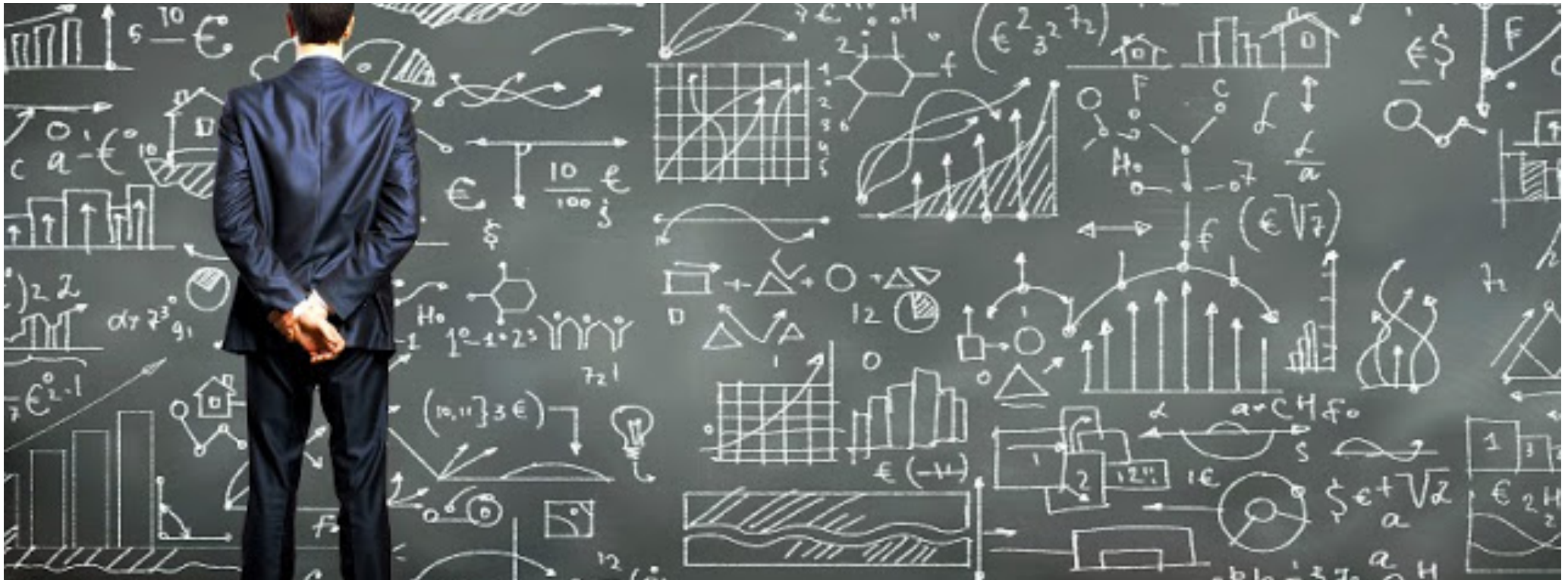
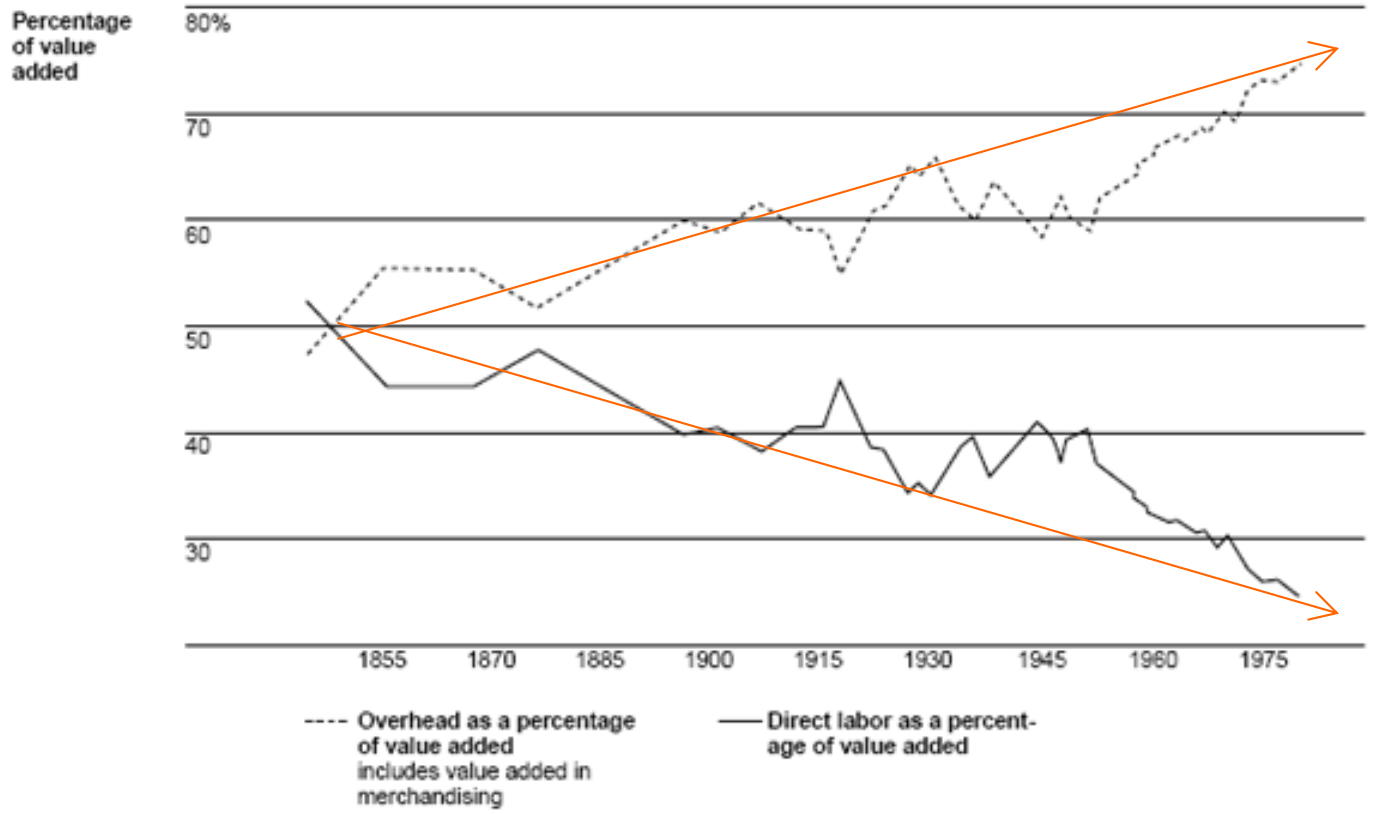
ACTIVITY BASED COSTING

How to improve the quality of the cost allocation process

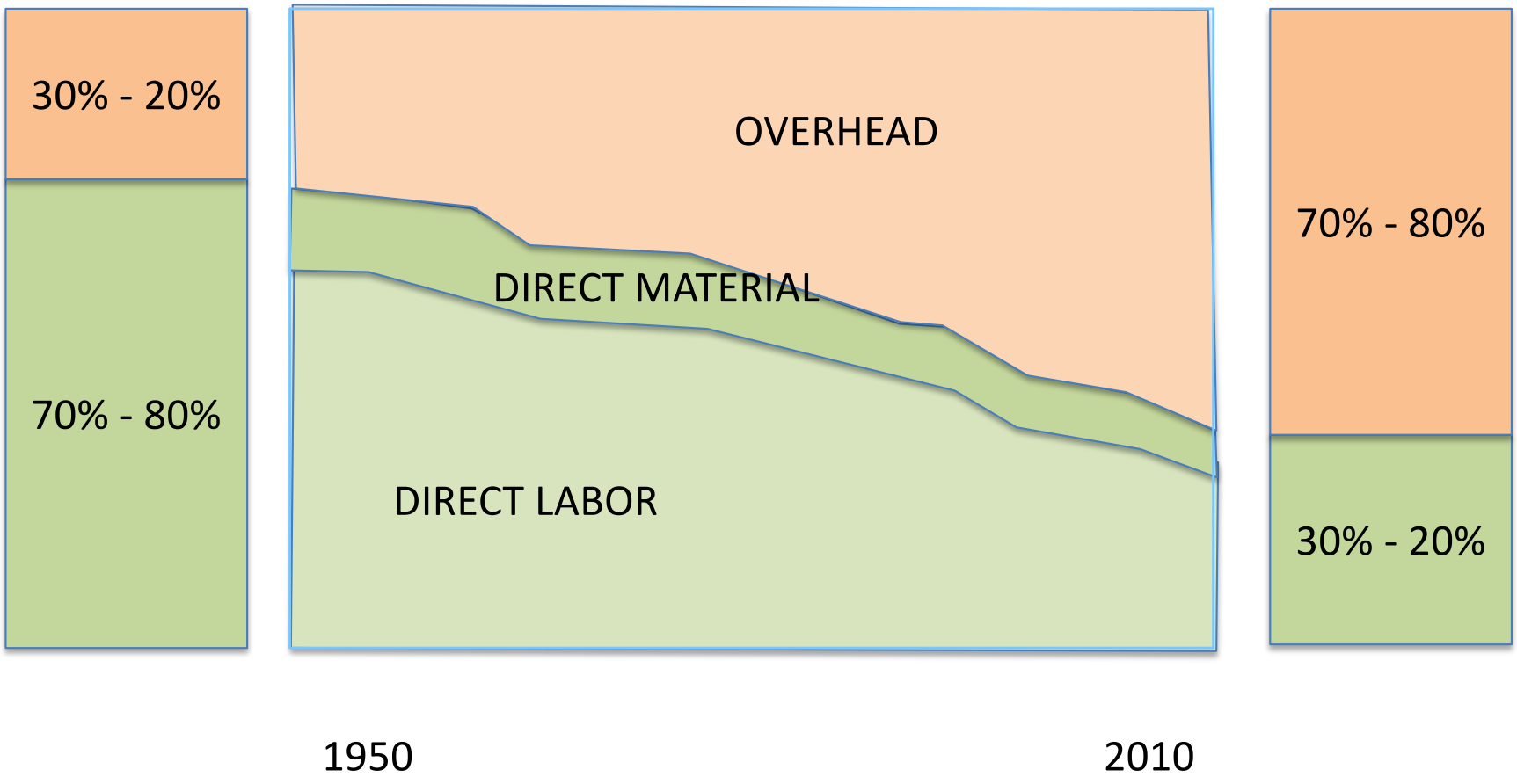


EVOLUTION OF COST STRUCTURES

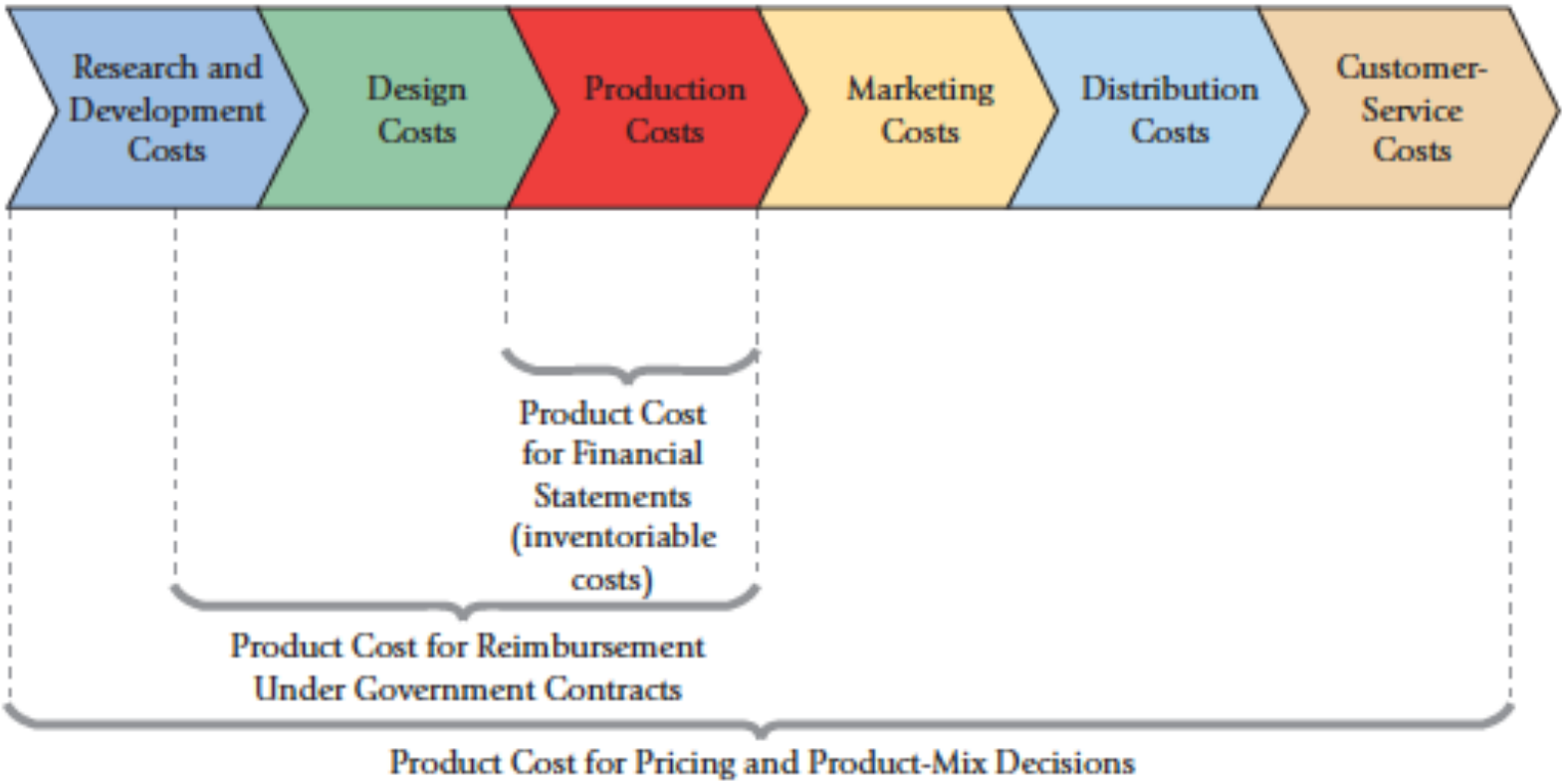
Exhibit I **Components of value added**



INDIRECT COSTS ARE DISPLACING DIRECT COSTS



ARE MANUFACTURING COSTS STILL RELEVANT?



FONTE: Horngren–Datar–Rajan, "Cost Accounting. A Managerial Emphasis", Fourteenth Edition

LEFT UNEXPLAINED

TRADITIONAL INCOME STATEMENT

+ Sales Revenues
– Cost of Goods Sold @ Manufacturing Full

= Gross Margin
– S,G&A Expenses

= EBIT
– Interest Expenses

= EBT

CONTRIBUTION INCOME STATEMENT

+ Sales Revenues
– Cost of Goods Sold @ Manufacturing Variable

= Manufacturing Variable Margin
– Selling Variable Costs

= Contribution Margin
+ Fixed Revenue
– Fixed Costs

= EBIT
– Interest Expenses

= EBT

COST VARIABILITY IN THE LONG RUN

A company should base most of its important product decisions on estimates of the long-run, variable costs of individual products.

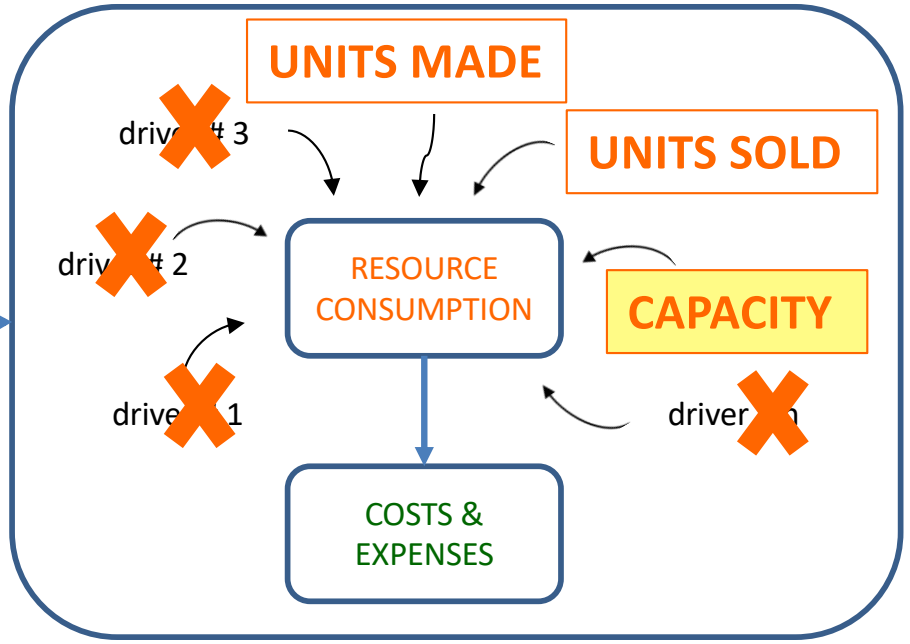
Whether costs are fixed or variable, of course, depends on the viewer's time horizon. In the short run, virtually all costs are fixed: materials have already been acquired, utilities have been turned on, and the workers have showed up for the day. Over a long period, however, costs become variable: machines and plants can be retired or sold, supervisors transferred.

Product decisions have long-term consequences for the organization. Executives should therefore consider virtually all costs to be variable when measuring product costs. That will require a new orientation for many managers. They must recognize that many costs traditionally thought of as fixed actually vary according to the diversity and complexity of products.

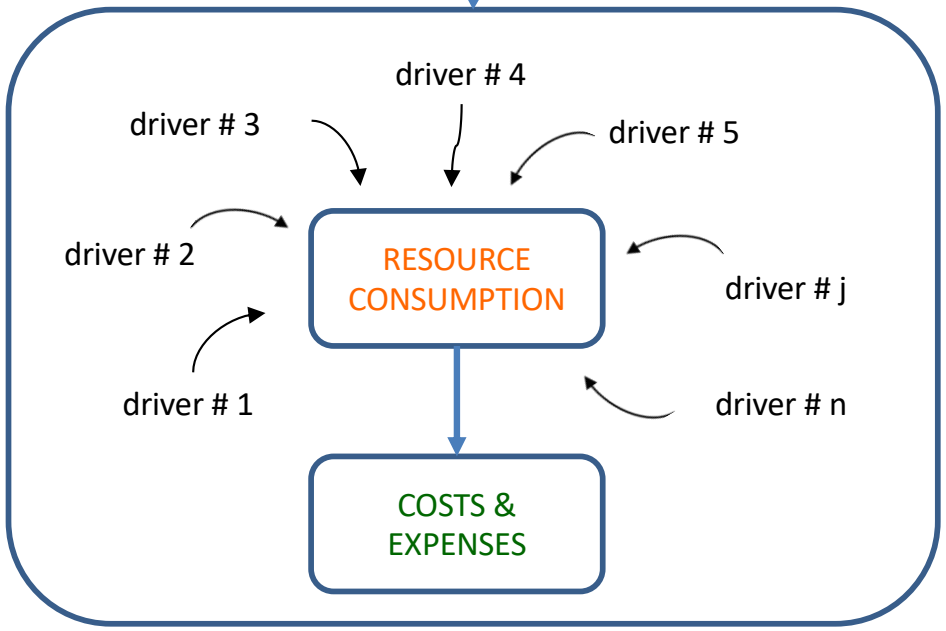
FONTE: Kaplan, "One Cost System Isn't Enough ", *Harvard Business Review*, January - February 1988

