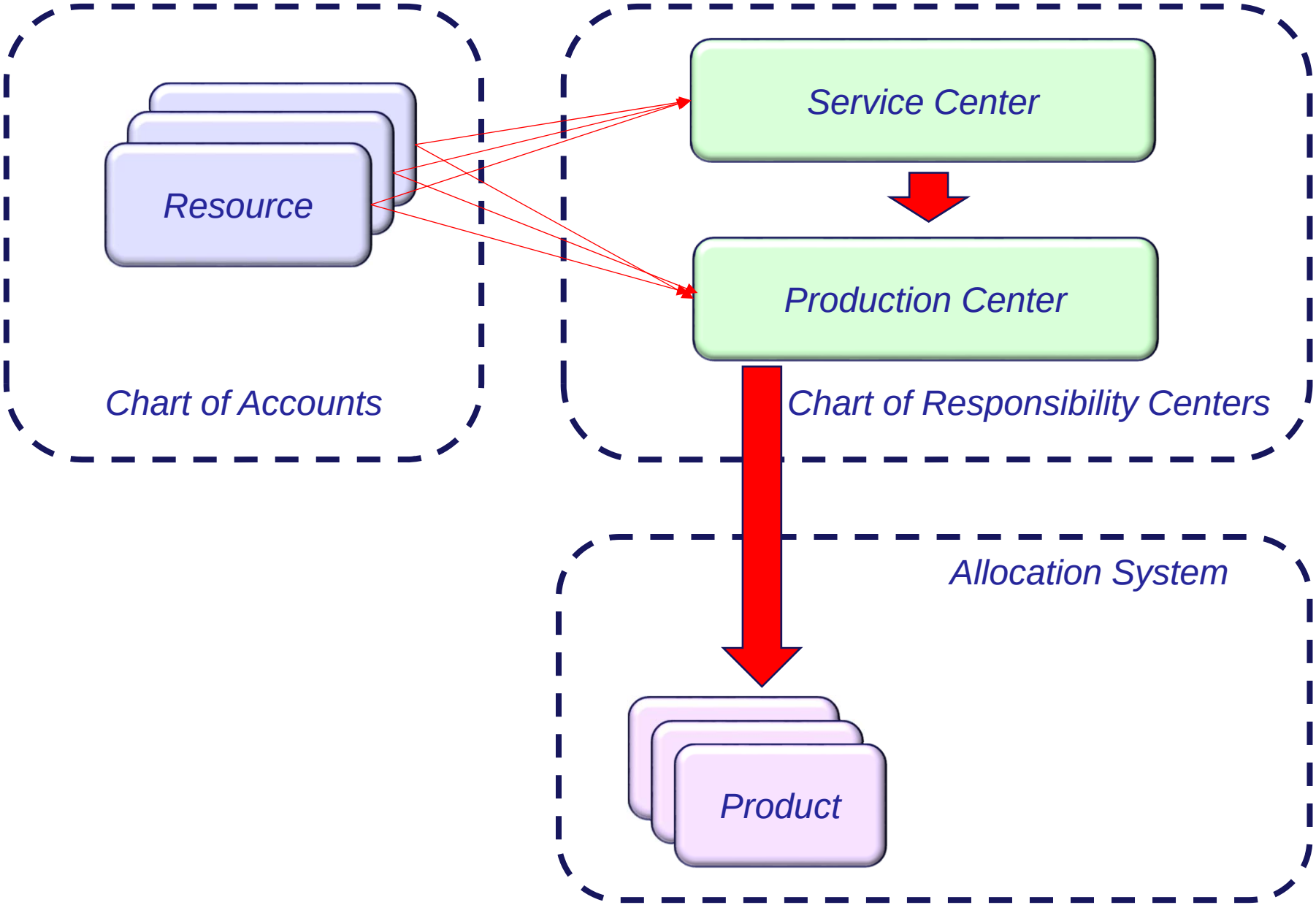
Direct and Indirect Cost: issues and methodology

The most critical issue in costs determination is represented by the presence of **costs that are not directly** linked to products because:

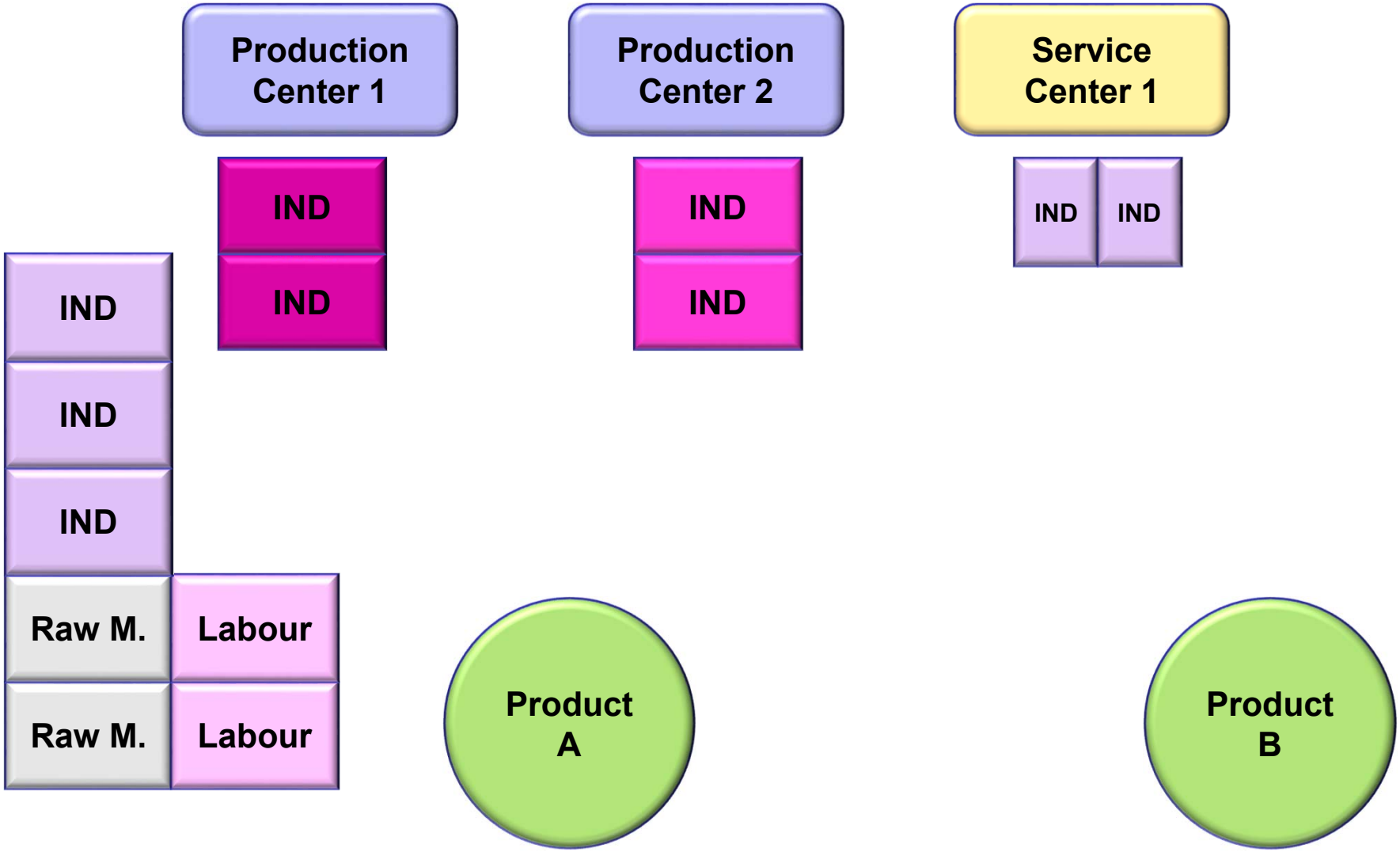
- They arise in a specific moment but affecting **very long period of time**;
- They interest **jointly more products**;