DIFFERENT COST DRIVERS

SELECTED CONCEPTS AND SELECTED RELATIONSHIPS BETWEEN THEM



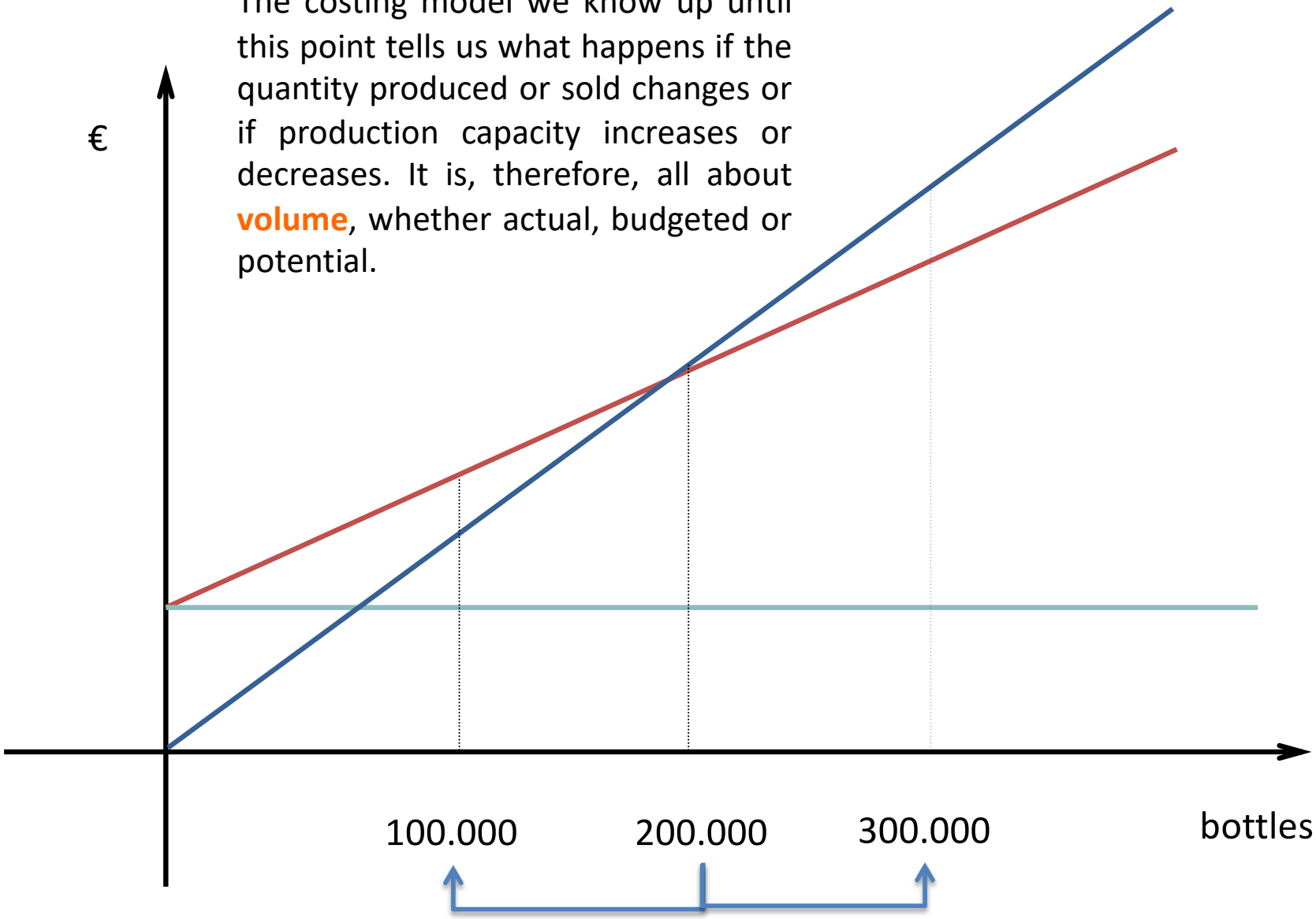
DECISION MODEL



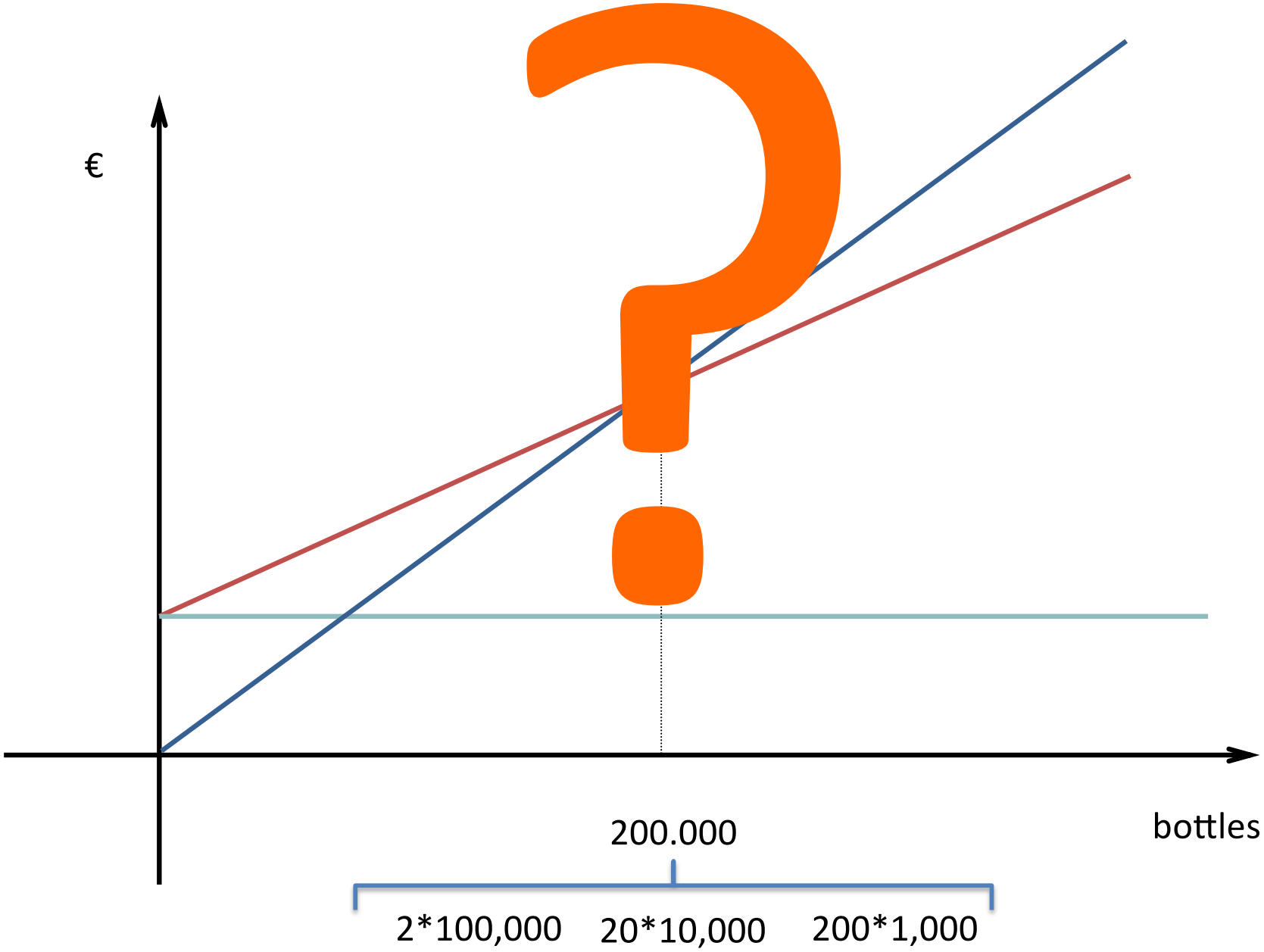
REALITY

WHAT CVP-ANALYSIS DOES EXPLAIN

The costing model we know up until this point tells us what happens if the quantity produced or sold changes or if production capacity increases or decreases. It is, therefore, all about **volume**, whether actual, budgeted or potential.



WHAT CVP-ANALYSIS DOES NOT EXPLAIN



INCREASING COMPLEXITY RESULTS IN MORE OVERHEAD EXPENSES

When you ask people why they believe indirect and overhead expenses are displacing direct costs, most answer that it is because of technology, equipment, automation, or computers. In other words, organizations are automating what previously were manual jobs. However, this is only a secondary factor in the shift in organizational expense components.

The primary cause for the shift is the gradual proliferation in products and service lines. Over the last few decades organizations have been increasingly offering a greater variety of products and services as well as using more types of distribution and sales channels. In addition, organizations have been servicing more and different types of customers.

Introducing greater variation and diversity (i.e., heterogeneity) into an organization creates complexity, and increasing complexity results in more overhead expenses to manage it.

FONTE: Kaplan, "One Cost System Isn't Enough ", *Harvard Business Review*, January - February 1988

COMPLEXITY INCREASES THE USAGE OF RESOURCES

If the complexity of the processes performed increases, the company would require many more resources to support its highly varied mix.

It, therefore, must have **much larger production support staff** requiring more people to:

- Schedule machines and production runs,
- Perform setups,
- Inspect items after setup,
- Move materials,
- Ship orders,
- Expedite orders,
- Rework defective items,
- Design new products
- Improve existing products,
- Negotiate with vendors,
- Schedule materials receipts,
- Order, receive, and inspect incoming materials and parts,
- Update and maintain the much larger computer-based information system.

COMPLEXITY DECREASE EFFICIENCY

Increase in complexity inevitably decrease the level of efficiency of the firm because increasing complexity implies increasing variability of the processes performed.

The firm it would therefore operate with considerably higher levels of

- Idle time,
- Setup time,
- Overtime,
- Inventory,
- Rework,
- Scrap.

THE HIDDEN FACTORY (HBR, SEPTEMBER 1985)

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The hidden factory

Cutting the explosive growth of overhead costs requires mastery of more than just what happens on the shop floor

Jeffrey G. Miller and Thomas E. Vollmann

As American companies face up to the challenge of restoring manufacturing competitiveness, they usually turn their attention first to reducing the costs of the visible operations on the floors of their plants and factories. But those costs—for all their importance—have long represented a decreasing percentage of the total value added by manufacturing.

Less immediately visible but every bit as critical to the improvement of operations are the overhead costs incurred by the "hidden factory" of off-line transactions. The indirect work embodied in logistical, balancing, quality, and change transactions now accounts for the lion's share of value added in most production-based industries; but because of our greater familiarity with the tasks involved in managing direct labor, these costs have received relatively little management attention. From their research, the authors show how a transaction-based analysis of overhead costs affords strong leverage to management action.

Mr. Miller, currently a visiting professor at Stanford Graduate School of Business, is professor of operations management at the Boston University School of Management and director of BU's Manufacturing Roundtable, the sponsoring organization for the Manufacturing Futures Project. He is the author of several HBR articles, including "Fit Production Systems to the Task" (January-February 1981).

Mr. Vollmann, formerly on the faculties of both INSEAD and IMEDE, is professor of operations management at the Boston University School of Management and chairman of the operations management department. He is coauthor (with Robert W. Hall) of "Planning Your Material Requirements" (HBR September-October 1978).

While the world's attention is focused on the fight to increase productivity and develop new technologies, manufacturing managers—especially those in the electronics and mechanical equipment (machinery) industries—are quietly waging a different battle: the battle to conquer overhead costs. Indeed, our research shows that overhead costs rank behind only quality and getting new products out on schedule as a primary concern of manufacturing executives.

The reason for this concern is obvious: high manufacturing overhead has a dramatic effect on profit and competitiveness, and manufacturing managers believe themselves to be poorly equipped to manage these costs well. As one senior executive told us, "We've been brought up to manage in a world where burden rates [the ratios of overhead costs to direct labor costs] are 100% to 200% or so. But now some of our plants are running with burden rates of over 1,000%. We don't even know what that means!"

We are convinced that this renewed attention to overhead is not a cyclical phenomenon. No doubt, low capacity utilization accounted for some increase in awareness during the last recession; even so, awareness has remained high throughout the recovery. Overhead costs as a percentage of value added in American industry and as a percentage of overall manufacturing costs have been rising steadily for more than 100 years as the ratio of direct labor costs to value added has declined (see *Exhibit I*). Moreover, in today's environment, production managers have more direct leverage on improving productivity through cutting overhead than they do through pruning direct labor.

As America's factories step up the pace of automation, they find that they are being hit twice: first, overhead costs grow in percentage terms as direct

1 See Steven C. Wheelwright and Robert H. Hayes, "Link Manufacturing Process and Product Life Cycles," HBR January-February 1979, p. 133, and "The Dynamics of Process-Product Life Cycles," HBR March-April 1979, p. 127.

THE HIDDEN FACTORY (HBR, SEPTEMBER 1985)

Unit output drives direct labor and materials inputs on the actual shop floor that we all think of when we envision a factory.

But in the **"hidden factory,"** where the bulk of manufacturing overhead costs accumulates, the real driving force comes from **transactions**, not physical products.

These transactions involve exchanges of the materials and/or information necessary to move production along but do not directly result in physical products. Rather, these transactions are responsible for aspects of the "augmented product," or "bundle of goods," that customers purchase—such aspects as on-time delivery, quality, variety, and improved design.

Source: Miller & Vollman The Hidden Factory, HBR September 1985

A FOCUS ON TRANSACTIONS

Logistical transactions, *which order, execute, and confirm the movement of materials from one location to another.*

These transactions are processed, tracked, and analyzed by many of the indirect workers on the shop floor as well as by people in receiving, expediting, shipping, data entry, data processing, and accounting.

Balancing transactions, *which ensure that the supplies of materials, labor, and capacity are equal to the demand. These result in the movement orders and authorizations that generate logistical transactions.*

The people involved in processing such transactions include purchasing, materials planning, and control personnel (who convert master schedules and customer orders into materials requirements and purchase and shop orders) as well as human resource staff (who convert these demands into labor requirements).

Quality transactions, *which extend far beyond what we usually think of as quality control, indirect engineering, and procurement to include the identification and communication of specifications, the certification that other transactions have taken place as they were supposed to, and the development and recording of relevant data.*

Change transactions, *which update basic manufacturing information systems to accommodate changes in engineering designs, schedules, routings, standards, materials specifications, and bills of material.*

These transactions involve the work of manufacturing, industrial, and quality engineers, along with a portion of the effort expended in purchasing, materials control, data entry, and data processing.

Source: Miller & Vollman The Hidden Factory, HBR September 1985

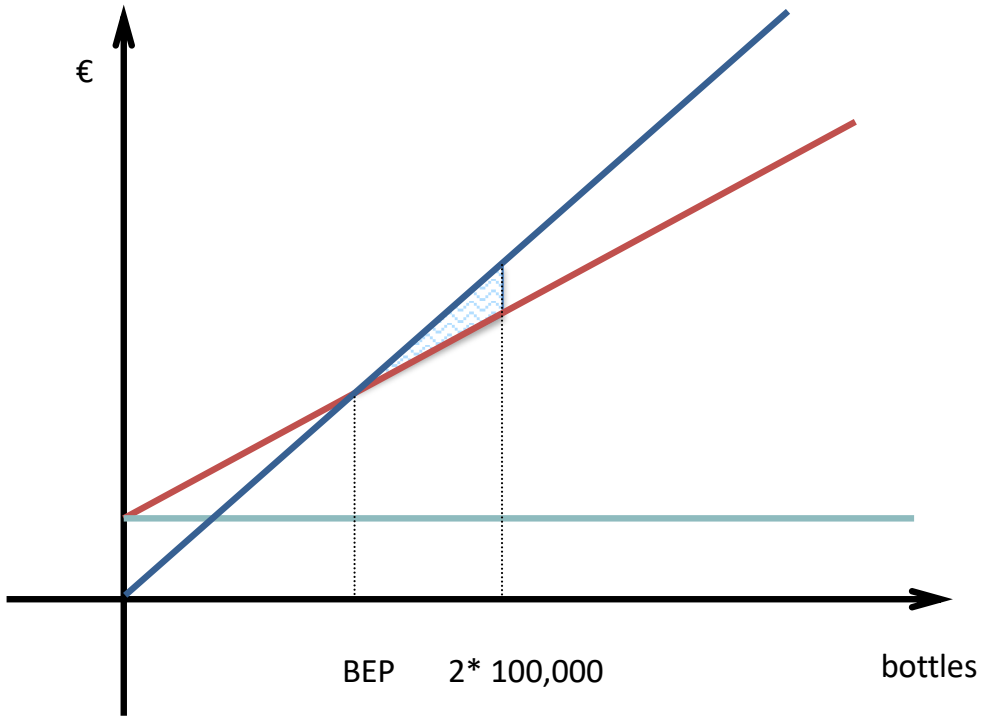
MANAGING OVERHEAD TRANSACTIONS

If, as we believe, transactions are responsible for most overhead costs in the hidden factory, then *the key to managing overheads is to control the transactions that drive them.*

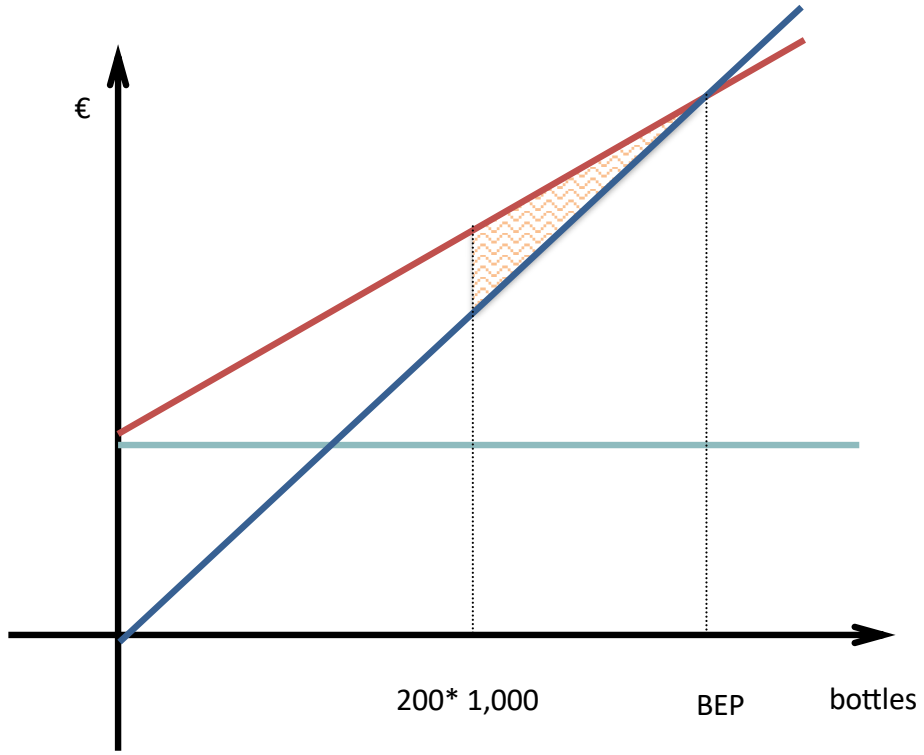
By *managing transactions,* we mean thinking consciously and carefully about which transactions are appropriate, and which are not and about how to do the important transactions most effectively.

Source: Miller & Vollman The Hidden Factory, HBR September 1985

WHAT CVP-ANALYSIS DOES NOT EXPLAIN



Low complexity – Low fixed costs



High complexity – High fixed costs

FROM THIS SITUATION…

… TO THIS ONE

TWO VERY DIFFERENT TYPE OF PRODUCTS

Product A

1,000,000 units | 0.250 Kg./unit | 10 batch of 100,000 units each

Direct costs = $ 70 per unit

Net selling price = $ 90 per unit

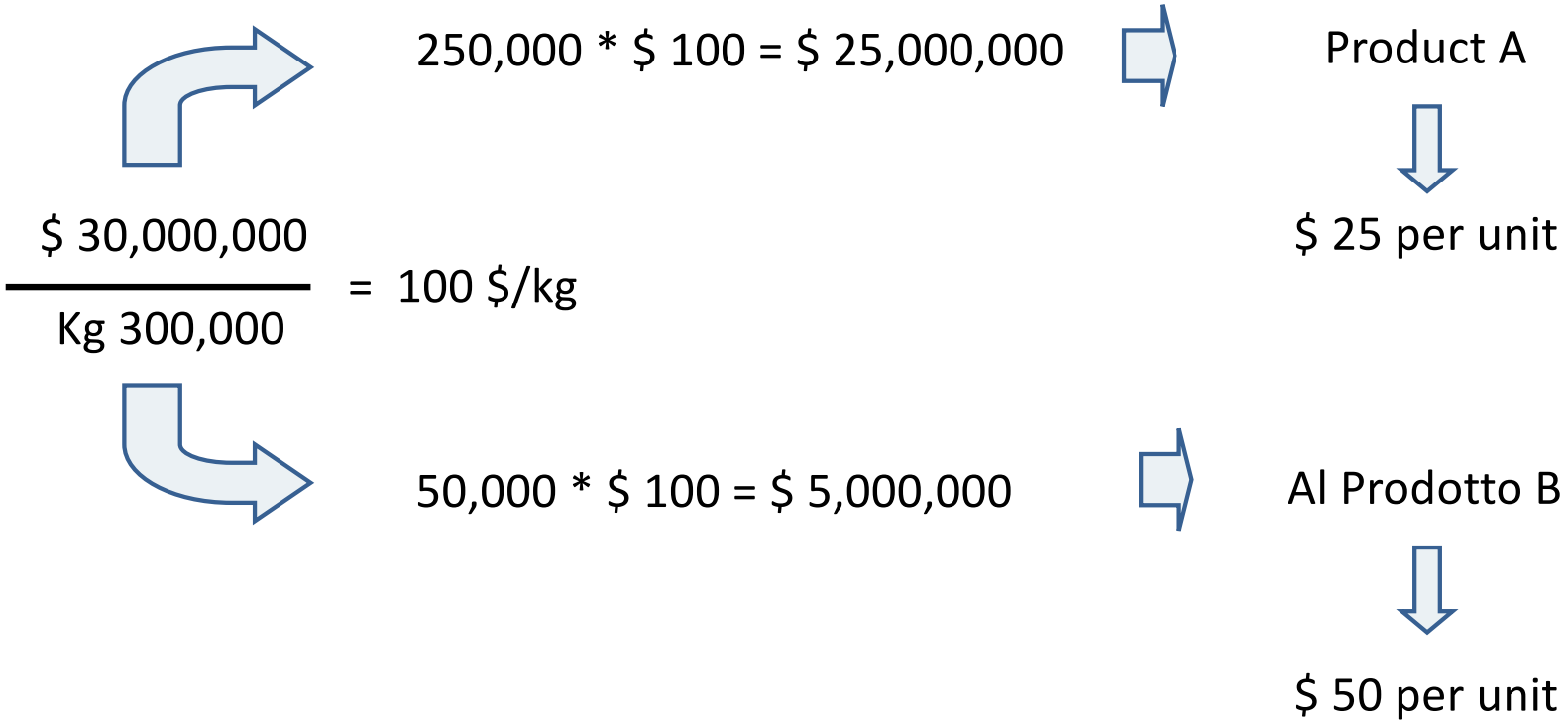
Product B

100.000 units | 0.50 Kg./unit | 100 batch of 1.000 units each

Direct costs = $ 150 per unit

Net selling price = $ 300 per unit

VOLUME OF PRODUCTION AS THE SOLE COST DRIVER

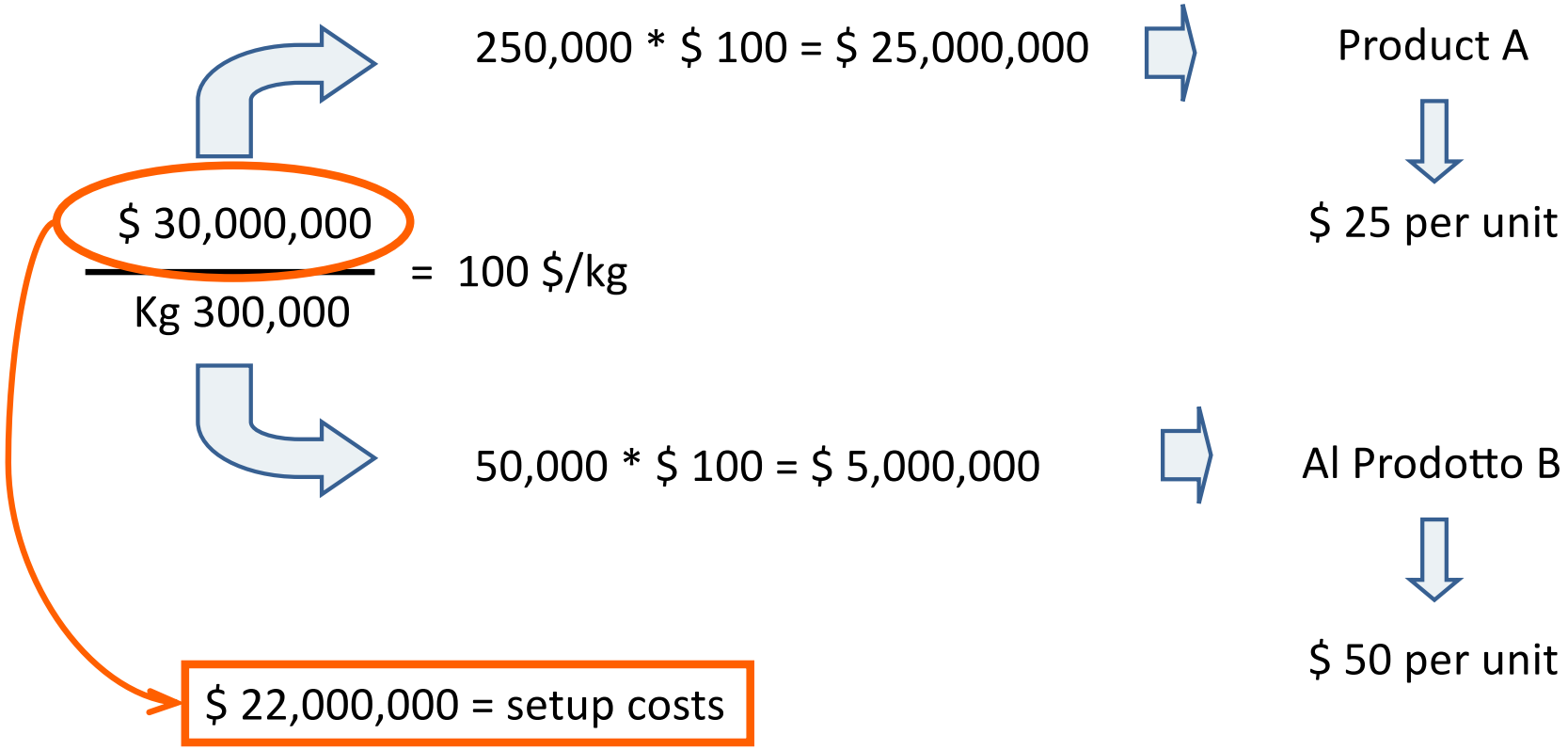


A VIEW ON THE PROFITABILITY OF THE TWO PRODUCTS

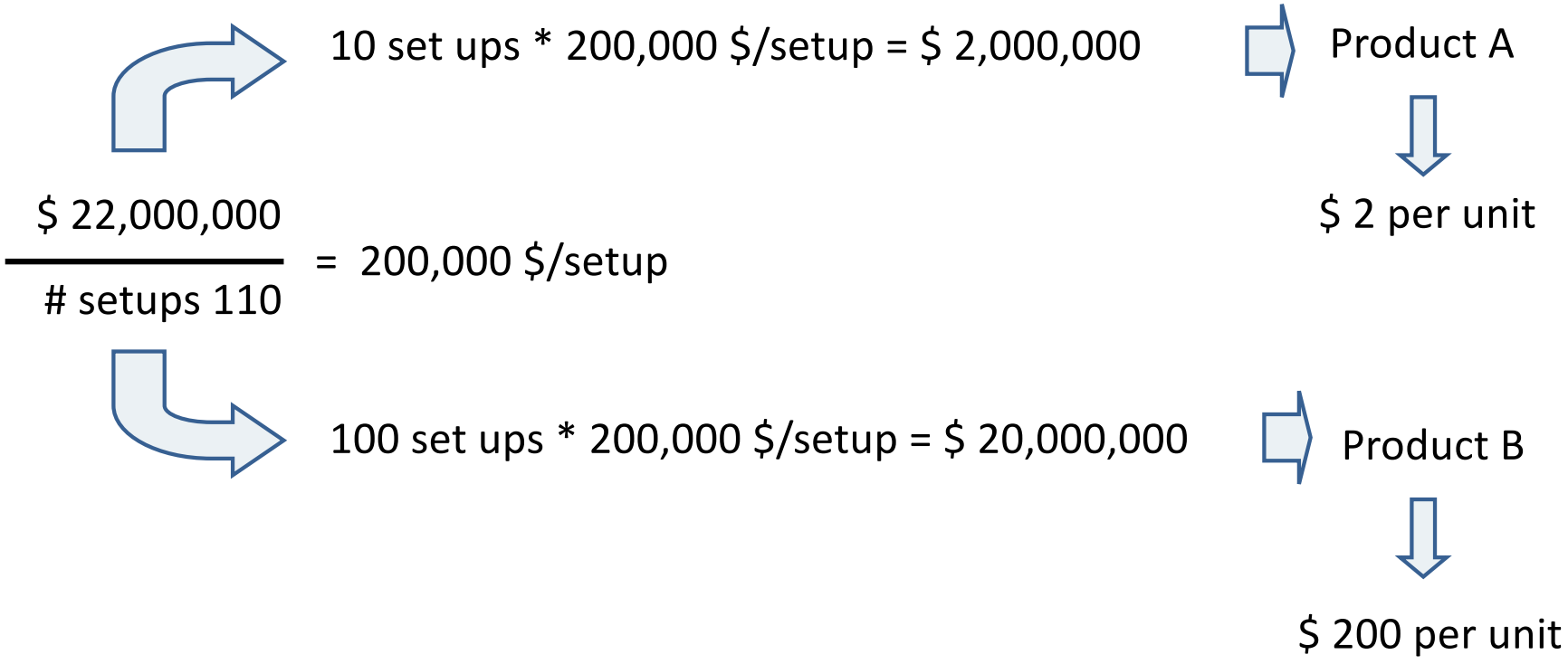
PRODUCT "A"	TOTAL	UNIT	%
+ Sales	$ 90,000,000.00	$ 90.00	100.00%
- Direct Costs	$ -70,000,000.00	$ -70.00	-77.78%
= Direct Margin	**$ 20,000,000.00**	**$ 20.00**	**22.22%**
- Applied overhead	$ -25,000,000.00	$ -25.00	-27.78%
= Operating Income	**$ -5,000,000.00**	**$ -5.00**	**-5.56%**

PRODUCT "B"	TOTAL	UNIT	%
+ Sales	$ 30,000,000.00	$ 300.00	33.33%
- Direct Costs	$ -15,000,000.00	$ -150.00	-16.67%
= Direct Margin	**$ 15,000,000.00**	**$ 150.00**	**16.67%**
- Applied overhead	$ -5,000,000.00	$ -50.00	-5.56%
= Operating Income	**$ 10,000,000.00**	**$ 100.00**	**11.11%**

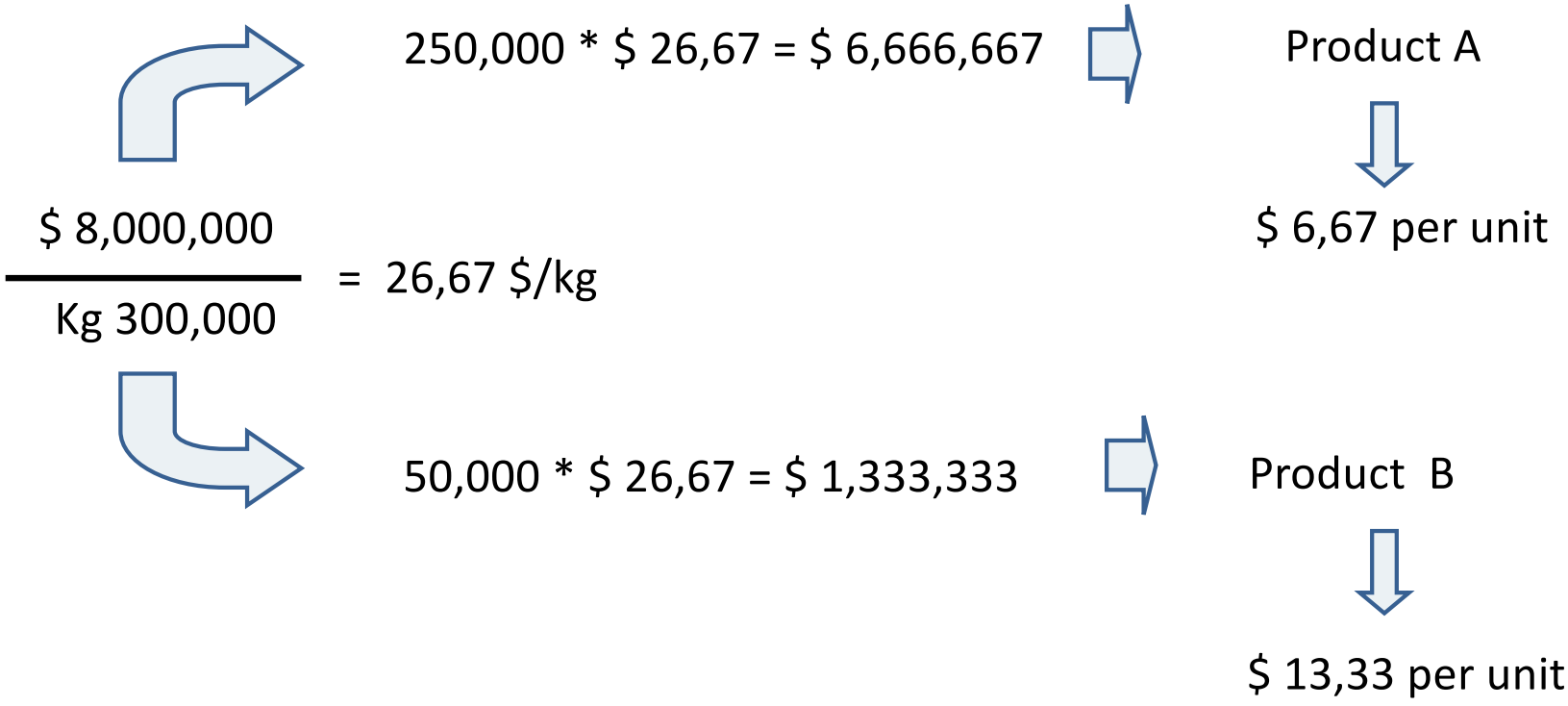
IS THERE A "CAUSE AND EFFECT" RELATION WITH VOLUME?



NOT ONLY VOLUME-RELATED MEASURES FOR TRACING COSTS



TRADITIONAL VOLUME-RELATED ALLOCATION



PRODUCT COST CROSS SUBSIDIZATION

PRODUCT "A"	TOTAL	UNIT	%
+ Sales	$ 90,000,000.00	$ 90.00	100.00%
- Direct Costs	$ -70,000,000.00	$ -70.00	-77.78%
= Direct Margin	**$ 20,000,000.00**	**$ 20.00**	**22.22%**
- Set up costs	$ -2,000,000.00	$ -2.00	-2.22%
- Other overhead	$ -6,670,000.00	$ -6.67	-7.41%
= Operating Income	**$ 11,330,000.00**	**$ 11.33**	**12.59%**

PRODUCT "B"	TOTAL	UNIT	%
+ Sales	$ 30,000,000.00	$ 300.00	33.33%
- Direct Costs	$ -15,000,000.00	$ -150.00	-16.67%
= Direct Margin	**$ 15,000,000.00**	**$ 150.00**	**16.67%**
- Set up costs	$ -20,000,000.00	$ -200.00	-22.22%
- Other overhead	$ -1,333,000.00	$ -13.33	-1.48%
= Operating Income	**$ -6,333,000.00**	**$ -63.33**	**-7.04%**

VARIABILITY AS AN OVERLY SIMPLISTIC VIEW OF CONSUMPTION

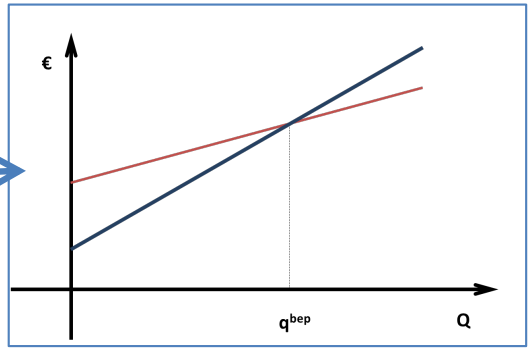
Variability is defined in terms of the relation between total **volume** and total cost. “Variability” implies a linear relationship between total final product output for a company and its total cost.

However, toward the latter part of the 20thCentury the emergence of multipurpose production facilities and an increase in product customization led to complexity in business and resulted in increased indirect and shared costs.

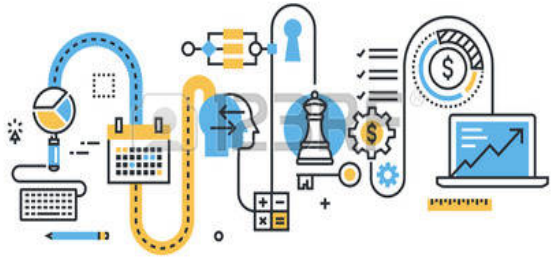
This has unmasked the concept of variability as an overly simplistic view of consumption and cost behavior. For example, when producing fewer, relatively more complex products, total output volume will decrease but can still result in higher total cost due to an increased number of more specialized direct and indirect activities needed to produce these complex products.

DECISION MODELS

SELECTED CONCEPTS AND SELECTED RELATIONSHIPS BETWEEN THEM

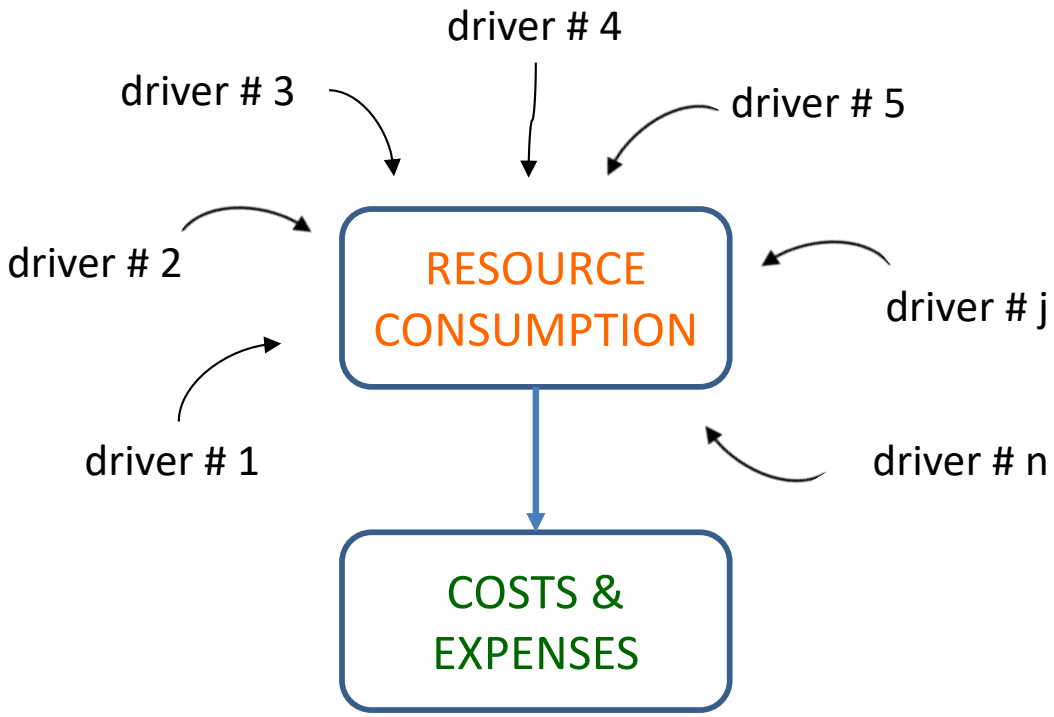


DECISION MODEL (ABSTRACTION)



BUSINESS PROCESSES (REALITY)

COSTS, RESOURCES AND DRIVERS

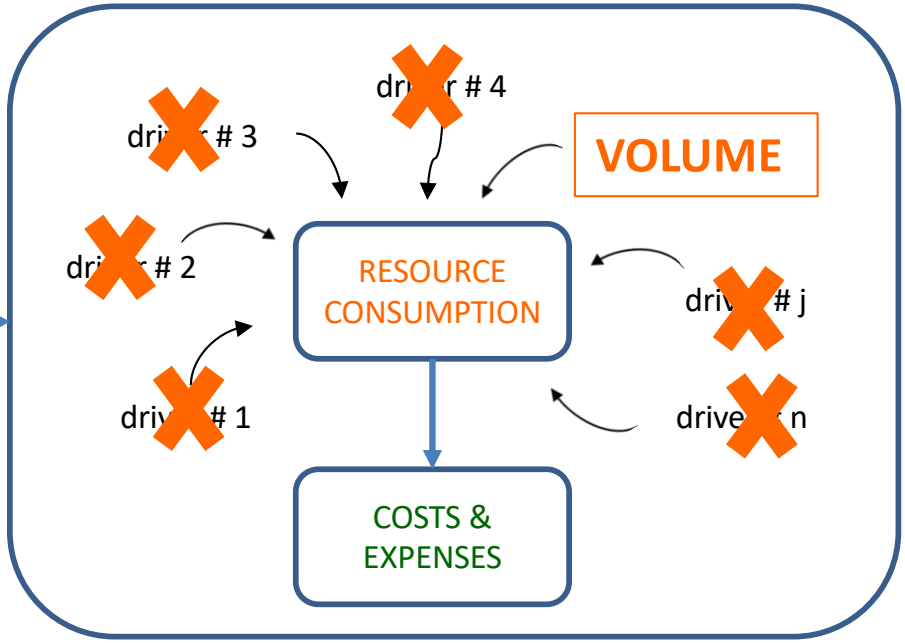


A **cost** is a sacrifice of resources. More precisely a cost (and therefore an expense) is **the monetary reflecion** of the sacrifice of a resource. The **usage** of resource is determined by different kinds of causes (generally indicated in accounting as drivers)

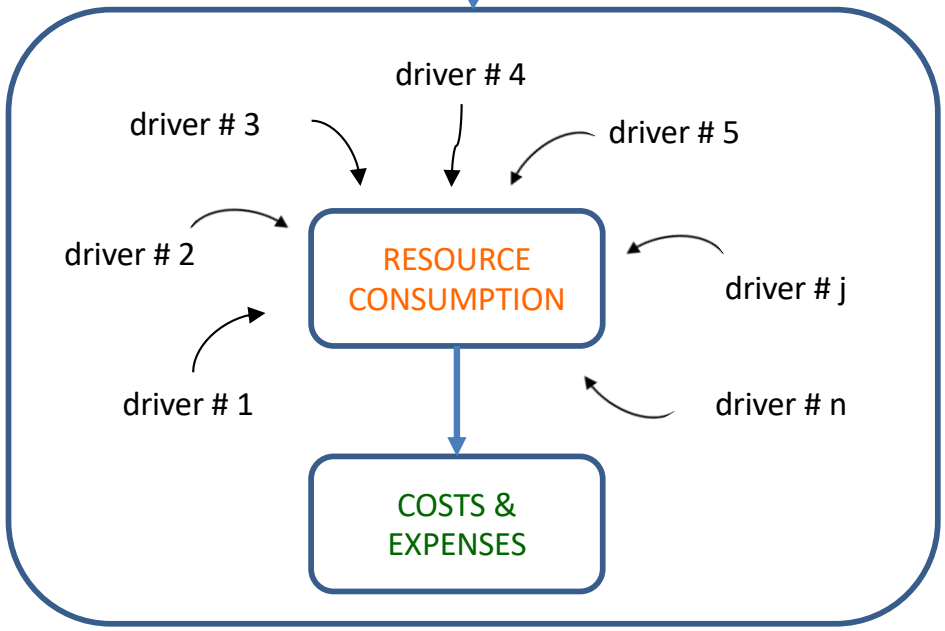
«The objective of managerial **costing** is to provide a **monetary reflection** of the **utilization** of business **resources** and related cause and effect insights».