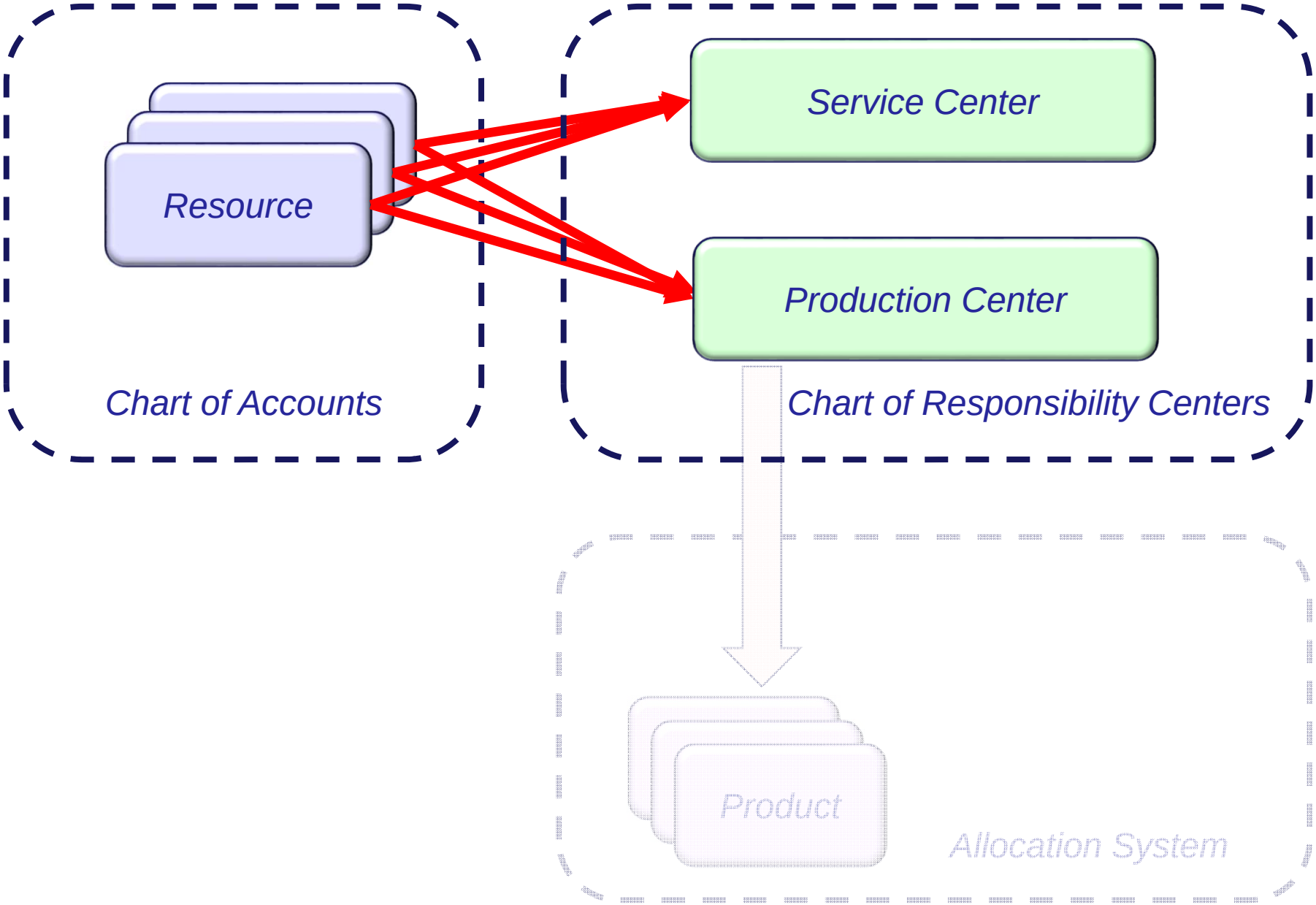
Allocation Process



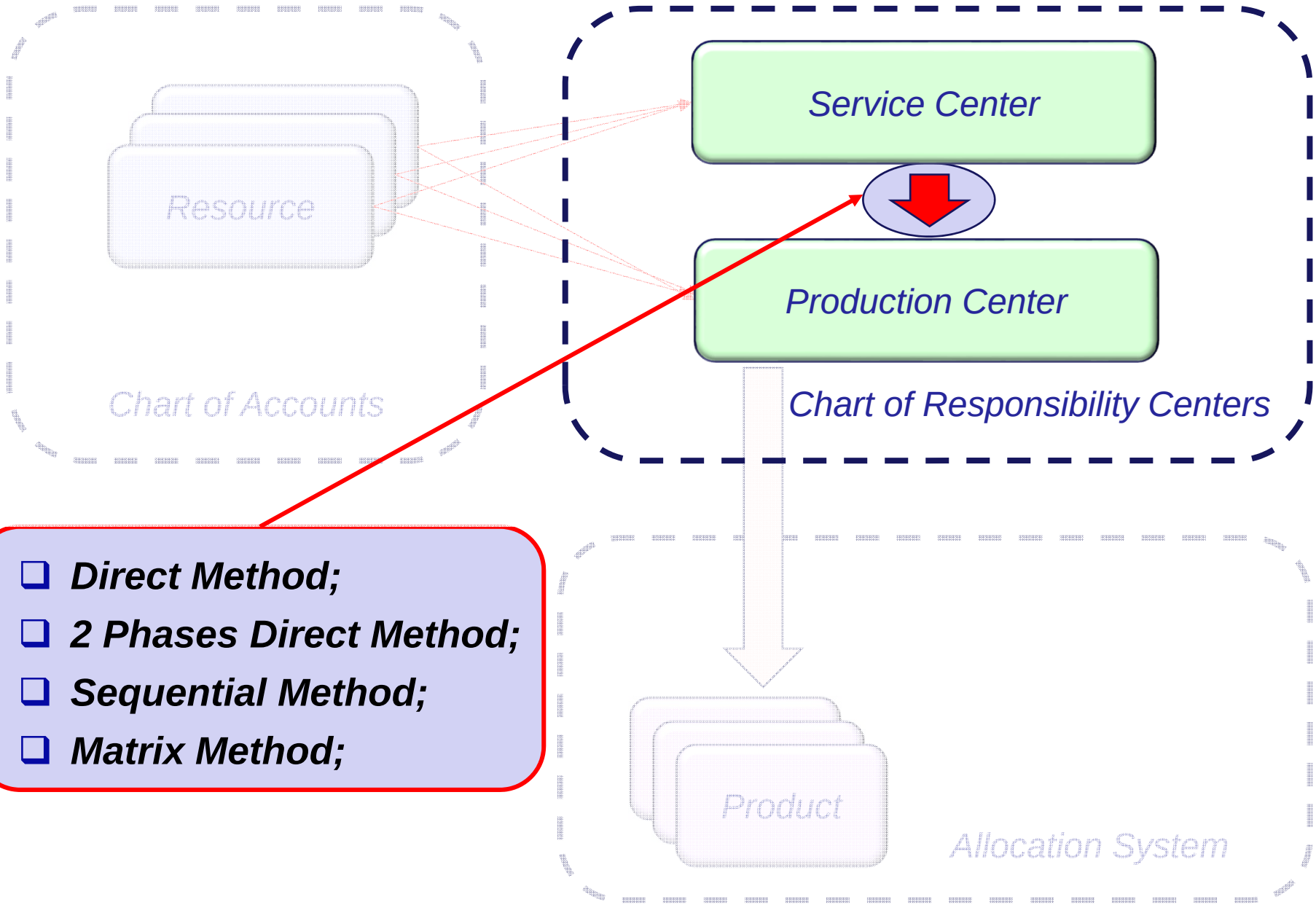
Conceptual Scheme



Process: Step 1



Process: Step 2



- ***Direct Method;***
- ***2 Phases Direct Method;***
- ***Sequential Method;***
- ***Matrix Method;***

Exercise 3

In a Company, there are 2 Departments and 2 Service Centers (HR, Legal). Costs are related to Personnel Management and Electricity.

Use all the methods to determine Production Center Costs.

	Dep. 1	Dep. 2	Legal	Pers.	TOT
Electricity Consumption	100	135	5	10	**250**
N. Workers	10	12	1	2	**25**

	Cost (€)
Electricity	200.000
Personnel mgmt	150.000

	Dep. 1	Dep. 2	Legal	Pers.
Dep. 1	*	*	30%	40%
Dep. 2	*	*	10%	48%
Legal	*	*	0%	4%
Personnel	*	*	60%	8%

Direct Method

This method forgets exchanges between Service Centers and, consequently, the costs of the Service Centers are allocated only on the basis of the consumption by the Production Centers.

For each Production Center k, cost of Service Center j is allocated on the following bases:

$$P_{jk} = S_j \cdot \frac{IP_{jk}}{\sum_{k=1}^{P} IP_{jk}}$$

$$P_k = \sum_{j=1}^{S} P_{jk}$$

Terminology:

- S_j : *Cost of Service Center j;*