COST-VOLUME-PROFIT MODEL

SELECTED CONCEPTS AND SELECTED RELATIONSHIPS BETWEEN THEM



DECISION MODEL



REALITY

NEW REALITIES REQUIRE NEW MODELS

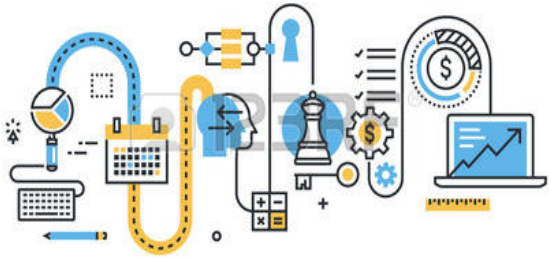
SELECTED CONCEPTS AND SELECTED RELATIONSHIPS BETWEEN THEM

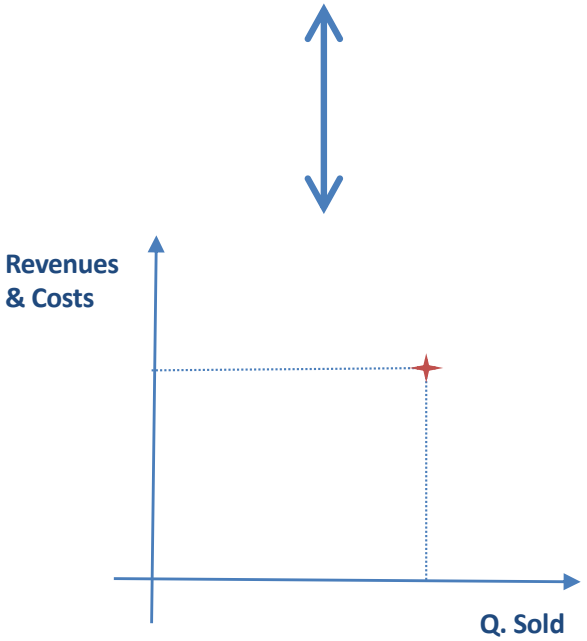
DECISION MODEL (ABSTRACTION)

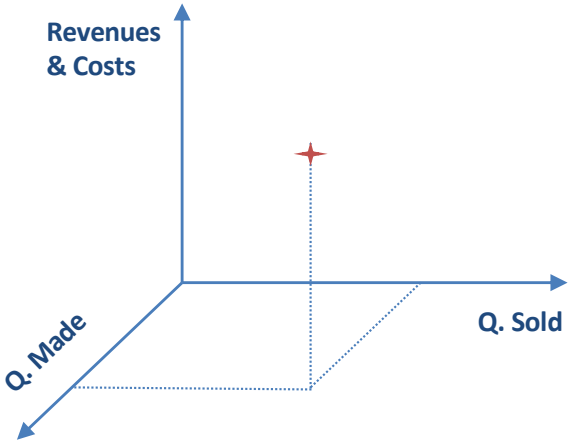
BUSINESS PROCESSES (REALITY)

UNSOLD PRODUCTS OR UNSOLD MERCHANDISES

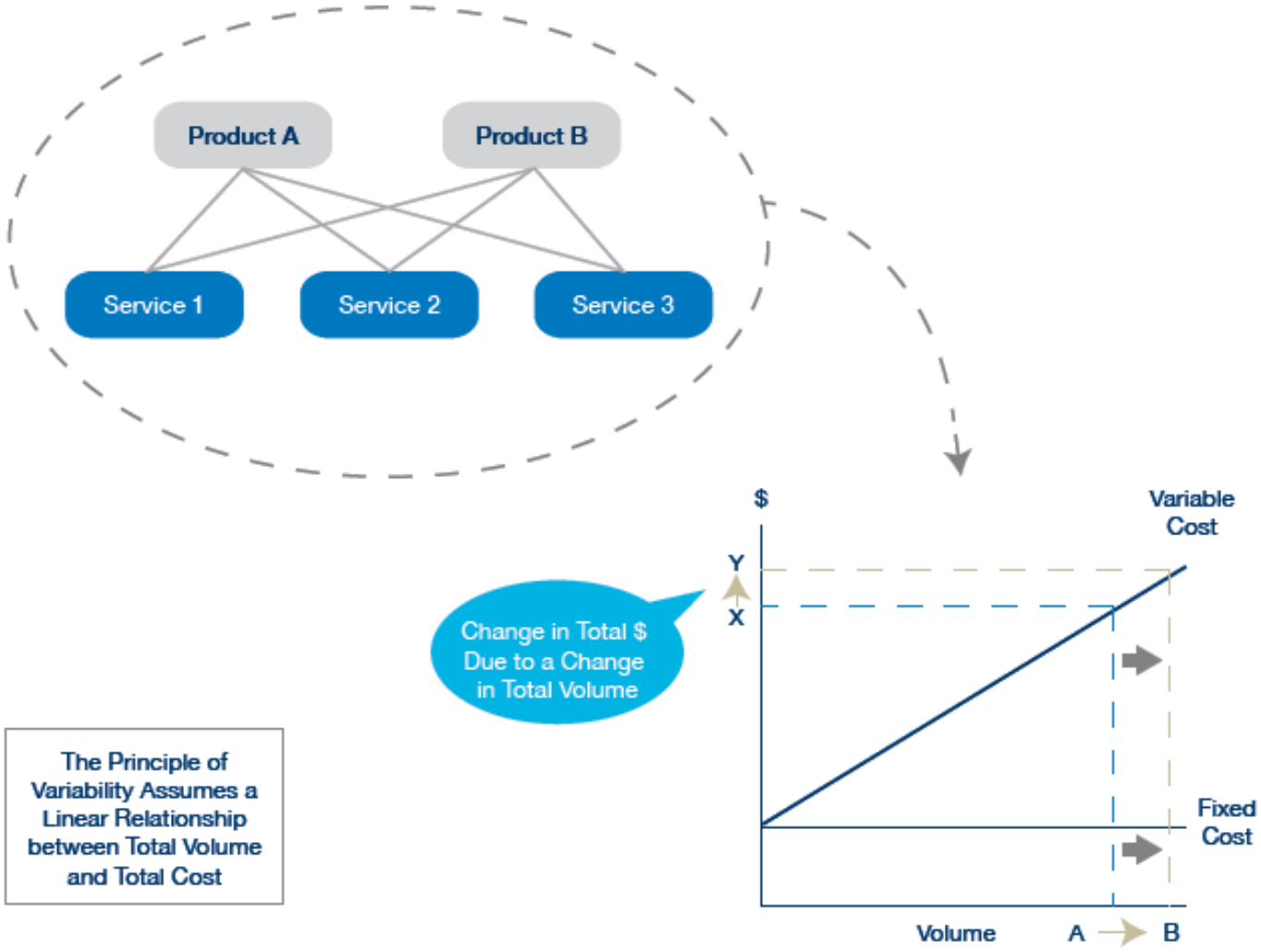
INCREASE IN COMPLEXITY





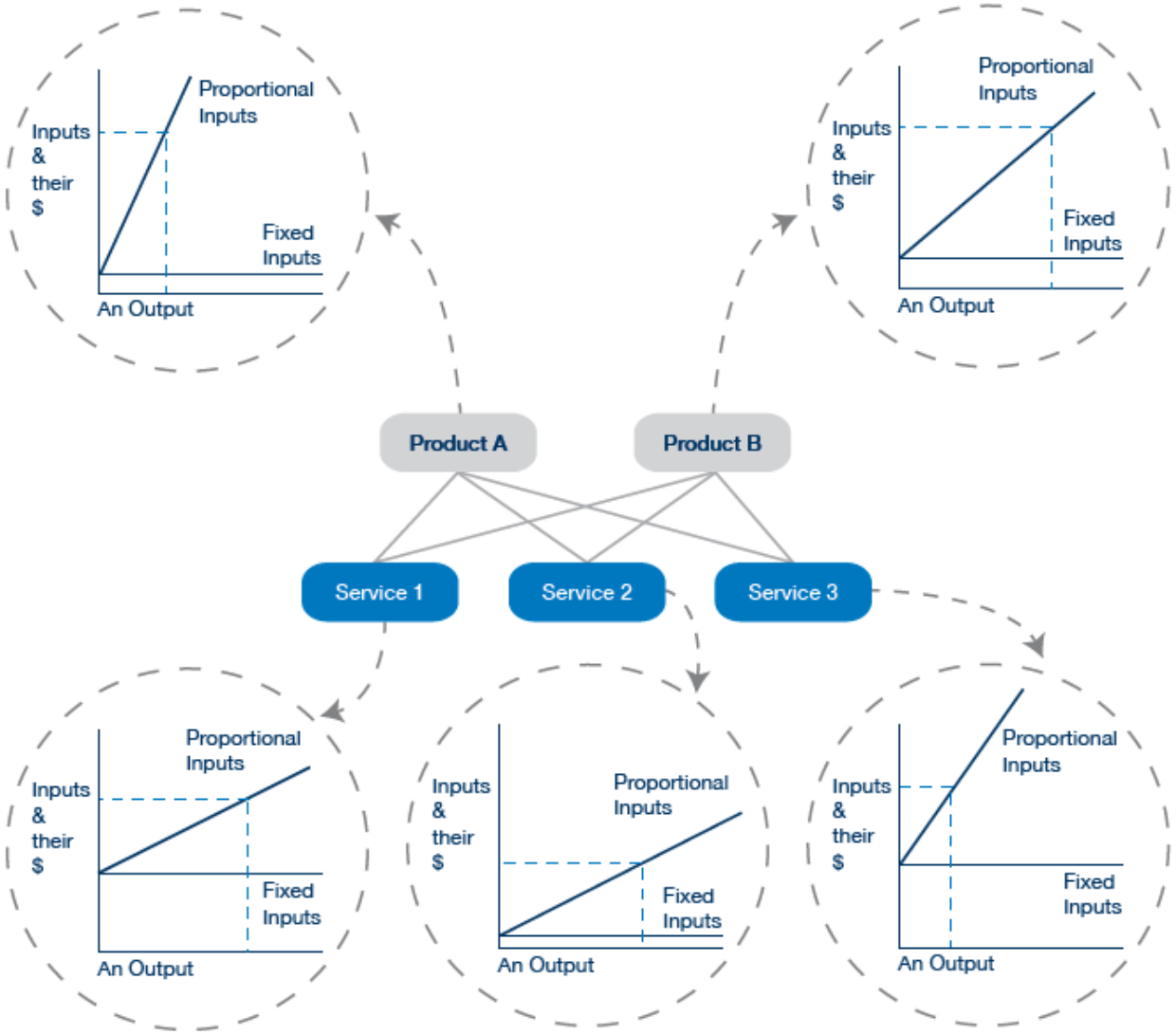


FROM ”VARIABILITY”…



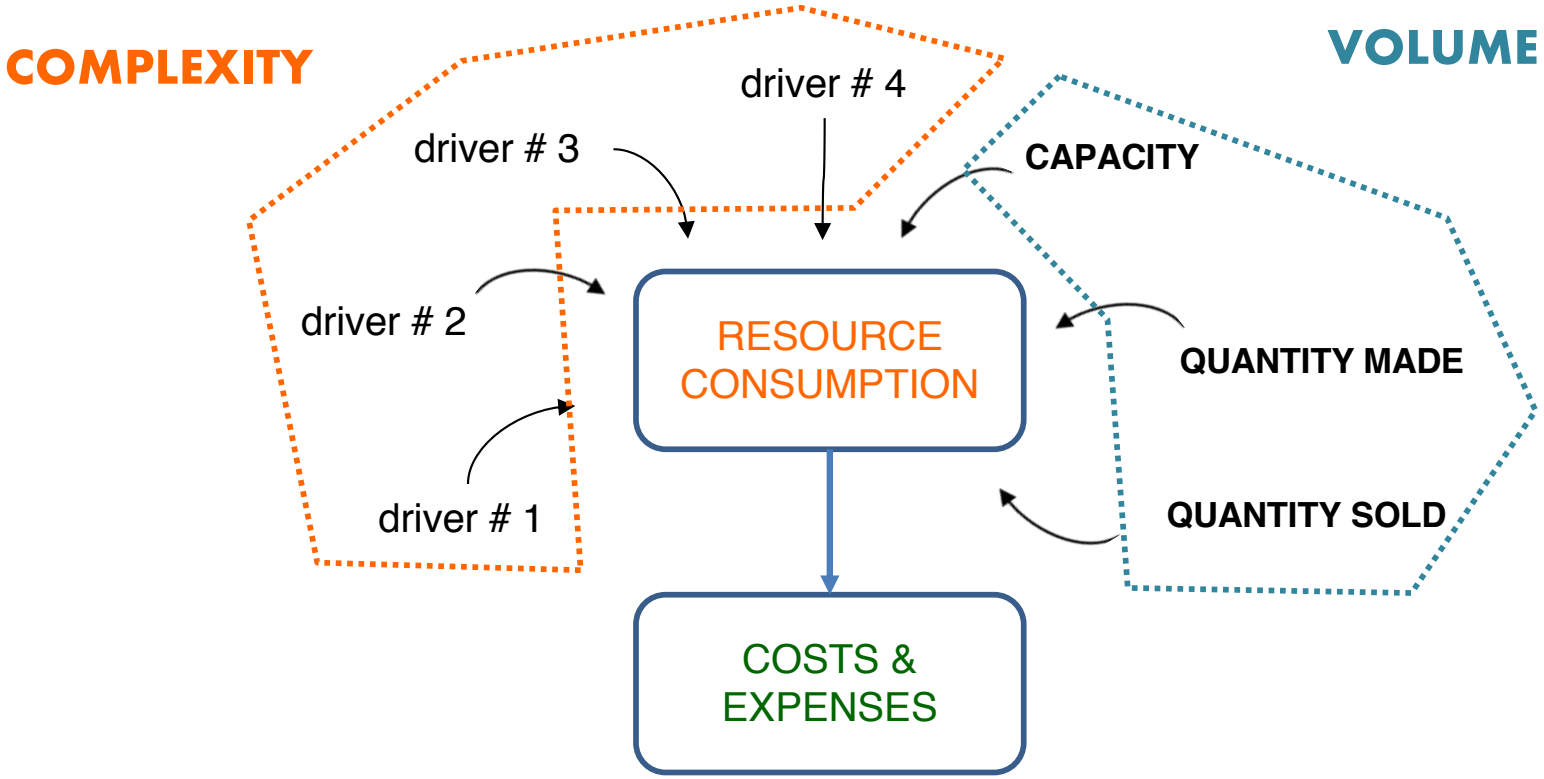
Variability: the relationship between total cost and total volume

… TO “RESPONSIVENESS”



Responsiveness: the relationship between resources and output

COSTS, RESOURCES AND DRIVERS



MARKETING SELLING DISTRIBUTION AND ADMINISTRATIVE EXPENSES

An organization's expenses are not limited to its factories.

Companies, in addition to the costs of producing their products and services, also incur marketing, selling, distribution, and administrative (MSDA) expenses.

Most of these expenses are independent of the volume and mix of products that the company produces, so that they **cannot be traced through causal relationships to products**.

Many of these expenses are incurred to market and sell products to customers through multiple distribution channels. And, like the different demands by products for factory resources, **customers and channels differ considerably in their use of MSDA resources**.

[…]

Companies need to understand the cost of selling through various channels to diverse customer segments.

[…]

Companies should also be measuring the **cost to serve** each customer and the profits earned, customer by customer. Measures such as percentage of unprofitable customers and dollars or Euros lost in unprofitable customer relationships provide valuable balancing metrics for a company's marketing strategy.

SOURCE: Atkinson, Kaplan, Matsumura, Young, "Management Accounting Information for Decision-Making and Strategy Execution", 6th Edition.

COST-TO-SERVE

High Cost-to-Serve Customers	Low Cost-to-Serve Customers
• Order custom products	• Order standard products
• Small order quantities	• High order quantities
• Unpredictable order arrivals	• Predictable order arrivals
• Customized delivery	• Standard delivery
• Change delivery requirements	• No changes in delivery requirements
• Manual processing; high order error rates	• Electronic processing (EDI) with zero defects
• Large amounts of pre-sales support (marketing, technical, and sales resources)	• Little to no pre-sales support (standard pricing and ordering)
• Large amounts of post-sales support (installation, training, warranty, field service)	• No post-sales support
• Pay slowly (have high accounts receivable from customer)	• Pay on time (low accounts receivable)