- IP_{jk} : *Use of the Service Center j by Production Center k;*
- IS_{jk} : *Use of the Service Center j by Service Center k;*
- P_{jk} : *Cost of Service Center j allocated to Production Center k*

2 Phases Direct Method

- In a first phase, Service Center costs are shared with all centers (centers of Production and Service) on the basis of the following formula:

$$S'_{jk} = S_j \cdot \frac{IS_{jk}}{\sum_{k=1}^{P} IP_{jk} + \sum_{t=1}^{S} IS_{jt}}$$

$$S'_j = \sum_{k=1}^{S} S'_{kj}$$

- In a second phase, costs of the service centers are allocated using direct method.

$$P''_{jk} = S'_j \cdot \frac{IP_{jk}}{\sum_{k=1}^{P} IP_{jk}}$$

$$P_k = \sum_{j=1}^{S} P''_{jk} + \sum_{j=1}^{S} P'_{jk}$$

Sequential Method

- We start selecting a particular service center (j) that presents the biggest difference between the services offered and those absorbed (**Net Interchange**) and we can ignore its absorbtions (IS_{jk} that are all k values).
- Then we use allocation based on the formula:

$$S_{jk} = S_j \cdot \frac{IP_{jk}}{\sum_{k=1}^{P} IP_{jk} + \sum_{t=1}^{S} IS_{jt}}$$

- We repeat the process, eliminating the service center already taken into consideration.

Matrix Method

- It takes account of all the interchanges between centers.
- First solving the following system:

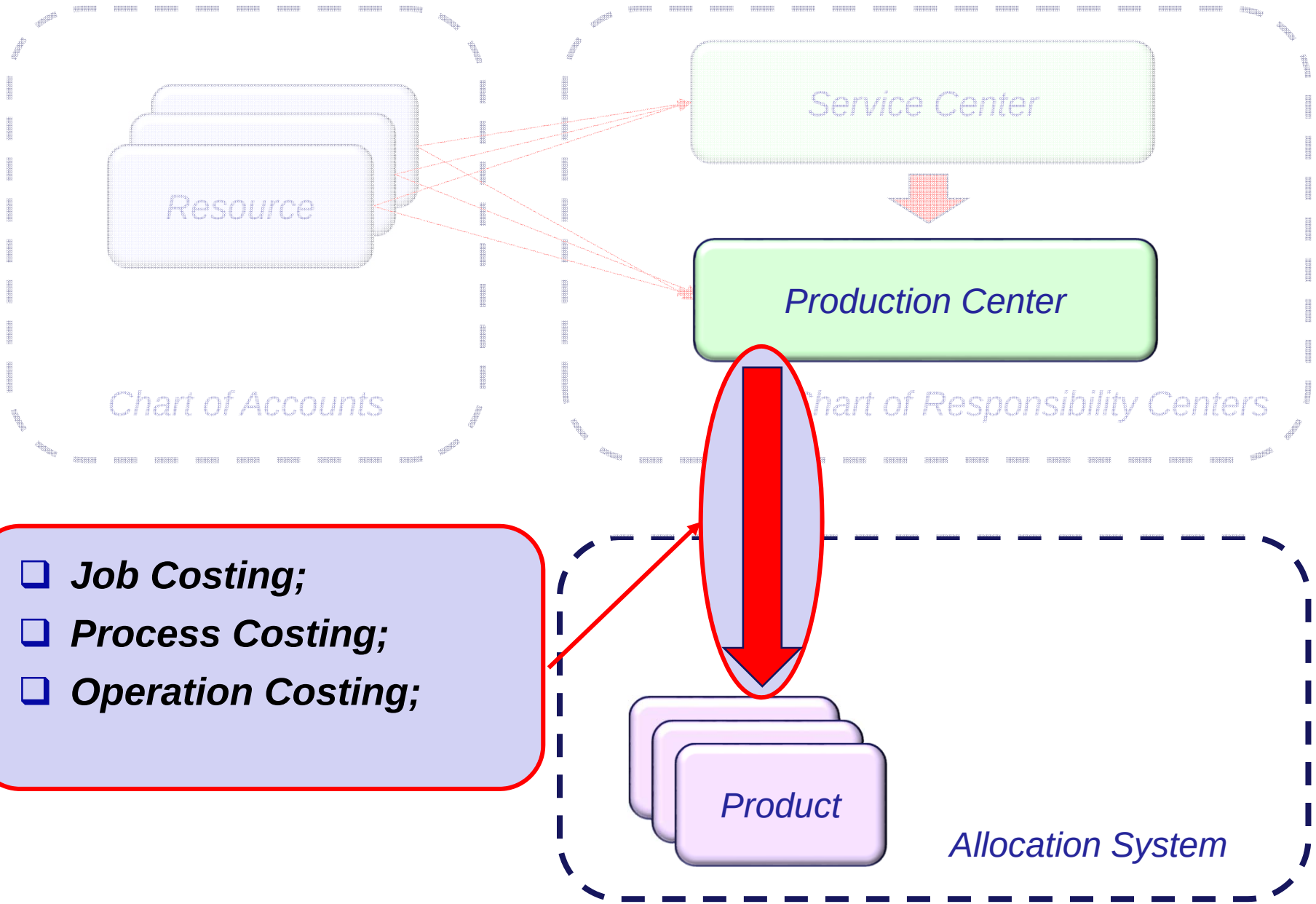
$$S_j^* = S_j \cdot + \sum_{k=1}^{S} x_{jk} \cdot S_k^*$$

- And then, allocating S_j^* cost using the original matrix

Considerations

Method	Department 1	Department 2
Direct	*156.591*	*193.409*
2 Phases Direct	*155.055*	*194.945*
Sequential	*154.818*	*195.182*
Matrix	*154.955*	*195.045*

Process: Step 3



- ***Job Costing;***
- ***Process Costing;***
- ***Operation Costing;***

Job Costing

It uses the job as the basis for cost allocation (**job order**) and costs of the production of each job are recorded on a card, as follow:

- **direct materials** are evaluated on the basis of **actual consumption** and **related costs**;
- **Labour** on the basis of the **actual use of time** and **related cost**;
- **Indirect costs** are **allocated** in relation to the use of a factor of production (generally **Labour**) by the job.

Unit costs are obtained by dividing the **total costs** derived from the card over the **batch quantity.**

Exercise 4 - Job Order Costing

Period: week 43

JOB		Direct Labour		Raw Materials
101	€	2.000,00	€	1.500,00
102	€	3.000,00	€	2.500,00
	€	5.000,00		
Allocation Base (DL)				
General Expenses Amount	€	10.000,00		

It‘s a less precise and less expensive method, suitable for **single-product** production with **constant WIP**.