MORE DETAIL

Marketing, Selling, Distribution & Administrative Expenses

+ Sales Revenues

– Cost of Goods Sold

= **Gross Margin**

– S,G & A Expenses

= **EBIT**

– Interest Expenses

= **EBT**

+ Sales Revenues

– Cost of Goods Sold

= **Gross Margin**

– M,S,D&A Expenses

= **Customer Contribution Margin**

– General & Corporate Expenses

= **EBIT**

– Interest Expenses

= **EBT**

CONSUMER-SPECIFIC COSTS

+ Sales Revenues
– Cost of Goods Sold

= Gross Margin

– M,S,D&A Expenses

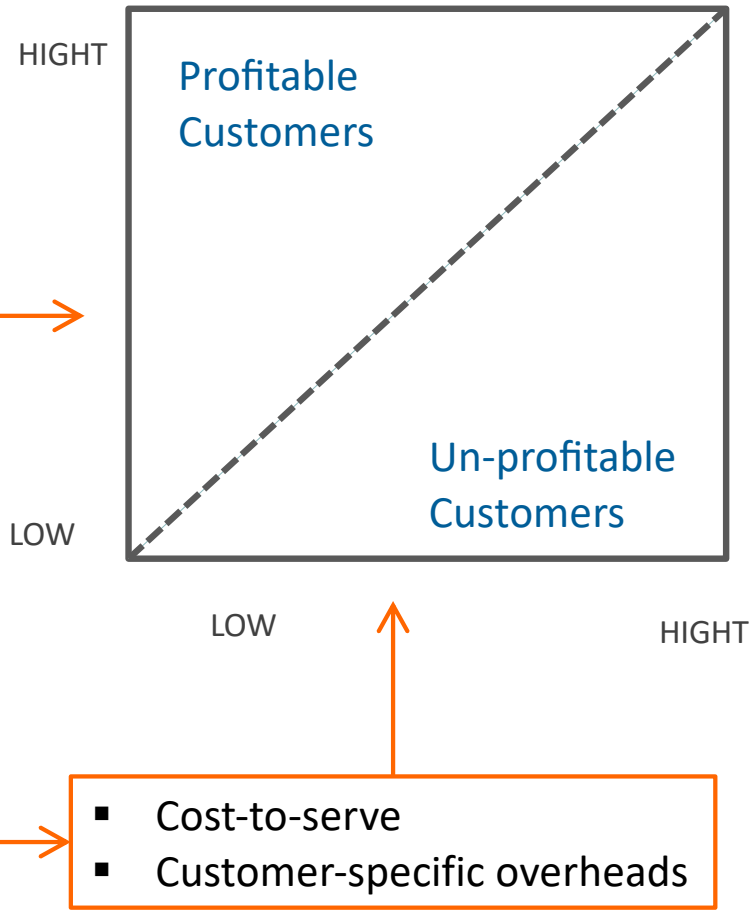
= Customer Contribution Margin

– General & Corporate Expenses

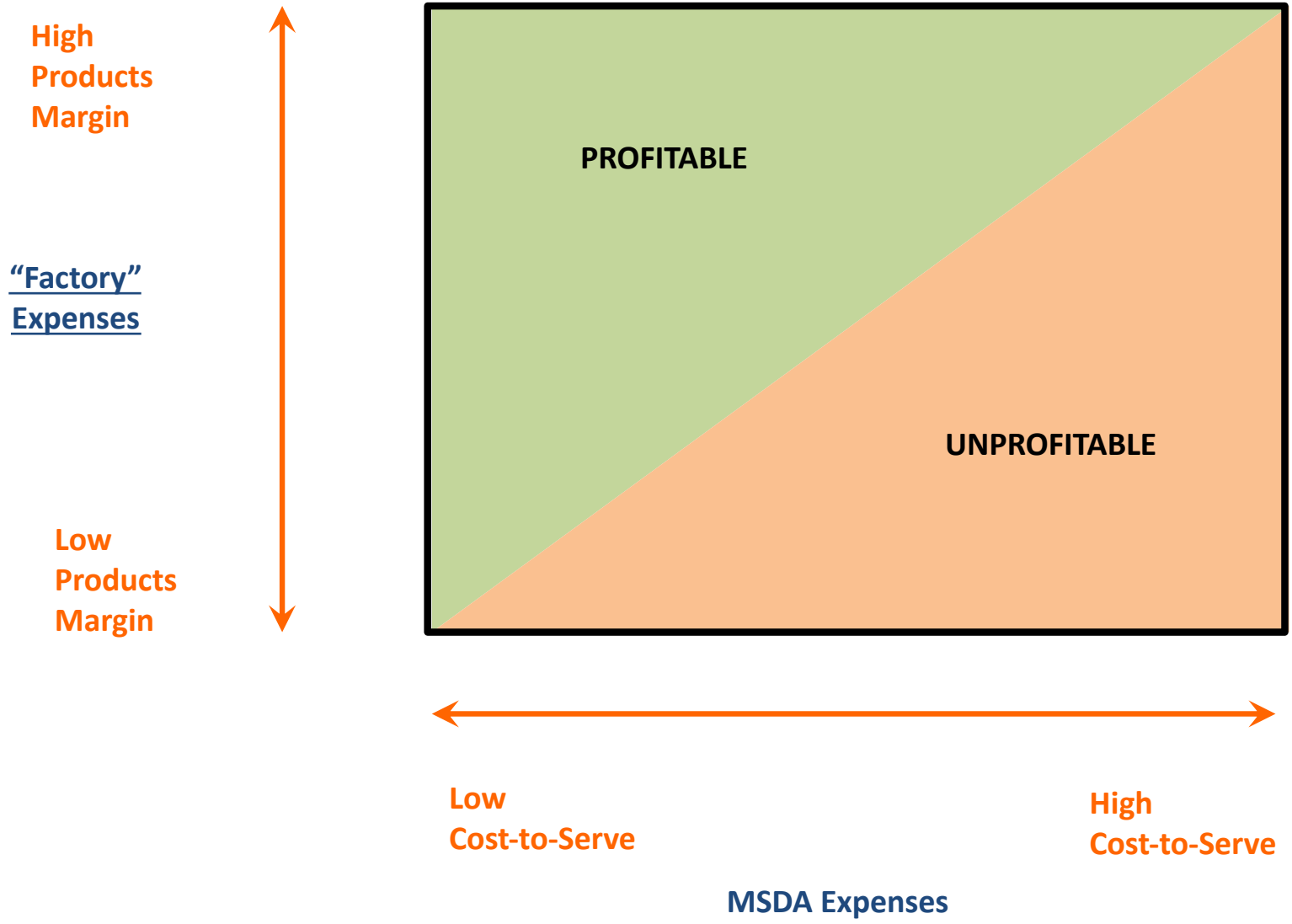
= EBIT

– Interest Expenses

= EBT



CUSTOMERS PROFITABILITY



A SIMPLE EXAMPLE

+ Sales Revenues	$ 28,000	
– Cost of Goods Sold	($ 20,000)	
= Gross Margin	**$ 8,000**	→ ?
– M,S,D&A Expenses	($ 7,000)	
= Customer Contribution Margin	**$ 1,000**	→ ?
– General & Corporate Expenses	($ 2,400)	
= EBIT	**($ 1400)**	

ANALYSIS OF CUSTOMERS' PROFIT MARGIN

	# Units	Price/Unit	COGS/Unit	Gross Margin
Customer 1	100	$50	$40	**$1.000**
Customer 2	100	$90	$60	**$3.000**
Customer 3	100	$50	$40	**$1.000**
Customer 4	100	$90	$60	**$3.000**
Total				**$8.000**

PEANUT BUTTER COSTING

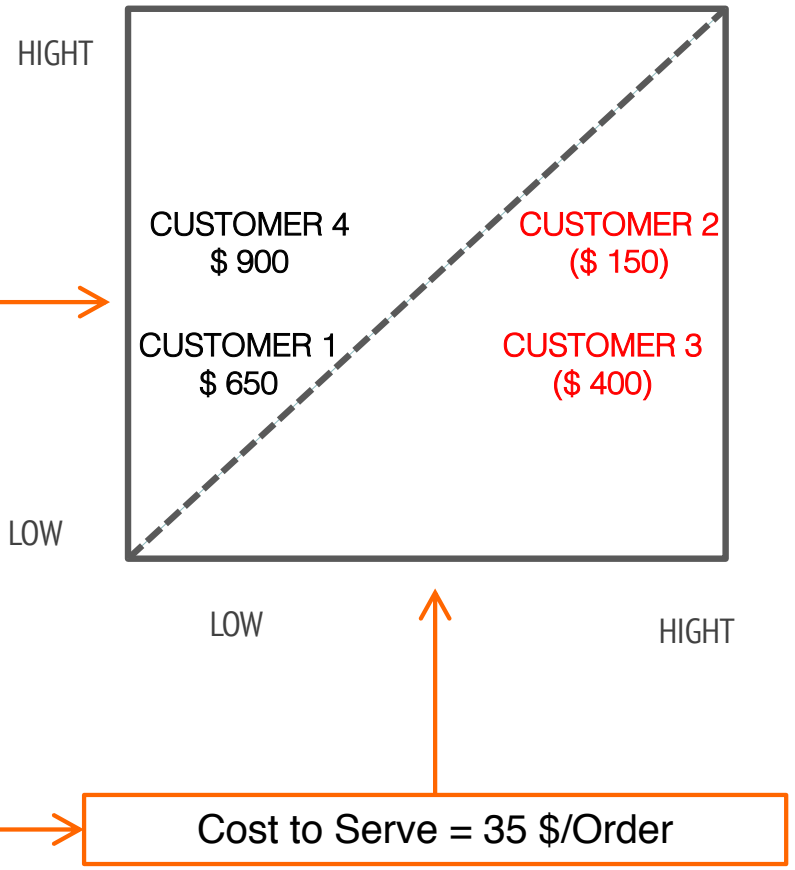
ANALYSIS OF CUSTOMERS' COST TO SERVE

	# Units	# Orders	Cost/Order	Cost to Sell
Customer 1	100	10	$35	**$ 350**
Customer 2	100	90	$35	**$3.150**
Customer 3	100	40	$35	**$1.400**
Customer 4	100	60	$35	**$2.100**
Total		**200**		**$7.000**

$$\text{Cost per oreder} = \frac{\text{M,S,D\&A Expenses}}{\text{Total Orders}} = \frac{\$\ 7{,}000}{200} = \$\ 35/\text{Order}$$

DIFFERENT CUSTOMER PROFITABILITIES

+ Sales Revenues	$ 28,000
– Cost of Goods Sold	($ 20,000)
= Gross Margin	**$ 8,000**
– M,S,D&A Expenses	($ 7,000)
= Customer Contribution Margin	**$ 1,000**
– General & Corporate Expenses	($ 2,400)
= EBIT	**($ 1400)**



THE PERILS OF NOT KNOWING

Mister “L”	?			
Mister “H”	?			
Total	**$ 4,000**	**$ 5,000**	**$ 1,000**	**20%**

AVERAGING THE COSTS

Mister “L”	$ 2,000	$ 2,500	$ 500	20%
Mister “H”	$ 2,000	$ 2,500	$ 500	20%
Total	**$ 4,000**	**$ 5,000**	**$ 1,000**	**20%**

CUSTOMER CROSS-SUBSIDIZATION

Mister “L”	$ 1,000	$ 2,500	$ 1.500	60%
Mister “H”	$ 3,000	$ 2,500	($ 500)	(20%)
Total	**$ 4,000**	**$ 5,000**	**$ 1,000**	**20%**

WHY IT IS DANGEROUS

In the longer term unprofitable customers could be more damaging to a company than might at first appear.

Year by year, profitable customer relationships have to subsidize unprofitable customer relationships. This has the overall effect that the profitable customers receive slightly poorer service than they should, because the company has to divert some of its money to servicing the unprofitable relationships. The unprofitable customers, conversely, receive slightly better service than they should.

The longer-term results are likely to be that the more profitable customers will tend to migrate away from the supplier, because they can get better service from a competitor who does not have to 'carry' so many unprofitable relationships.

Moreover, less profitable customers will tend to migrate towards the supplier as word gets round that service levels are better than the unprofitable customer has the right to expect.

COST PER ORDER

	Volume in pounds	Order Average Size	# Orders
Retailers	400,000	50	8,000
Offices	200,000	10	20,000
Restaurants and Hotels	400,000	100	4,000
Total	**1,000,000**		**32,000**

$$\text{Activity Cost Rate} = \frac{\text{Activity Total Cost}}{\text{Total Activity Drivers}} = \frac{\$\ 2{,}000{,}000}{32{,}000\ \text{orders}} = 62{,}5\ \$/\text{order}$$

COST PER POUND

Cost per order = 62,5 $/order

$$\frac{62{,}5\ \$/\text{order}}{50\ \text{pounds/order}} = 1{,}25\ \$/\text{pound}$$

$$\frac{62{,}5\ \$/\text{order}}{10\ \text{pounds/order}} = 6{,}25\ \$/\text{pound}$$

$$\frac{62{,}5\ \$/\text{order}}{10=\ \text{pounds/order}} = 0{,}625\ \$/\text{pound}$$

COST PER POUND

$$\text{Cost per pound} = \frac{\$\ 2{,}000{,}000}{1{,}000{,}000\ \text{pounds}} = 2, \$/\text{pound}$$

Cost per order = 62,5 $/order

$$\frac{62{,}5\ \$/\text{order}}{50\ \text{pounds/order}} = 1{,}25\ \$/\text{pound}$$

$$\frac{62{,}5\ \$/\text{order}}{10\ \text{pounds/order}} = 6{,}25\ \$/\text{pound}$$

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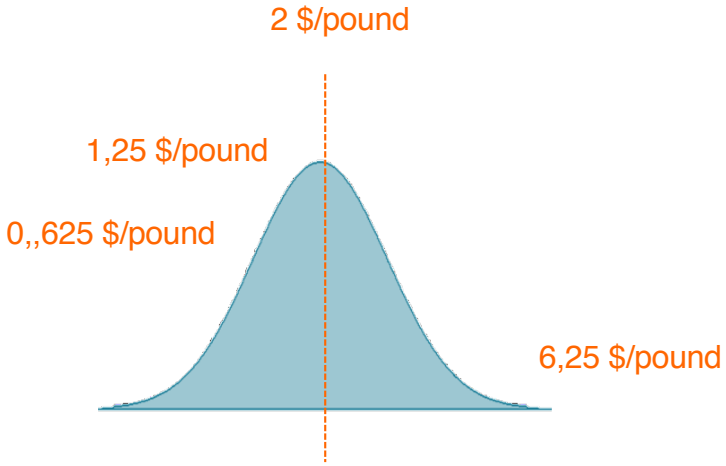
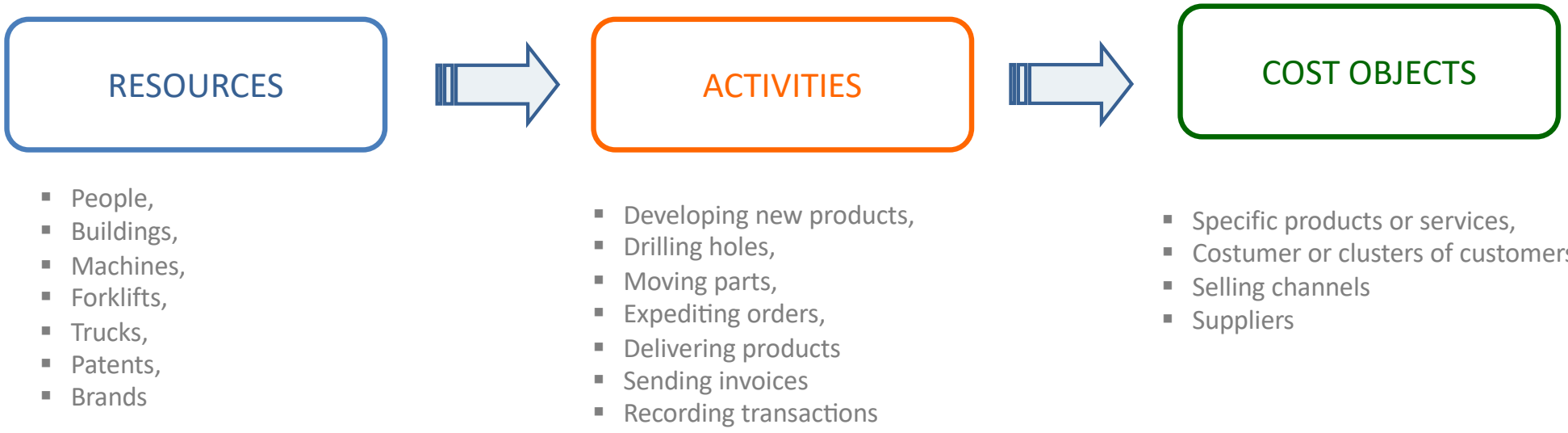


ACTIVITY-BASED COSTING

The system is based on the premise that ACTIVITIES consume RESOURCES and COST OBJECT consume ACTIVITIES.



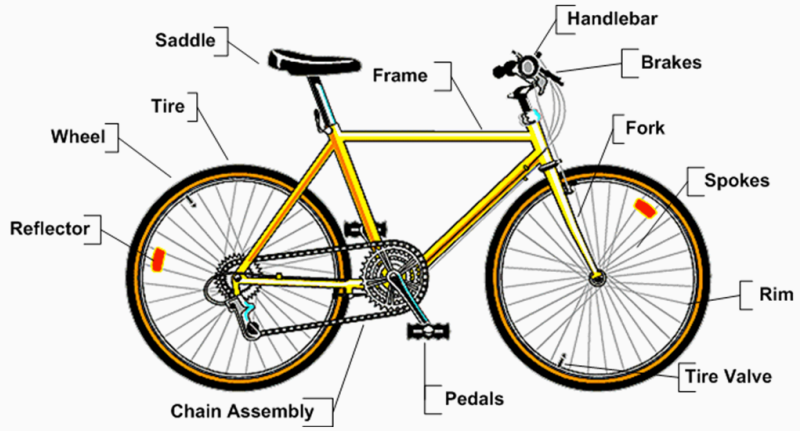
The ABC logic is that the provision of a product/service output incurs cost by requiring resource consuming activities to be performed.

It is the performing of these activities that causes cost, by triggering resource consumption.

TRADITIONAL LOGIC

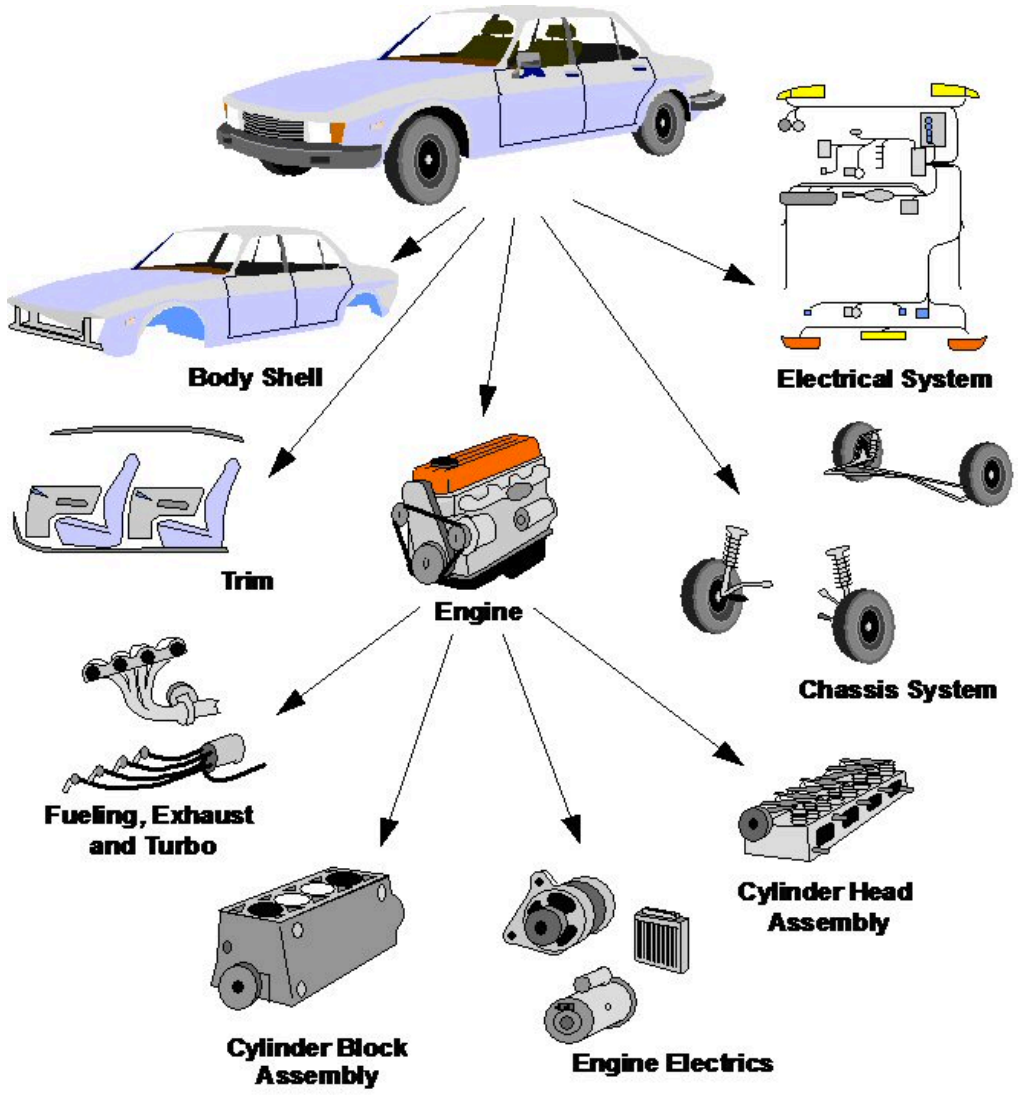
"resources are consumed by products"

BILL OF MATERIALS (B.O.M.)



Bicycle BOM (Bill of Materials)

Level 0 (Finished Good)		Bicycle (1 pc.)		
Level 1 (Main Components)		Wheel (2 pcs.)		Frame (1 pc.)
Level 2 (Sub-assemblies)	Rim (2 pcs.)	Tire 2 (pcs.)	Spokes (72 pcs.)	Color
Level 3		Tire Valve (2 pcs.)		
Level 4	Bolt (1 pc.)	Nut (1 pc.)	Cap (1 pc.)	