Hypothesis (at the moment):

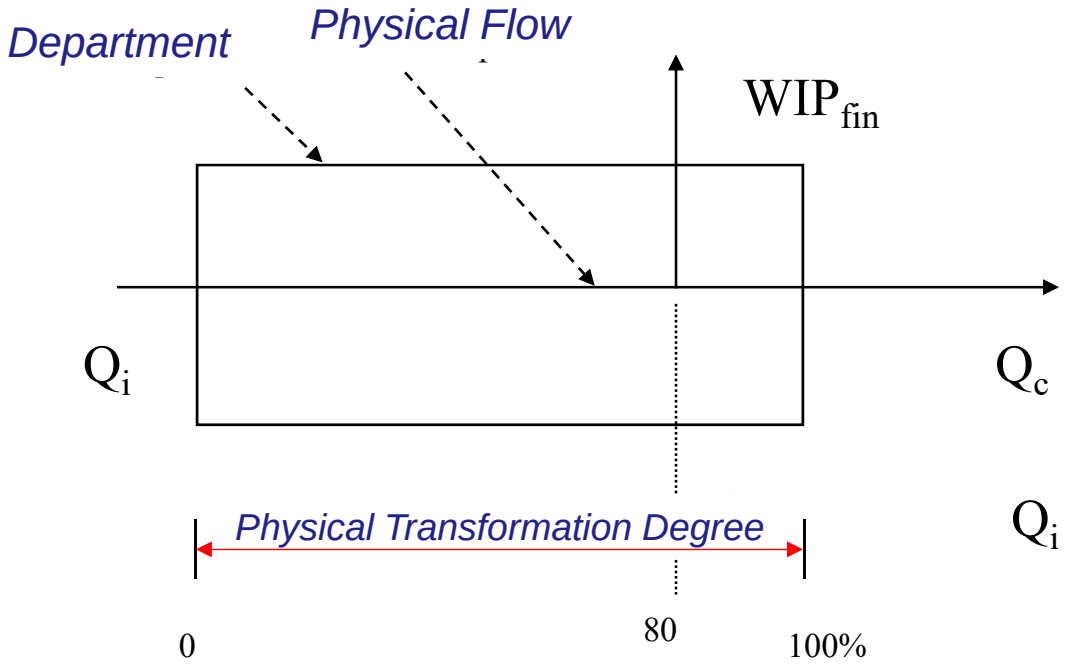
- *monoproduct Production*
- *Monodepartment Production*
- *Absence of WIP at the beginning and at the end of a period*
- *Unique cost pool (Raw Materials, Direct Labour and Overhead)*

In this case, the calculation of the unit cost of the product made in a given period is very simple:

$$c = \frac{\sum C_i}{\sum n_i}$$

Process Costing: WIP at the end of a period

Considering still valid hypothesis: single-product production, mono Department, absence of initial WIP, undifferentiated costs.



$$Q_i = Q_c + WIP_{fin}$$

To allocate costs between WIP and finished production, we must introduce the concepts of **completion degree** and **equivalent units**.

We need to introduce the concept of **equivalent units**, defined as the product of the **number of semi-finished unit in each stage** for the related **degree of completion**.

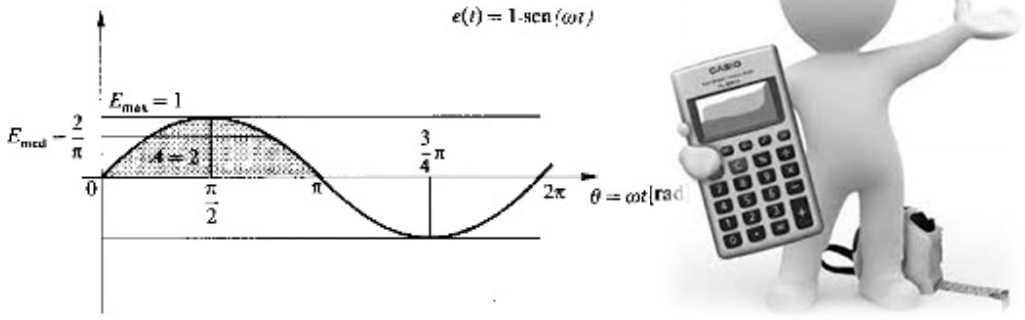
Using this concept, number of equivalent units is:

$$N_{eq} = Q_c + \sum_{j=1}^{N} WIP_{fj} * gc_{fj}$$

j = Phase

Process costing: average cost of products

- This method **doesn't distinguish between units (WIP_i) and units that start working in the period**: this is because it is assumed that it is not possible to identify the product flows within the process.
- **Raw materials and conversion costs associated with the initial WIP are incorporated in the costs incurred in the period** and distributed **over production** (= completed units and the final amount WIP) calculated on the basis of equivalent units.
- For this reason this method is also called **roll-back method**, as it redistributes the costs incurred in prior periods, and are already assigned to a particular cost object.



How to Calculate: average cost

- Take into consideration also cost incorporated in initial WIP and all the production