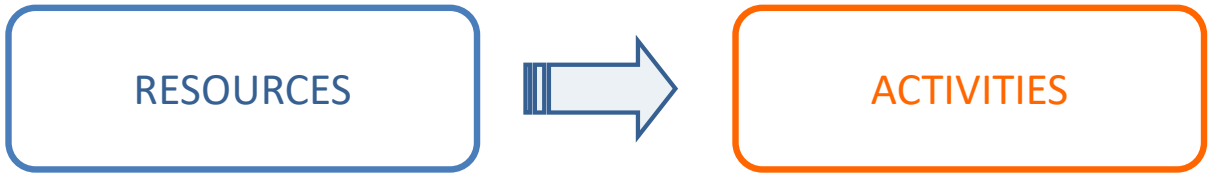
TWO STAGES APPROACH

"resources are used within departments"

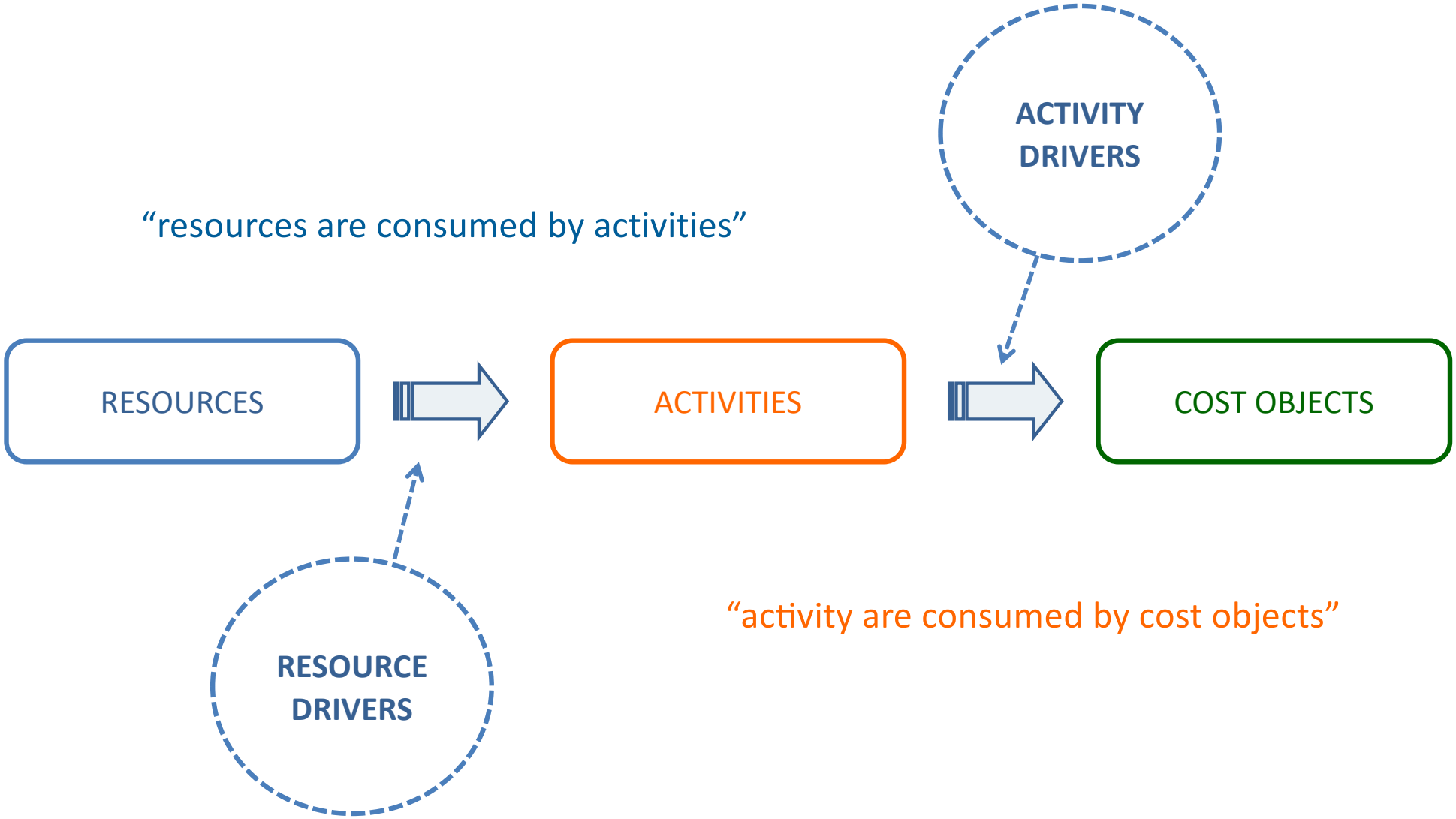
"departments operate to provide products"

ACTIVITY- BASED LOGIC

"resources are consumed by activities"



ACTIVITY- BASED LOGIC



THE IDEA OF "COST DRIVERS"

Porter (1985)	Riley (1987)	Cooper & Kaplan (1998)
Scale	*Structural drivers*	*Manufacturing stage of value chain*
Learning and spillovers	Scale	Unit-level
Capacity utilization	Scope	Batch-level
Linkages between activities across value chain (within firm, across extended value chain)	Experience	Product-sustaining
	Production technology, across the value chain	Facilities-sustaining
		Rest of firm value chain
Linkages with business units within the firm	Product line complexity	Customer-sustaining
	Executional drivers	Product-line sustaining
Timing (first/late movers)	Workforce commitment to continuous improvement	Brand-sustaining
Policy choices (product design and mix (scope), service levels, investments, delivery times, distribution channels technology, materials quality)		Channel-sustaining
	Quality management	Location-sustaining
	Capacity utilization	Corporate-sustaining
	Plant layout efficiency	*Extended value/supply chain*
	Product design configuration	Vendor-sustaining
Geographic locations	Linkages with suppliers and customers (extended value/supply chain)	
Institutional factors (regulation, tariffs, unionization)		

NUMBER OF SCREW AS A COST DRIVER

ACTIVITIES LINKED WITH
SUPPLIER SELECTION

ACTIVITIES LINKED WITH
PRODUCT LIABILITY

ACTIVITIES LINKED WITH
TRANSPORTATION

ACTIVITIES LINKED WITH
INSERTION

ACTIVITIES LINKED WITH
MACHINES SET UP

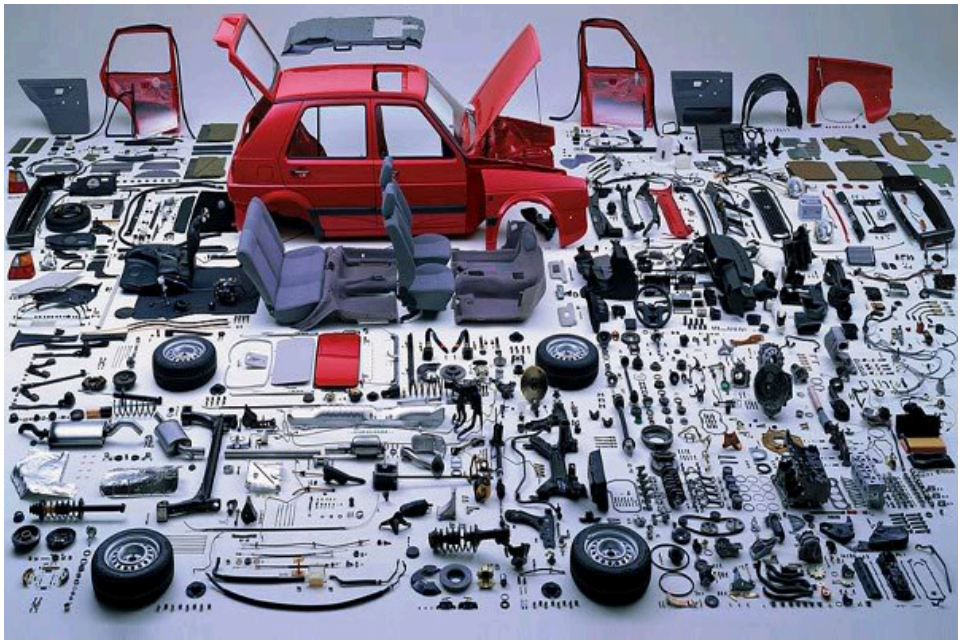
ACTIVITIES LINKED WITH
RECEPTION

ACTIVITIES LINKED WITH
IN-BOUND LOGISTIC

ACTIVITIES LINKED WITH
WAREHOUSING

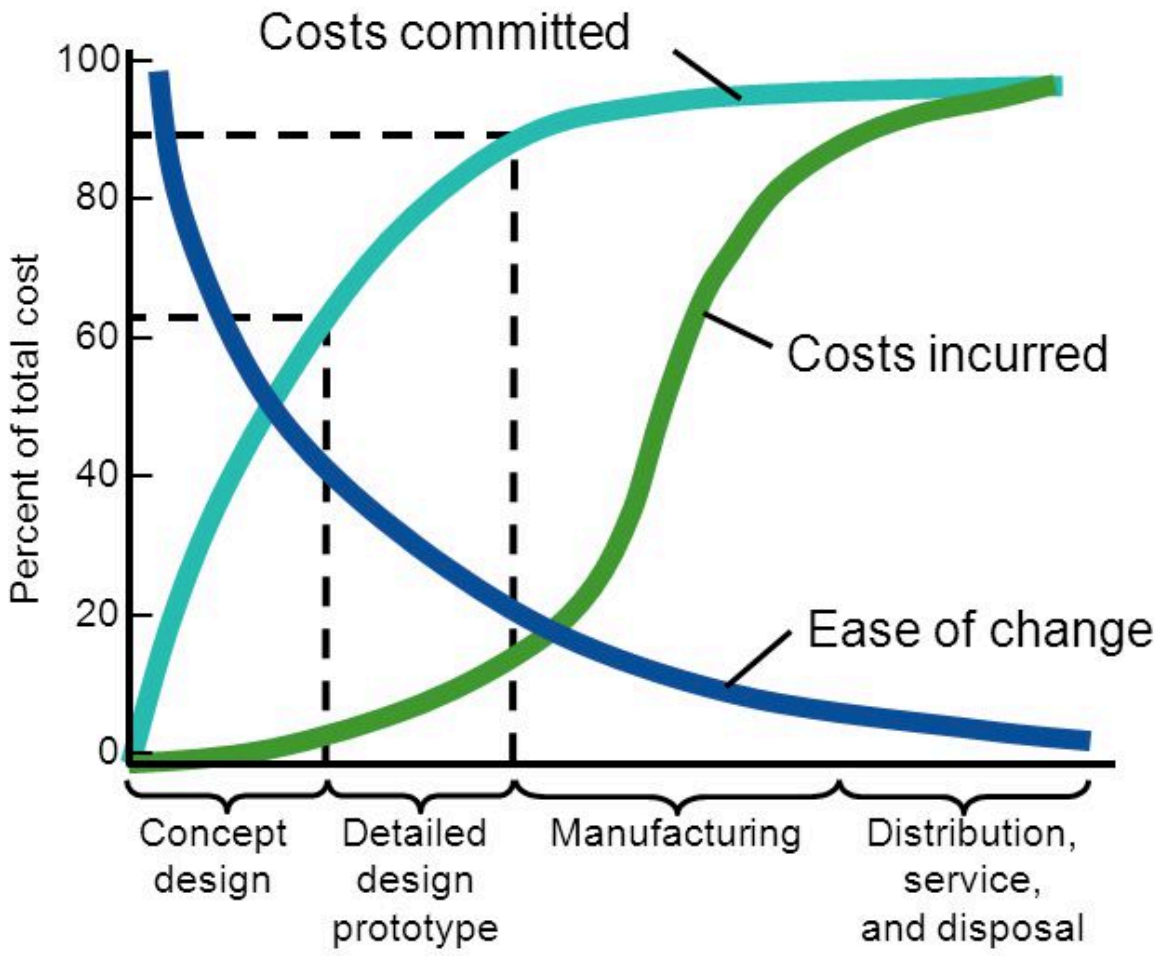
ACTIVITIES LINKED WITH
INSPECTIONS

WHICH ONE REQUIRE MORE ACTIVITIES?

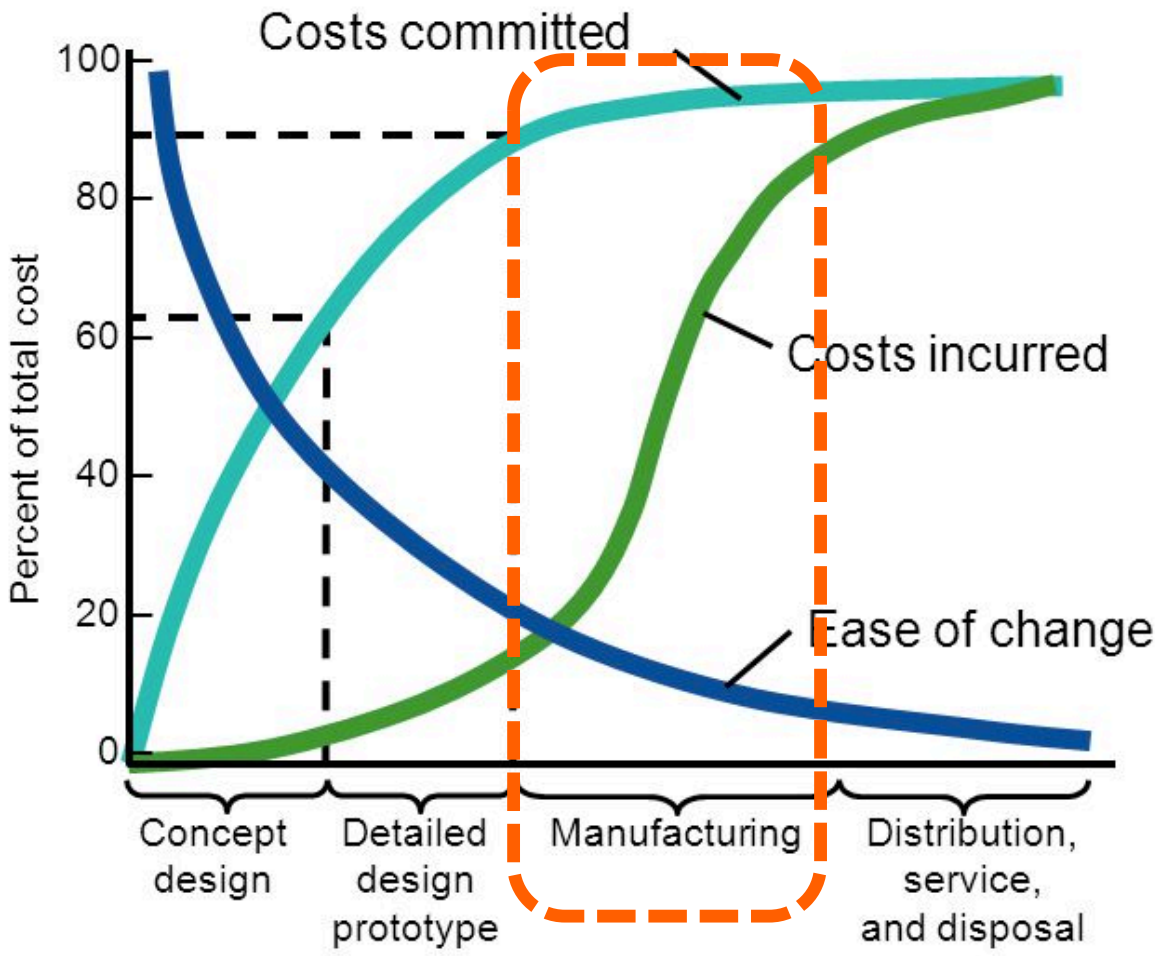


WHICH ONE REQUIRE MORE ACTIVITIES?

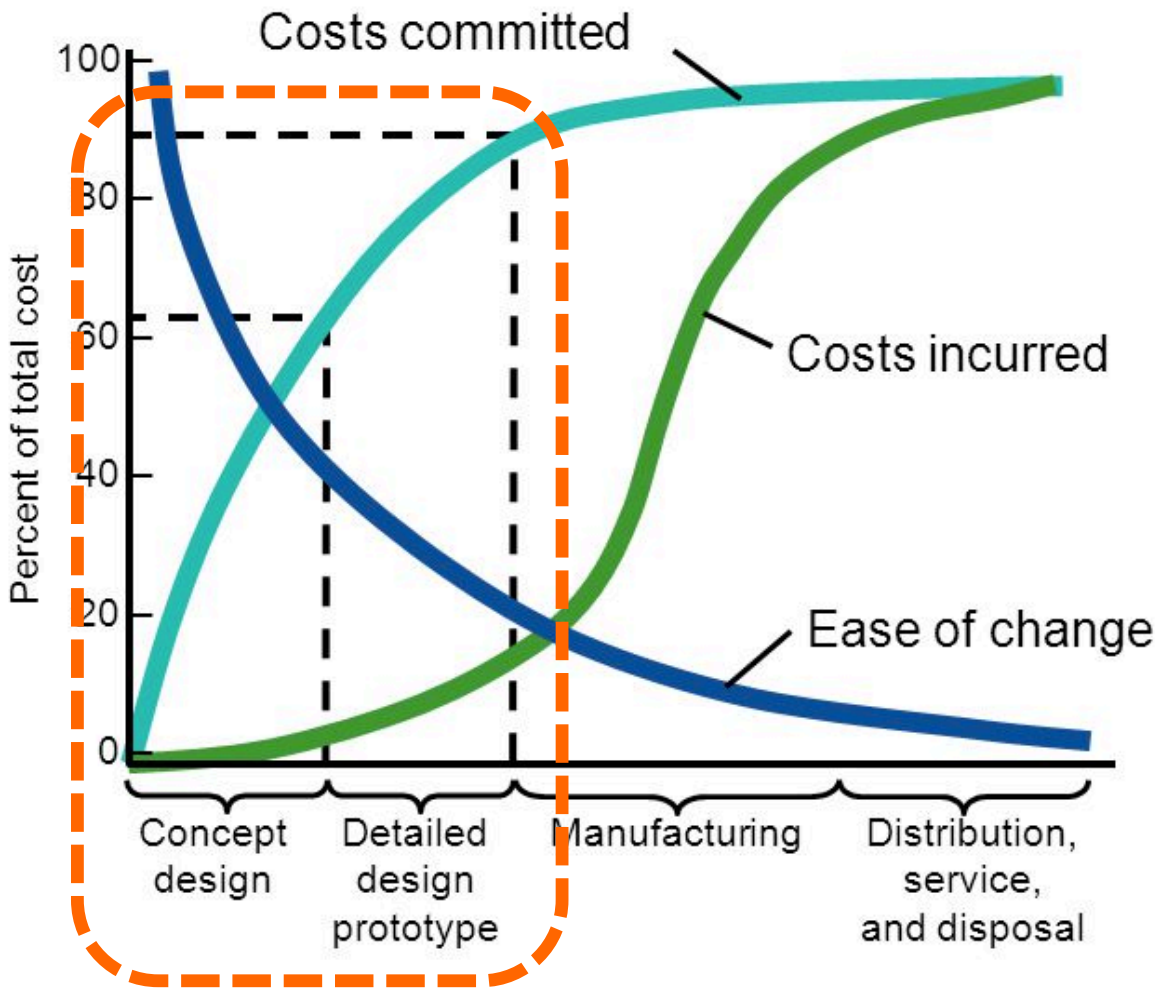
PRODUCT LIFE CYCLE COSTS



PRODUCT LIFE CYCLE COSTS



PRODUCT LIFE CYCLE COSTS



A NEW APPROACH TO COST CONTROL

MANAGING THE COST

- OF EXISTENT PRODUCTS
- OF FUTURE PRODUCTS
  - TARGET COSTING
  - VALUE ENGINEERING
  - DESIGN TO COST

Three significant cost drivers have traditionally been disregarded:

- ✧ Product variety refers to the number of different types of products made;
- ✧ Product complexity refers to the number of components included in a product;
- ✧ Process complexity refers to the number of processes through which a product flows;

PRODUCT COST MANAGEMENT & PROCESS COST MANAGEMENT

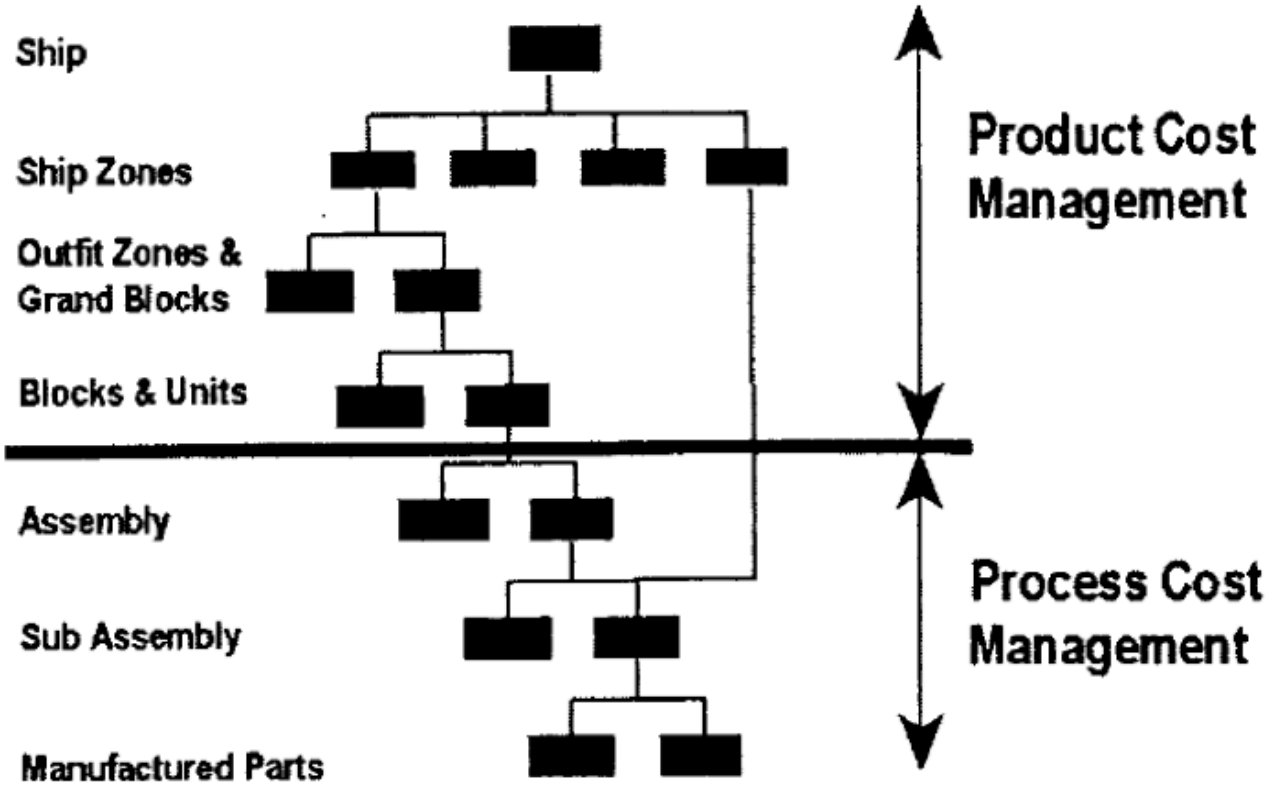


Figure 10.1 Product/Process Configuration & Cost Management

COST DRIVER VERSUS OTHER DRIVERS

Cost driver is something that can be described in words but not necessarily in numbers. For example, a storm would be a cost driver that results in much cleanup work and the resulting costs.