$$N_{eq} = Q_c + \sum_{1}^{N} q_{fj} * gc_{fj}$$

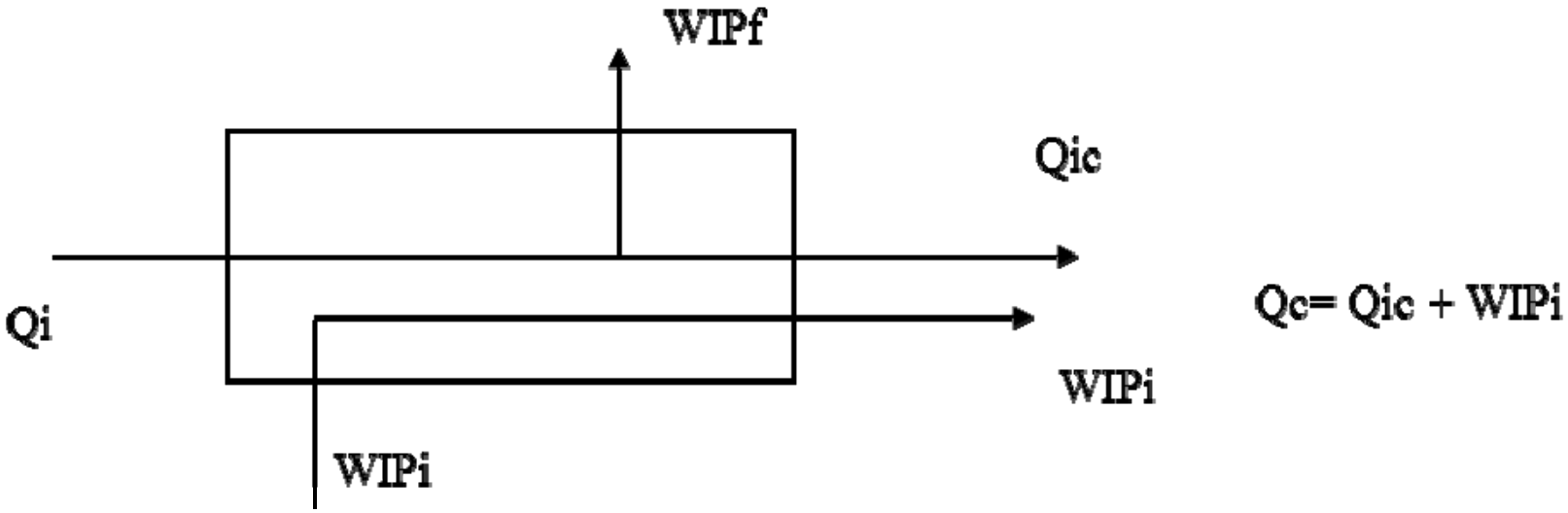
$$C_t = CA + CI$$

$$c = \frac{C_t}{N_{eq}}$$

CA = Added Costs in the Period; CI = Costs of initial WIP;
Qc = Completed quantity in the period

In this case, we assume that the **initial WIP** is **the first to be completed** during the considered period;

The following scheme represents the situation:



Costs incorporated in the initial WIP are not subject of re-allocation in the period considered.

We have **different costs for each production** (WIP and production of the period).

How to Calculate: Fifo Logic

- Take into consideration only production in the period

$$N_{eq} = Q_c + \sum_{1}^{N} WIP_{fj} * gc_{fj} - \sum_{1}^{N} WIP_{ij} * gc_{ij}$$

$$C_t = CA$$

$$c = \frac{C_t}{N_{eq}}$$

$$c_{t\ wip\ in} = \frac{c * WIP_j * (1 - gc_{ij}) + CI}{WIP_j}$$

CA = Added Costs in the Period; CI = Costs of initial WIP;
Qc = Completed quantity in the period

Exercise 5

WIP i	50 pieces
gc i	80%
CI	€ 4.000,00

WIP f	75 pieces
gc f	30%

Qc	10.000 pieces

CA	€ 120.000,00

How to Calculate: average cost

- Take into consideration also cost incorporated in initial WIP and all the production

$$N_{eq} = Q_c + \sum_{1}^{N} q_{fj} * gc_{fj}$$

$$C_t = CA + CI$$

$$c = \frac{C_t}{N_{eq}}$$

CA = Added Costs in the Period; CI = Costs of initial WIP; Qc = Completed quantity in the period

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How to Calculate: Fifo Logic

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$$C_t = CA$$

$$c = \frac{C_t}{N_{eq}}$$

$$c_{t\ wip\ in} = \frac{c * WIP_j * (1 - gc_{ij}) + CI}{WIP_j}$$

CA = Added Costs in the Period; CI = Costs of initial WIP; Qc = Completed quantity in the period

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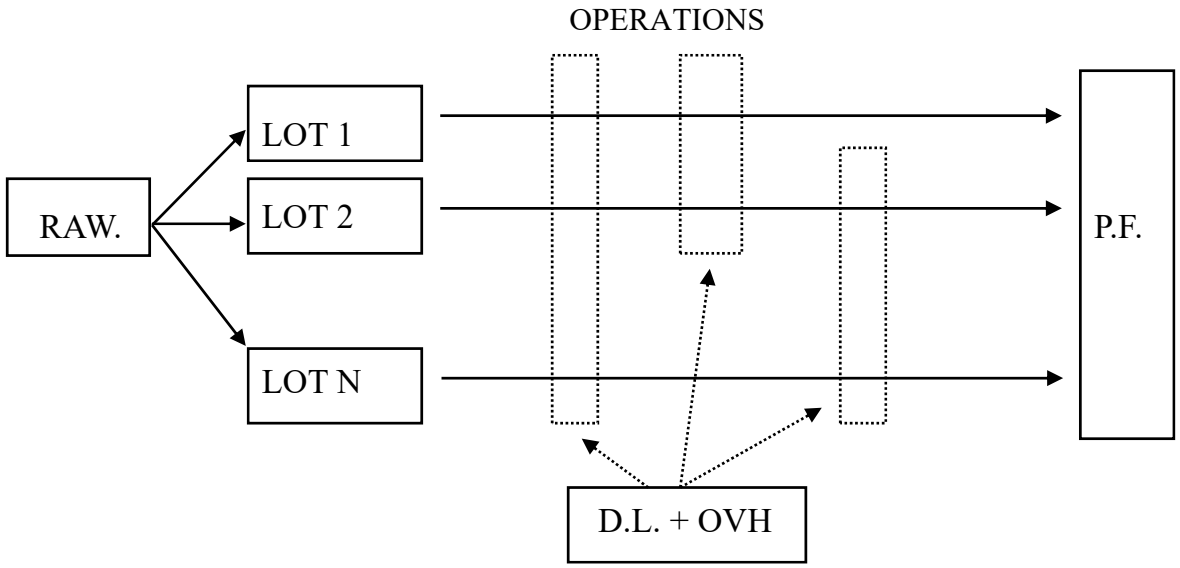
Process Costing: Multi product

- Seldom in a factory we produce just one product.

- For the allocation of costs it is necessary to know the relationship between resource consumption of each product: therefore we must introduce a **coefficient of equivalence** between the products, taking one of them as a reference product.

•It is a **"hybrid" system**, as it **attributes direct material** costs to the products, while the **conversion costs are distributed similarly in process costing**.

• We can use ot in the production for large batches, with similar processing cycles (textiles, footwear, packaging, semiconductors,…), especially in cases where the cost of the raw material represents a significant portion of the cost of the final product



Exercise 6 - Operation Costing

unibz

Raw material pr. A: stock	
01/01/2019	35.000
31/12/2019	4.900
Raw material pr. B: stock	
01/01/2019	75.300
31/12/2019	12.100
Purchasing	
Purchasing of Raw Material	250.000
Purchasing of Taw Material	375.000
Other Costs	
Energy	53.200
Workers wages	275.000
General Factory expenses	120.000
Depretiation of machines	340.000

Product A	
hours per unit	1
Fin. Good 1/1/2019	100
Fin. Good 31/12/2019	253
Number of pieces sold A	425
Product B	
hours per unit	2
Fin. Good 1/1/2019	100
Fin. Good 31/12/2019	253
Number of pieces sold B	500

Traditional Methods Crisis

Traditional product costing methodologies are characterized by **different levels of accuracy and complexity**.