In contrast, the *resource drivers*, *activity drivers* *and* *cost object drivers* must be quantitative, using measures that apportion costs.

More specifically:

- ✧ Resource drivers trace expenditures (cash outlays) to work activities.
- ✧ Activity drivers trace activity costs to cost objects.
- ✧ Cost object drivers trace cost object costs to other cost objects.

COST DRIVER

A *cost driver* is a driver of a higher order than other drivers. One cost driver can affect multiple activities. A cost driver need not be measurable but can simply be described as a triggering event.

The term describes the larger scale causal event that influences the frequency, intensity, or magnitude of a workload and, therefore, influences the amount of work done that translates to the cost of the activities.

For example, a sales promotion can be a cost driver for substantial increases in the company's work activities of the order-fulfillment process. The amount of effort used in taking orders, for example segmented by teenagers versus senior citizens, would require an activity driver (i.e., number of orders placed due to promotion) to calculate the proportional costs to customers in each segment. There would be a unique activity driver for each work activity that belongs to the order-fulfillment process.

FROM EXPENSE CATEGORIES TO ACTIVITIES

RESOURCE DRIVERS

How much is the organization spending on each of its activities?

To answer this question, the ABC system maps the causal relations existing between resource **used** or **supplied** and activities performed, using specific parameters called “resource cost drivers”.

The resource cost drivers link spending and expenses, as captured in the organization’s financial or general ledger system, to the activities performed.

Resources are the initial building block of both traditional and ABC cost systems.

THE SELECTION OF RESOURCE COST DRIVERS

Typically, the ABC analyst interviews or surveys employees.

They may give employees a survey form with the activity dictionary and ask them to estimate the percentage of time they spend on any activity (in excess, say, of 5% of their time) on the list.

For non-personnel resources, the ABC project team either relies on direct measurement (how much power, computer or telecommunications time) or estimates the percentage of the resource used by each activity in the dictionary.

SOURCE: Atkinson, Kaplan, Matsumura, Young, "Management Accounting Information for Decision-Making and Strategy Execution", 6th Edition2.

RESOURCE DRIVER: TIME

Time Distribution in Percentages						
Activity	Crew Leader	Lineman	Telephone	Vehicle 1	Vehicle 2	PC/Network
Number of position	*1*	*22*				
Plan work day	10	5				x
Close out work day	5	5			x	x
Travel to/from job site	10	10			x	
Attend reqiored meetings	5	5				
Direct and control distribution work	20	0	x	x		x
Unload/set/remove poles	10	15			x	
Install/remove anchors	15	15			x	
Frame poles/string wires	20	40			x	
Set up personal protection devices	5	5				
	100	**100**				

RESOURCE DRIVER: TIME

Time Distribution in Percentages						
Activity	Crew Leader	Lineman	Telephone	Vehicle		PC/Network
Number of position	*1*	*22*				
Plan work day	10	5				16.67
Close out work day	5	5			5.88	16.67
Travel to/from job site	10	10			11.76	
Attend reqiored meetings	5	5				
Direct and control distribution work	20	0	100	100		66.66
Unload/set/remove poles	10	15			17.65	
Install/remove anchors	15	15			17.65	
Frame poles/string wires	20	40			47.06	
Set up personal protection devices	5	5				
	100	**100**	**100**	**100**	**100**	**100**

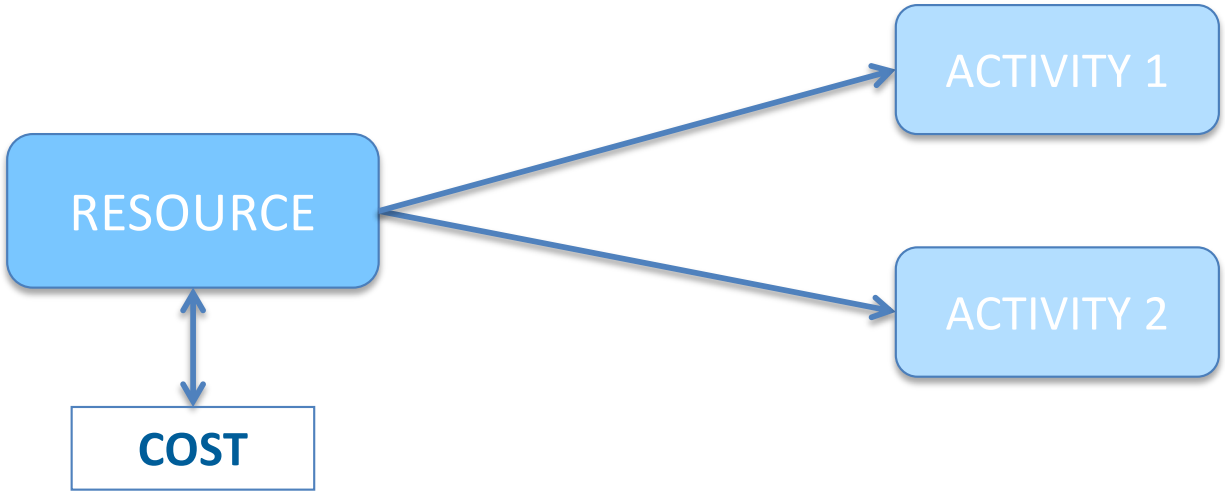
LESS RIGOROUS METHODS OF MEASUREMENT

One does not need extensive time-and-motion studies to link resource spending to activities performed.

The goal is to be approximately right, rather than precisely wrong, as are virtually all traditional product costing systems.

Many traditional standard cost systems calculate product costs out to six significant digits but, because of arbitrary allocation procedures, the first digit is wrong.

TRACING COSTS IN THE ERA OF ABC



Activity-Based Costing advocates accept methods of measurement less rigorous than those used in traditional cost accounting systems.

In ABC systems, resource costs are **traced** to activities using less precise measurement tools, such as **interviews** with personnel, managers and department heads. An important part of cost assignment is therefore based on **individuals' subjective estimates** of the percentages of time spent by personnel on various activities.

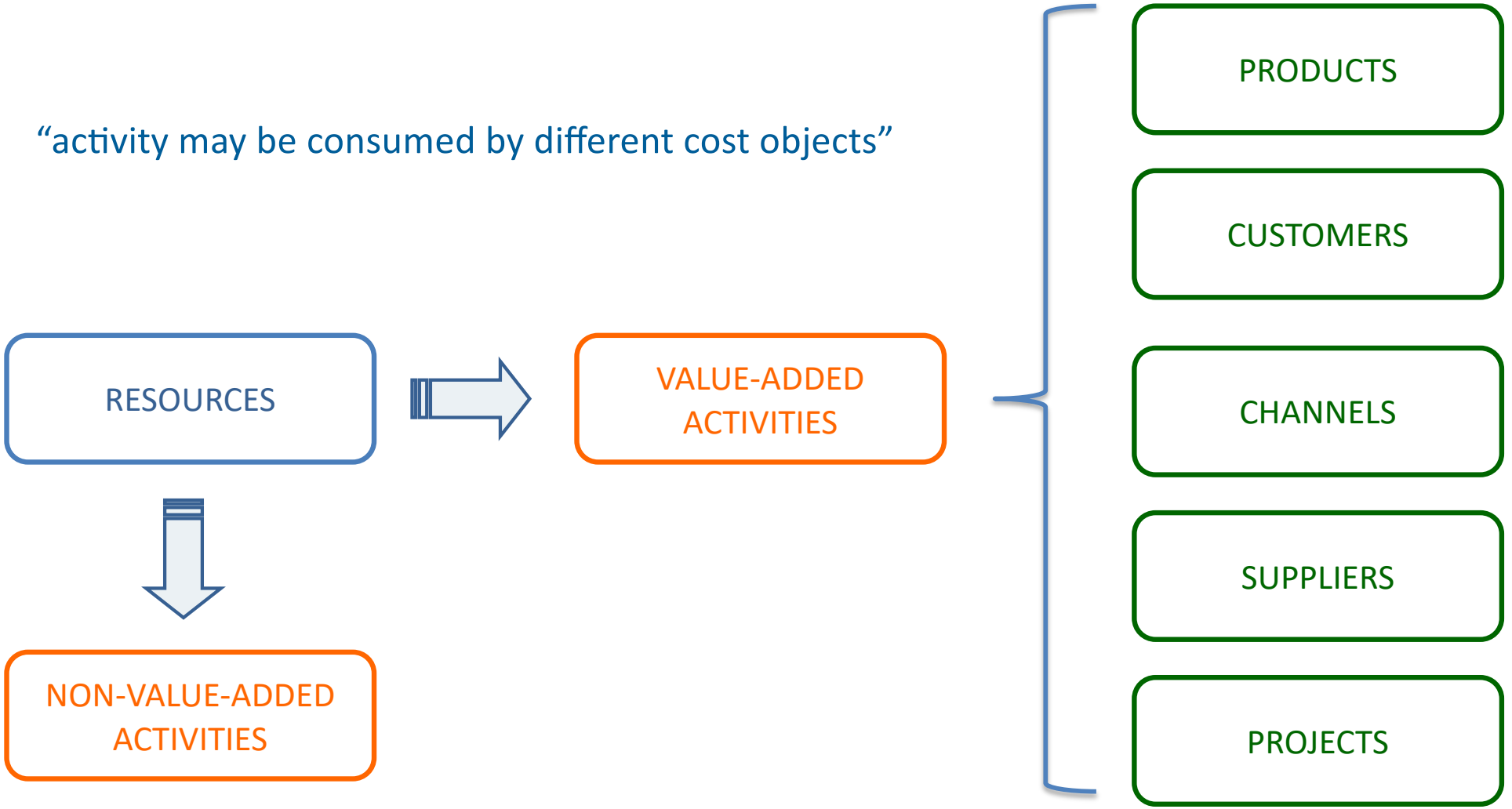
PROBLEMS ARISING FORM INTERVIEWS

The process of interviewing and surveying employees to get their time allocations to multiple activities can pose some problems:

- It could be time-consuming and costly.
- The accuracy of the system may be questioned since cost assignments is based on individuals' subjective estimates of how they spend their time.
- A subtler and more serious problem arose: when people estimated how much time they spend on various activities, they invariably reported percentages that added up to 100%. Few individuals reported that a significant percentage of their time was idle or unused. Therefore, cost-driver rates are calculated assuming that resources were working at full capacity. But, of course, operations at practical capacity are more the exception than the rule.

ACTIVITY- BASED LOGIC

"activity may be consumed by different cost objects"



DECOUPLING ORGANIZATION STRUCTURE

The activity focus permits a flexible cost management system that decouples the organization structure from the function performed.

The decoupling of activities from the organization facilitates an adaptable and flexible cost accumulation procedure to support multiple reporting objectives.

BROAD SET OF COST OBJECTS

Traditional cost accounting assumes that products and services cause costs to occur. Therefore, costs are traced (direct) and allocated (indirect) mainly to products.

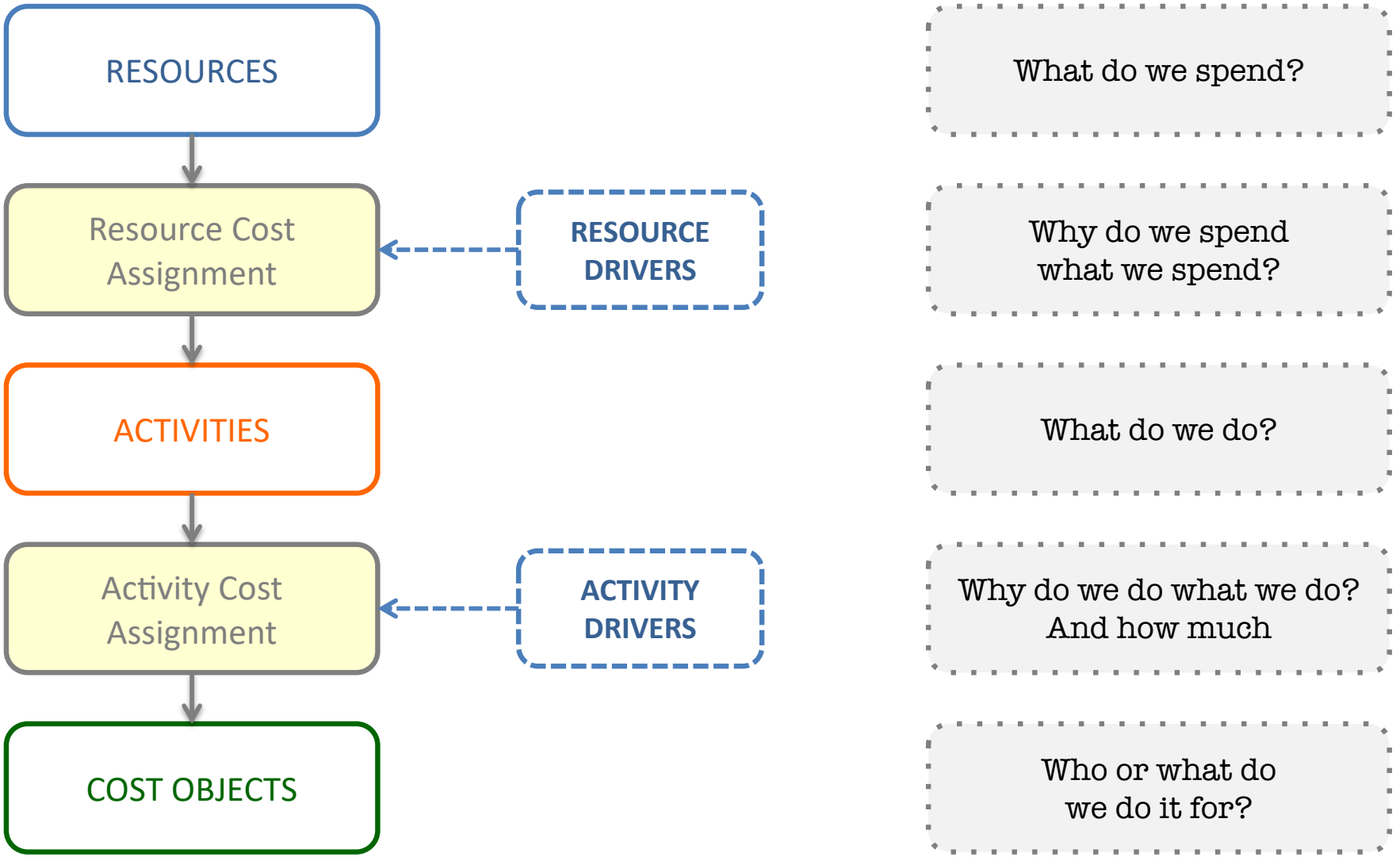
ABC provides information on many aspects of company functions in addition to product cost data. ABC can show how:

- products,
- brands,
- customers,
- customer groups,
- facilities,
- regions or
- distribution channels

both generate revenue and use company resources

FONTE: The Institute of Chartered Accountants of England and Wales , "Customer profitability analysis",

COST ASSIGNEMENT VIEW



ACTIVITY DRIVERS

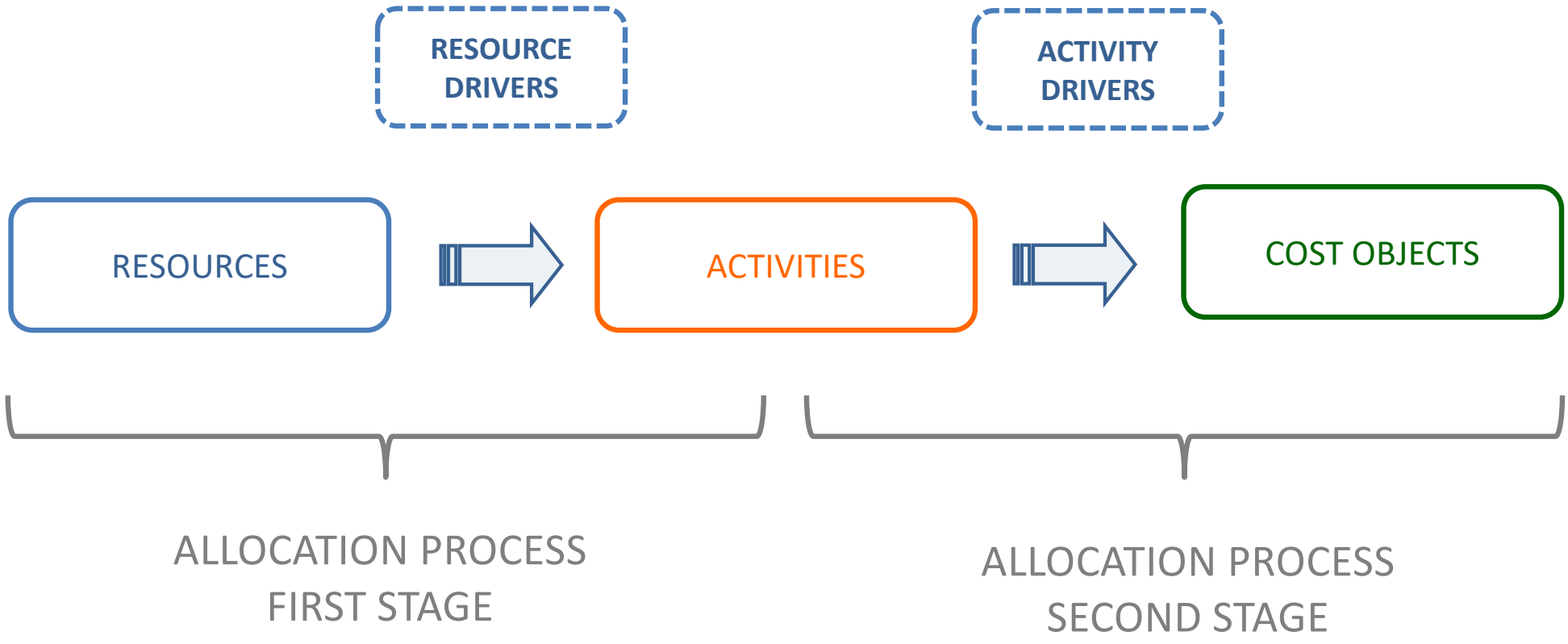
Within ABC Systems the linkage between activities and cost objects, such as products, services, and customers, is accomplished using specific parameters called “activity cost drivers”.

An activity cost driver is a quantitative measure of the output of an activity.

Examples of typical activity cost drivers for particular activities are shown on the list below:

Activity Activity	**Cost Driver**
Run machines	Number of machine hours
Setup machines	Number of setups or setup hours
Schedule production jobs	Number of production runs
Receive materials	Number of material receipts
Support existing products	Number of products
Introduce new products	Number of new products introduced
Maintain machines	Number of maintenance hours
Modify product characteristics	Number of engineering change notices

ACTIVITY-BASED COSTING: TWO IMPROVEMENTS



Major theoretical and practical improvements have been acquired in this area:

- Cost hierarchies
- Different types of activity cost drivers

DELIVERY DEPARTMENT OF ORWEL INC.

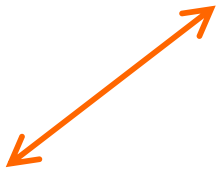
Personnel expense	35,000.00 $
Delivery truck depreciation	10,000.00 $
Fuel	1,200.00 $
Maintenance	2,500.00 $
Road tolls	4,100.00 $
Total costs of Delivery Department	**52,800.00 $**

# of units delivered to Customer X	7,800
# of units delivered to Customer Y	2,200
# of units delivered to Costumers during the period	**10,000**

DELIVERY DEPARTMENT OF ORWEL INC.

Deliver product to customer	80%	42,240.00 $
Move parts (inbound logistic)	15%	7,920.00 $
Provide/attend driving lesson	5%	2,640.00 $
Total costs of Delivery Department	**100%**	**52,800.00 $**

# of units delivered to Customer X	7,800	14	557.14
# of units delivered to Customer Y	2,200	38	57.89
# of units delivered to Costumers during the period	**10,000**	**52**	**192.31**



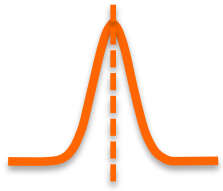
Cost Driver: # of Trips

DELIVERY DEPARTMENT OF ORWEL INC.