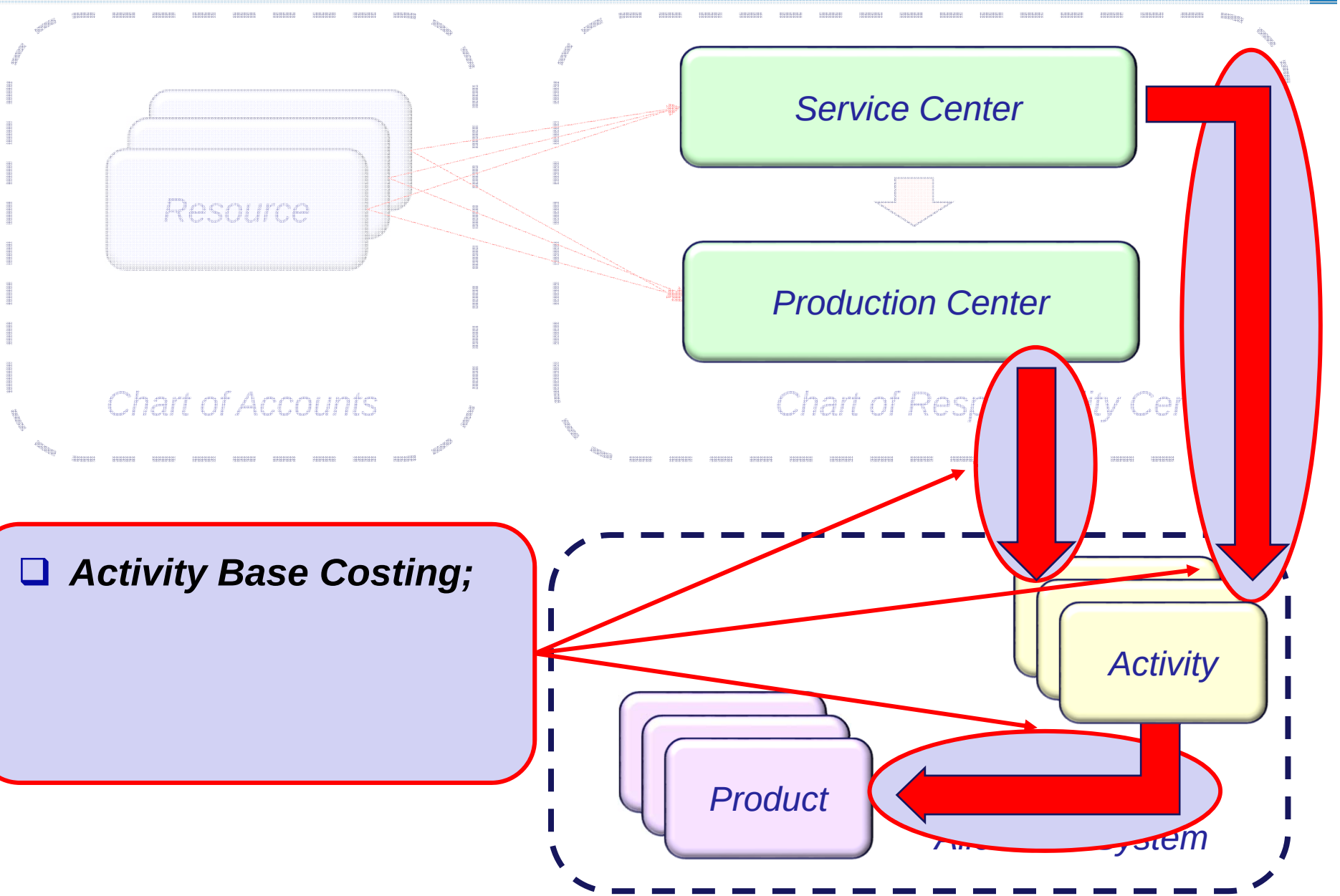
All methods provide for an allocation of common costs proportional to some “allocation base".

But factors such as:

- the increasing **complexity of the activities**;
- the number and the growing importance of **costs and activities not linked to volumes**;
- the increasing weight of the **overhead over total business costs** and their typology;
- the **decrease in the costs of information**;

bring into **crisis traditional costing** and most appropriate methodologies are needed.

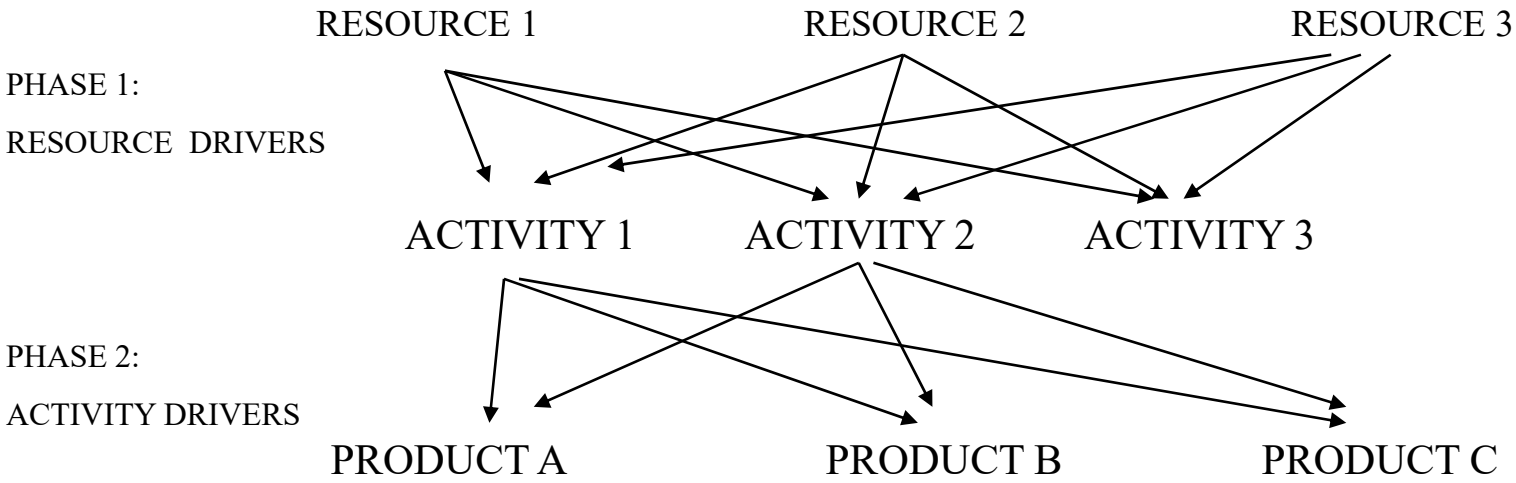
Scheme



- ***Activity Base Costing;***

Activity Based Costing (ABC)