Deliver product to customer	80%	42,240.00 $
Move parts (inbound logistic)	15%	7,920.00 $
Provide/attend driving lesson	5%	2,640.00 $
Total costs of Delivery Department	**100%**	**52,800.00 $**

# of units delivered to Customer X	7,800	14	557.14
# of units delivered to Customer Y	2,200	38	57.89
# of units delivered to Costumers during the period	**10,000**	**52**	**192.31**

Cost of the delivery service traced to customer X	11,372.31 $	1.46 $
Cost of the delivery service traced to customer Y	30,867.69 $	14.03 $
Cost of the delivery service	**42,240.00 $**	**4.22 $**



COST HIERARCHIES

A cost hierarchy categorizes various activity cost pools on the basis of the different types of cost drivers, or cost-allocation bases, or different degrees of difficulty in determining cause-and-effect (or benefits-received) relationships.

ABC systems commonly use a cost hierarchy with four levels

- output unit-level costs,
- batch-level costs,
- product-sustaining costs, and
- facility-sustaining costs

to identify cost-allocation bases that are cost drivers of the activity cost pools.

OUTPUT UNIT-LEVEL COSTS

Output unit-level costs are the costs of activities performed on each individual unit of a product or service.

Machine operations costs (such as the cost of energy, machine depreciation, and repair) related to the activity of running the automated molding machines are output unit-level costs. They are output unit-level costs because, over time, the cost of this activity increases with additional units of output produced (or machine-hours used).

BATCH-LEVEL COSTS

Batch-level costs are the costs of activities related to a group of units of a product or service rather than each individual unit of product or service.

Tasks such as placing purchase orders, setting up equipment, and arranging for shipments to customers are batch-level activities. They are incurred once for each batch (or customer order).

Costs at the batch level depend on the number of batches processed rather than on the number of units produced, the number of units sold, or other measures of volume.

For example, the cost of setting up a machine for batch processing is the same regardless of whether the batch contains one or thousands of items.

PRODUCT-LEVEL & COSTUMER-LEVEL COSTS

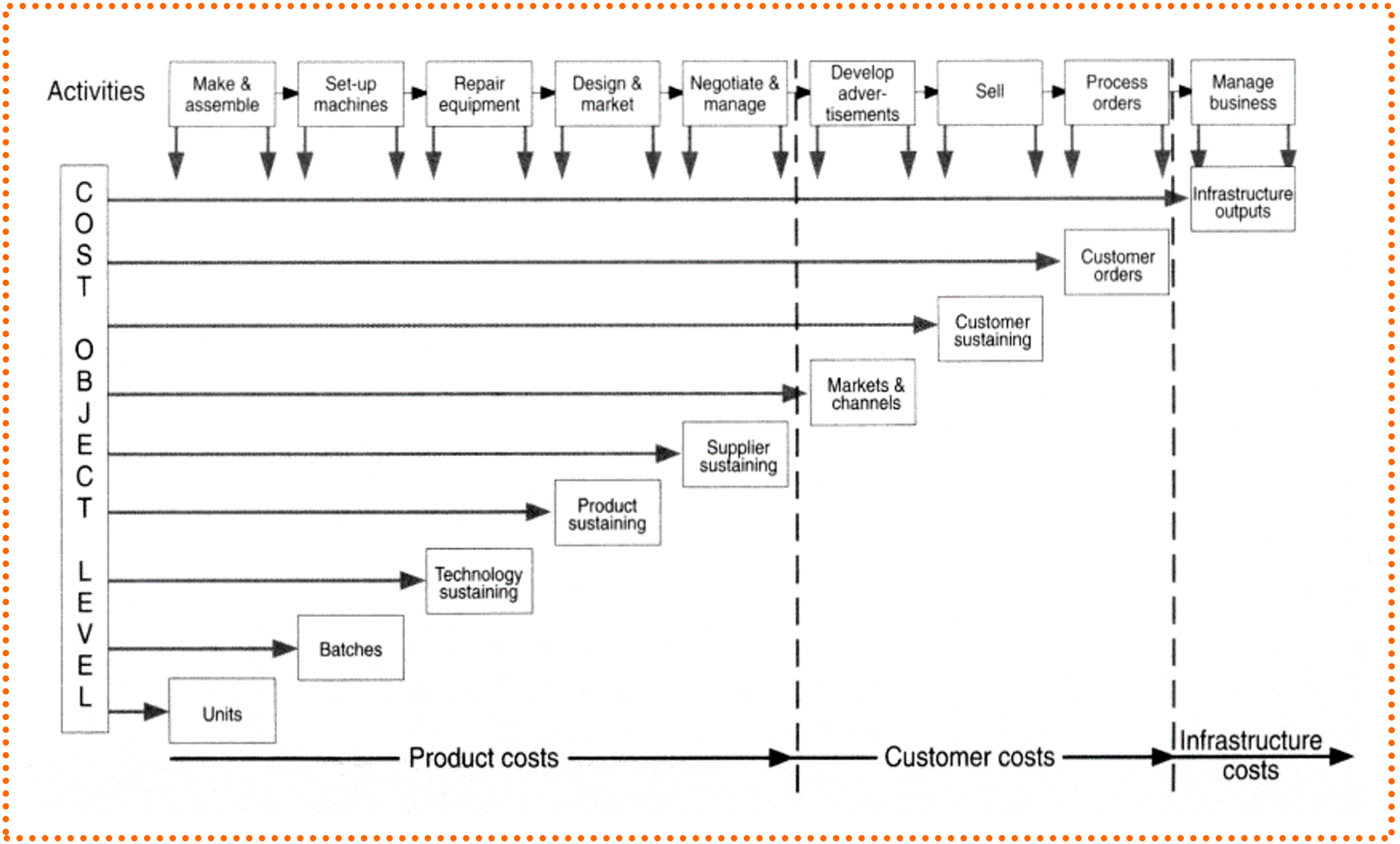
Product-sustaining costs (service-sustaining costs) are the costs of activities undertaken to support individual products or services regardless of the number of units or batches in which the units are produced.

Design costs are product-sustaining costs. Over time, design costs depend largely on the time designers spend on designing and modifying the product, the machinery, and the process.

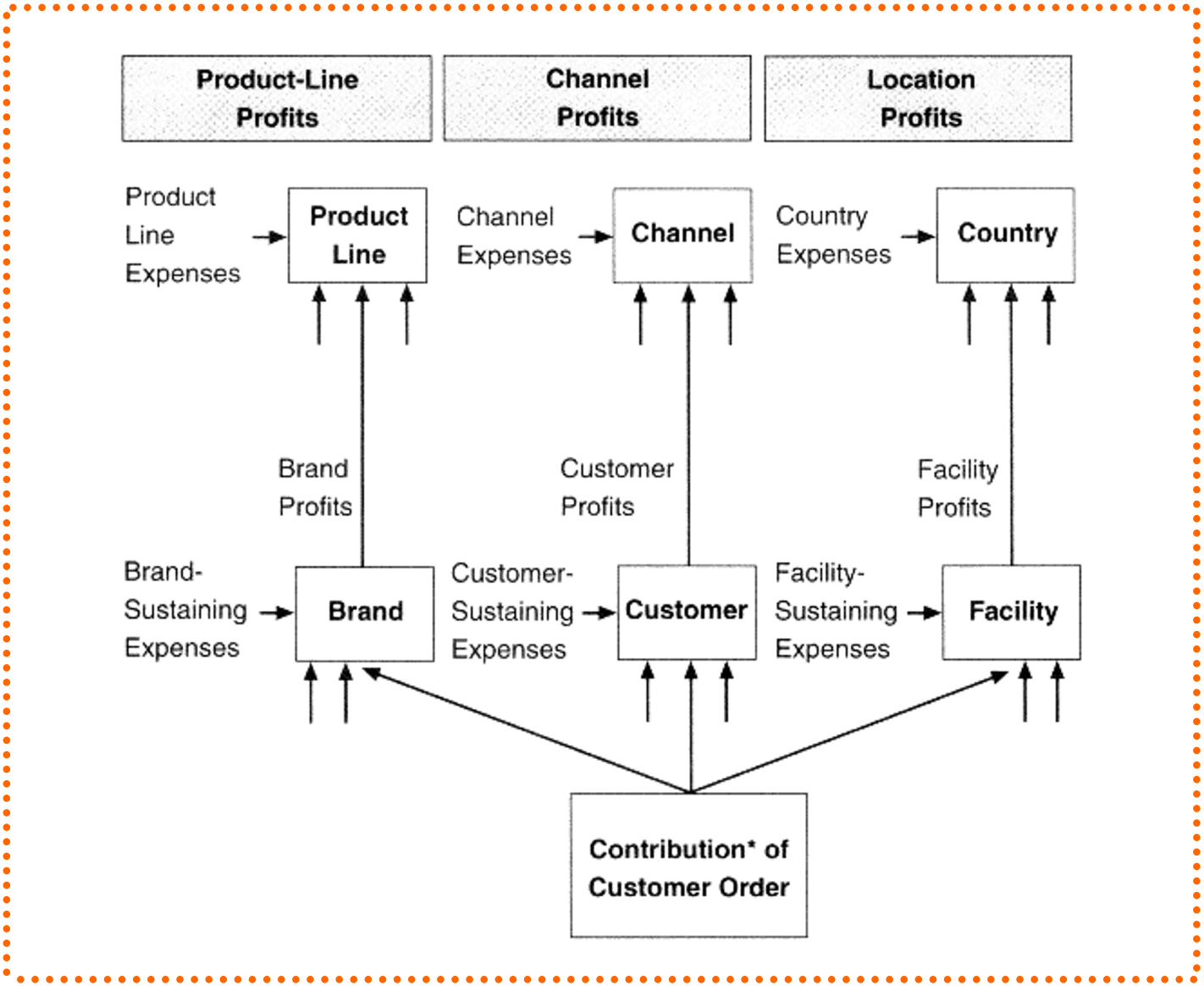
Other examples of product-sustaining costs are product research and development costs, costs of making engineering changes, and marketing costs to launch new products.

Customer-level activities relate to specific customers and include activities such as sales calls, catalog mailings, and general technical support that are not tied to any specific product.

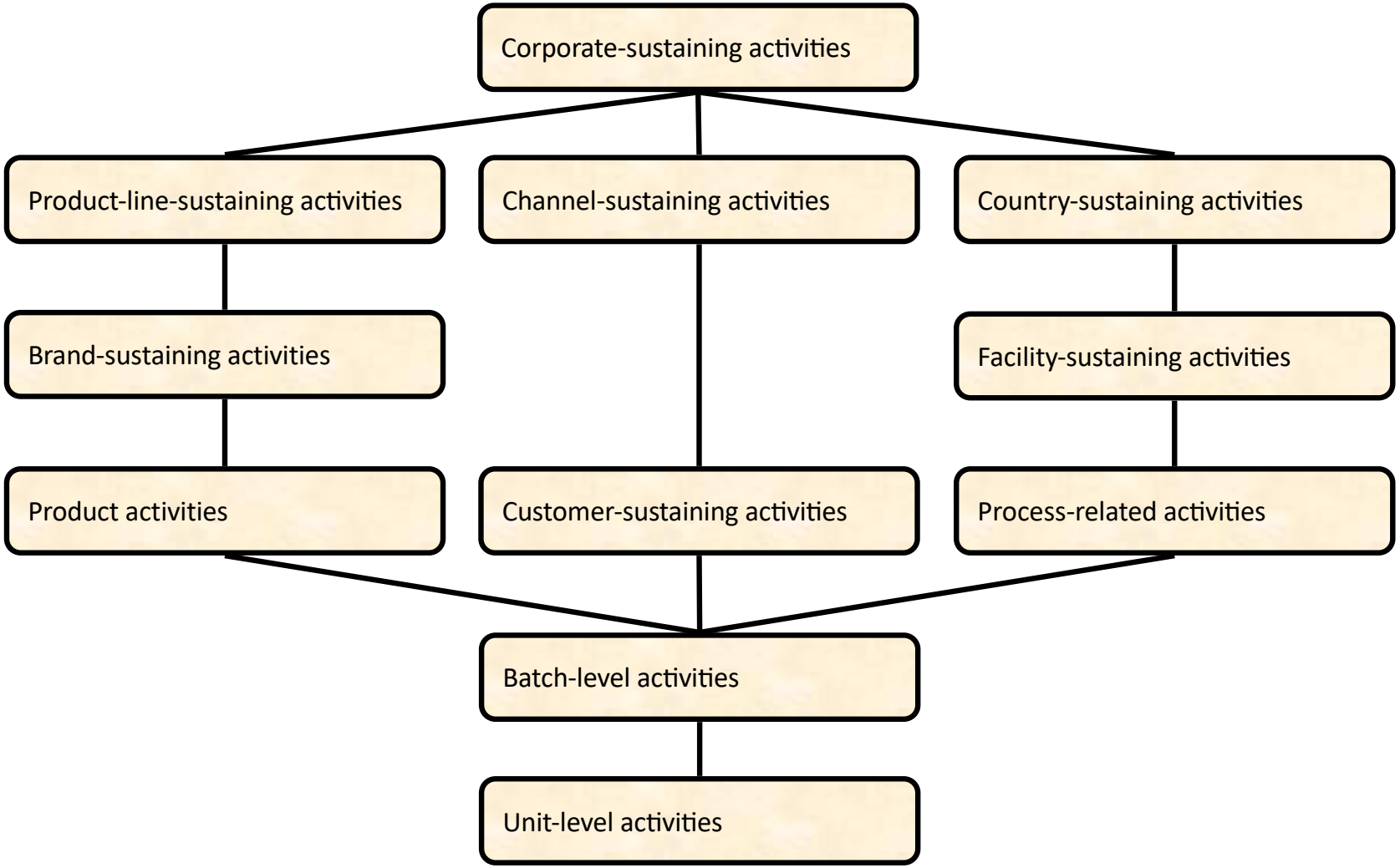
COST HIERARCHIES



COST HIERARCHIES



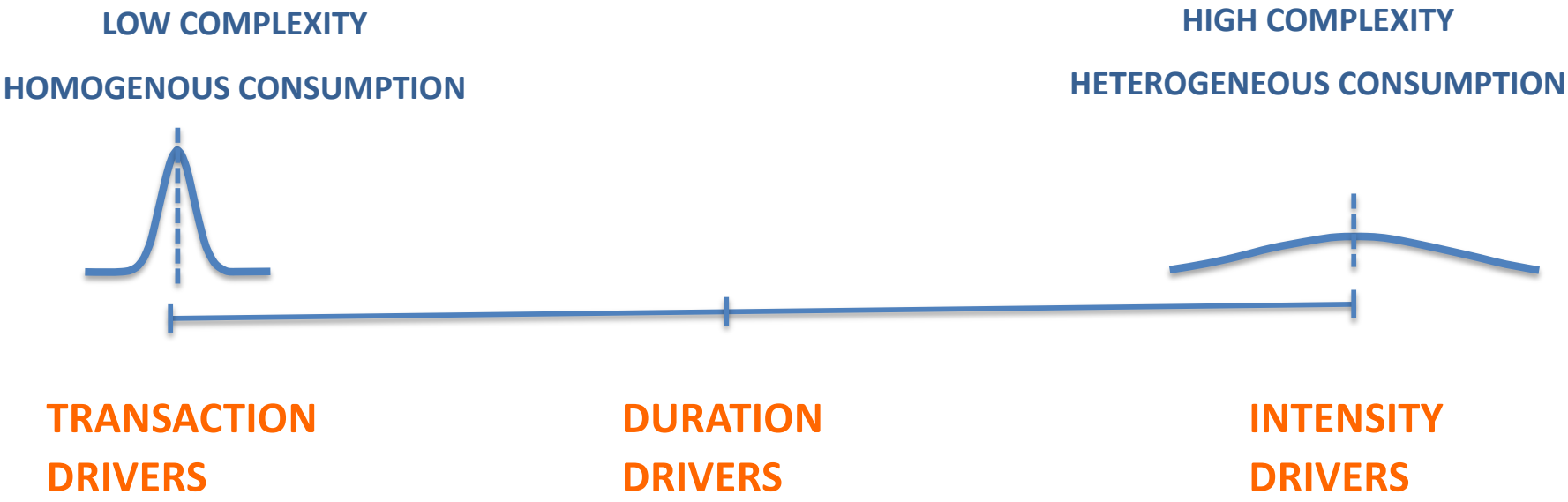
COST HIERARCHIES



TYPES OF ACTIVITY COST DRIVERS

ABC system designers can choose from three different types of activity cost drivers:

- ✧ Transaction
- ✧ Duration
- ✧ Intensity or Direct Charging



TRANSACTION DRIVERS

Transaction drivers, such as the number of setups, number of receipts, and number of products supported, count how often an activity is performed.

Transaction drivers can be used when all outputs make essentially the same demands on the activity. For example, scheduling a production run, processing a purchase order, or maintaining a unique part number may take the same time and effort independent of which product is being scheduled, which material is being purchased, or which part is being supported in the system.

Transaction drivers are the least expensive type of cost driver but could be the least accurate, since they assume that the same quantity of resources is required every time an activity is performed; that is, the activity is homogeneous across products. For example, the use of a transaction driver like the number of setups assumes that all setups take the same time to perform. For many activities, the variation in use by individual cost objects is small enough that a transaction driver will be fine for assigning activity expenses to the cost object.

DURATION DRIVERS

Duration drivers represent the amount of time required to perform an activity.

Duration drivers should be used when significant variation exists in the amount of activity required for different outputs.

For example, simple products may require only 10-15 minutes to setup, while complex, high-precision products may require 6 hours for setup. Using a transactions driver, like number of setups, will overcost the resources required to setup simple products and will undercost the resources required for complex products. To avoid this distortion, ABC designers would use a duration driver, like setup hours, to assign the cost of setups to individual products.

Examples of duration drivers include setup hours, inspection hours, and direct labor hours. For materials movement, distance moved can be viewed as a duration driver; distance acts as a proxy for the time taken to move materials from one point to another.

DURATION DRIVERS VERSUS TRANSACTIONS DRIVERS

In general, duration drivers are more accurate than transactions drivers, but they are much more expensive to implement since the model requires an estimate of the duration each time an activity is performed. With only a transaction driver (number of setups), the designer would only need to know how many times a product was setup, information that should be readily available from the production scheduling system. Knowing the setup time for each product is an additional, and more costly, piece of information.

The choice between a duration and a transactional driver is, as always, one of economics, balancing the benefits of increased accuracy against the costs of increased measurement.

INTENSITY DRIVERS

For some activities, however, even duration drivers may not be accurate. Intensity drivers directly charge for the resources that are used each time an activity is performed.

Continuing with our setup example, a particularly complex product may require special setup and quality control people, as well as special gauging and test equipment each time the machine is setup to produce the product. A duration driver, like setup cost per hour, assumes that all hours are equally costly, but does not reflect extra personnel, especially skilled personnel and expensive equipment that may be required on some setups but not others. In these cases, activity costs may have to be charged directly to the output, based on work orders or other records that accumulate the activity expenses incurred for that output.

INTENSITY DRIVERS

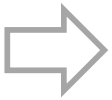
Intensity drivers are the most accurate activity cost drivers but are the most expensive to implement; in effect they require **direct charging** via a job order costing system to keep track of all the resources used each time an activity is performed.

They should be used only when the resources associated with performing an activity are both expensive and variable each time an activity is performed.

ABC : A SYNTESIS

Activity-Based Costing

devised to take into consideration the effect of complexity on costs.



2 main ideas

1. **HIERARCHIES OF ACTIVITIES**
   This framework recognizes that different subsets of costs may be explained by different "drivers" ("causes"). It establishes, therefore, the existence of a multilevel relationship between costs and cost drivers.

2. **DISTINCTION OF ACTIVITY DRIVERS IN THREE DIFFERENT CATEGORIES:**
   - **TRANSACTION,**
   - **DURATION, AND**
   - **INTENSITY DRIVERS.**

   This distinction takes into consideration the fact that the same activity, if performed differently, could use the same set of resources with a different level of intensity.

1. HIERARCHIES OF ACTIVITIES

ABC costing systems have been devised to take into consideration the effect of complexity on costs.

They achieve this purpose by means of two basic innovations in the process of costing

The first one is called “hierarchies of activities”. This framework recognizes that different subsets of costs may be explained by different “drivers” (“causes”). It establishes, therefore, the existence of a multilevel relationship between costs and cost drivers. In this way, a clearer and more profound understanding of the causes beyond cost variations in the long run could be attained.

Thanks to this “conceptual tool”, for instance, it is possible to differentiate “costs” that are caused by the complexity of the products from those that are caused by the complexity driven by customers’ behavior or by structural and organizational decisions.

2. DIFFERENT CLASSES OF COST DRIVERS

The second innovation is represented by the **distinction of activity drivers in three different categories:** transaction, duration, and intensity drivers. This distinction takes into consideration the fact that the same activity, if performed differently, could use the same set of resources with a different level of intensity.

If an activity is always performed in the same way, its level of consumption is almost the same and so its cost per unit of activity performed is stable. In this case the average cost of the activity (total cost of the activity/numbers of time the activity is performed) can be properly compounded, and it is meaningful. **Transition drivers** count how often an activity is performed and therefore are used as denominator of the "activity cost rate".

If, however, the mode in which the activity is performed changes continuously, then the computation of an average cost must be avoided. In these instances, a more complex computation is required, and **duration drivers** or **intensity drivers** are employed