Presented by **Cooper and Kaplan in 1988**, it seeks to give all costs (also indirect) on the basis of a **causal principle (activities)** specific for the cost category considered unlike traditional systems that allocate on the basis of an arbitrary criterion and misleading .



ABC: Logical Path

- Identify **resource and activities** that determine the consumption of the resources;
- Calculate the **costs of activities** based on their resource consumption (allocating the costs of resources through appropriate **resource driver**);
- Identify the **activity drivers** for each activity (i.e. the available sizes, explaining the use of each activity by products);
- **Allocate the costs of the activities to the products** identified by the activity driver (In this way, you can distinguish between activities linked to production volumes and activities that depend on other factors, for instance Set-up);

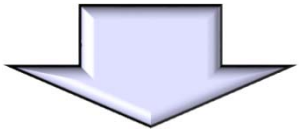
- This method can also be applied to non-productive costs.

Exercise 7 - Activity Based Costing

Cost of Finishig Plant	**€**	**50.000,00**
setup time (min)		60
Walnut Finish		1.000
unit working time (min)		3
Mahogany Finish		100
unit working time (min)		4

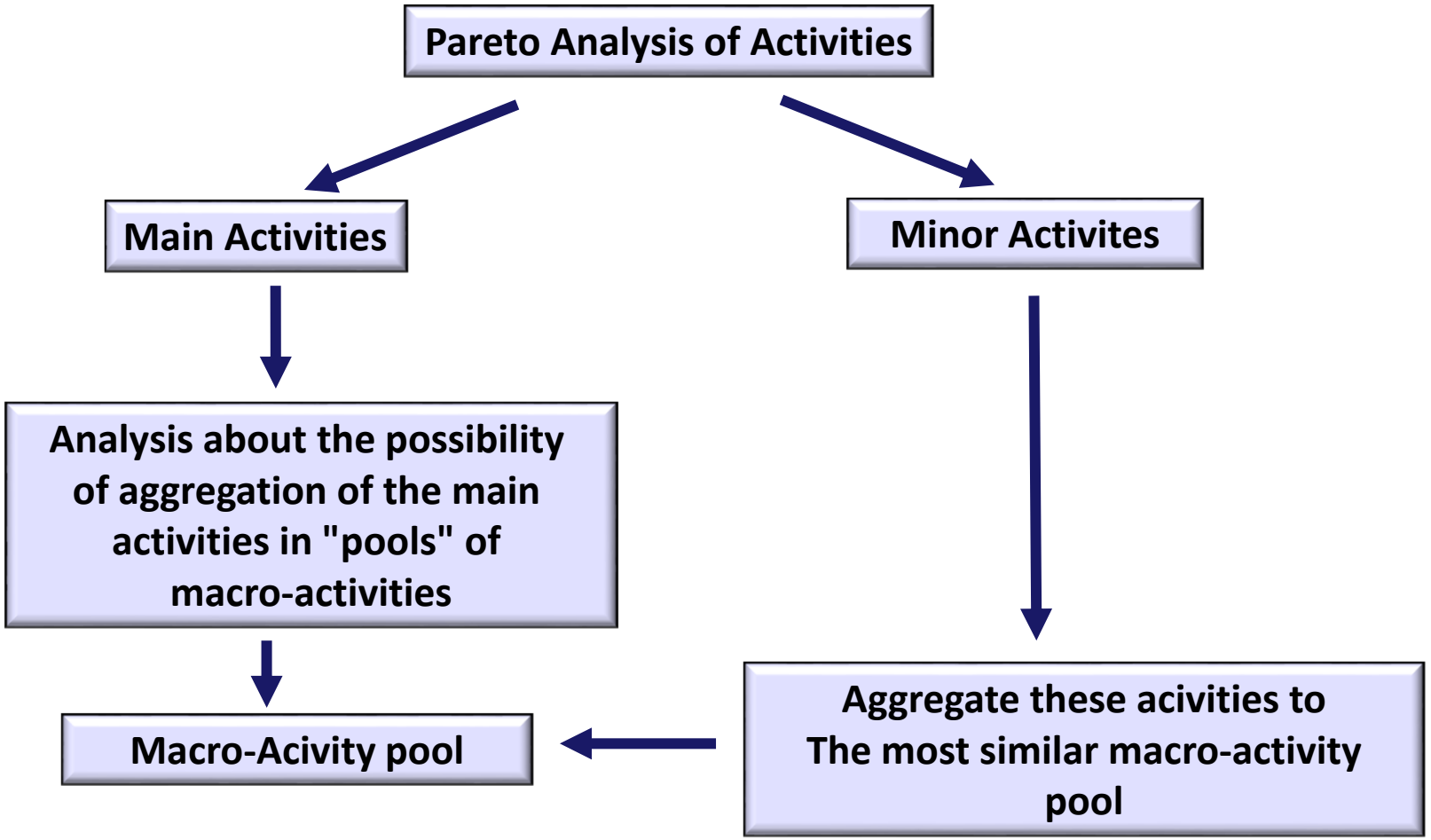
ABC – Discussion points

A too much detailed analysis **entail excessive cost** of collection.



- We consider **groups of omogeneus activities** (macro activities) and for each one we can choose **driver** based on the trade off between:
  - degree of correlation between **drivers and consumption activity**;
  - **easyness** of retrieval and data reporting.

Macro Activity Identification



Conceptual Scheme