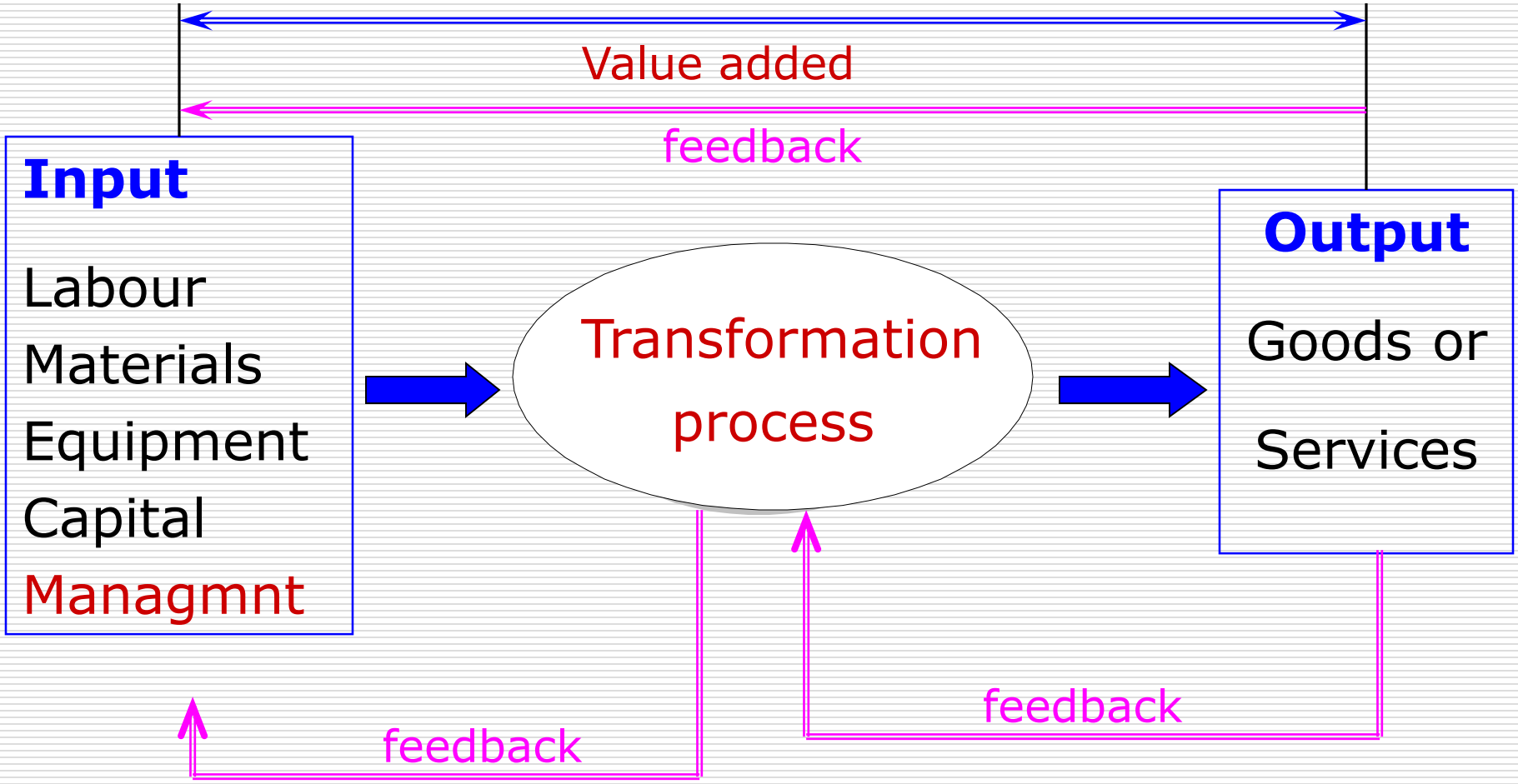
Chapter 1

THE BASIC CONCEPT OF PRODUCTION & OPERATIONS

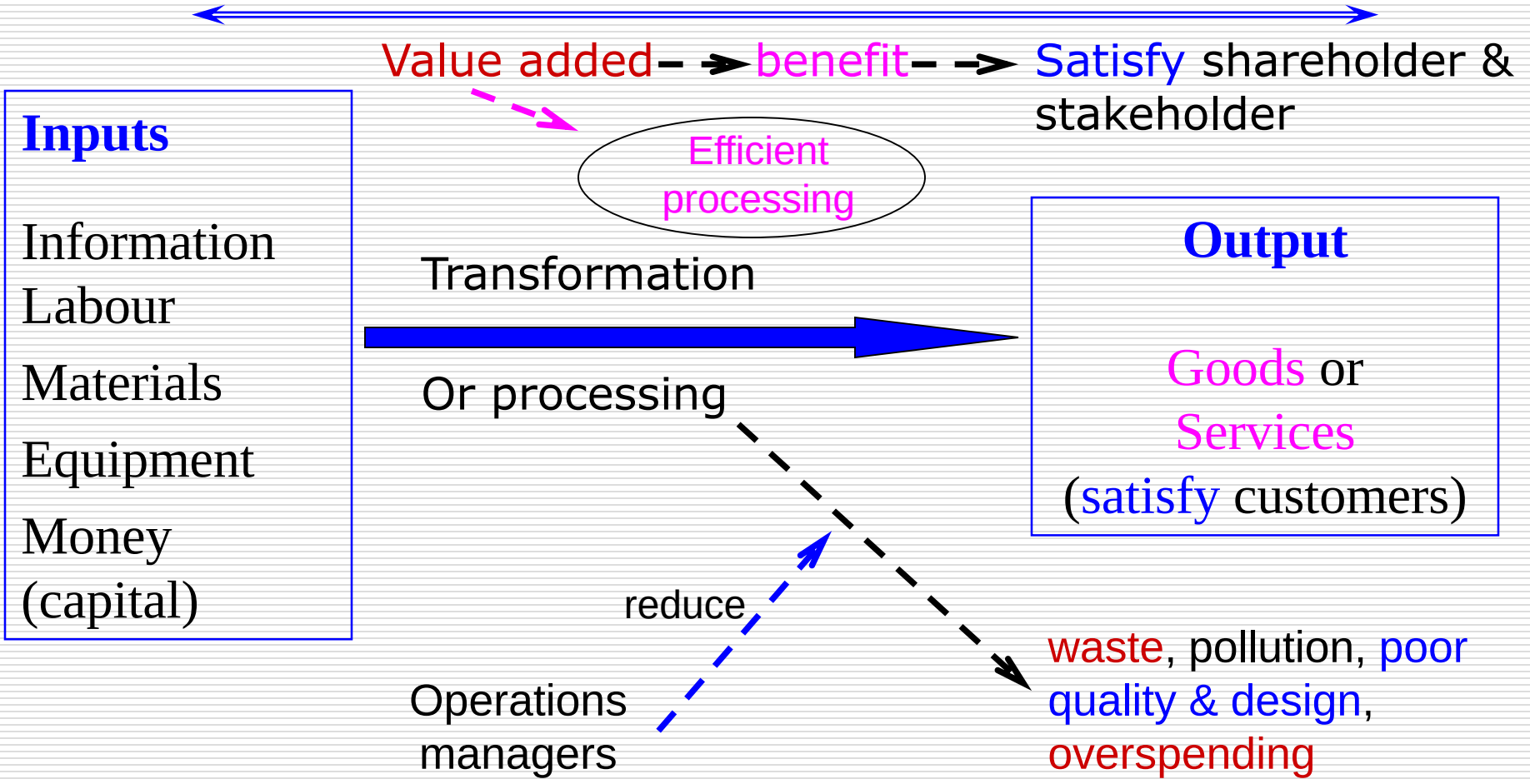
1. The important role of POM

Manufacturing is a transformation process



1. The important role of POM

Overview of operations management



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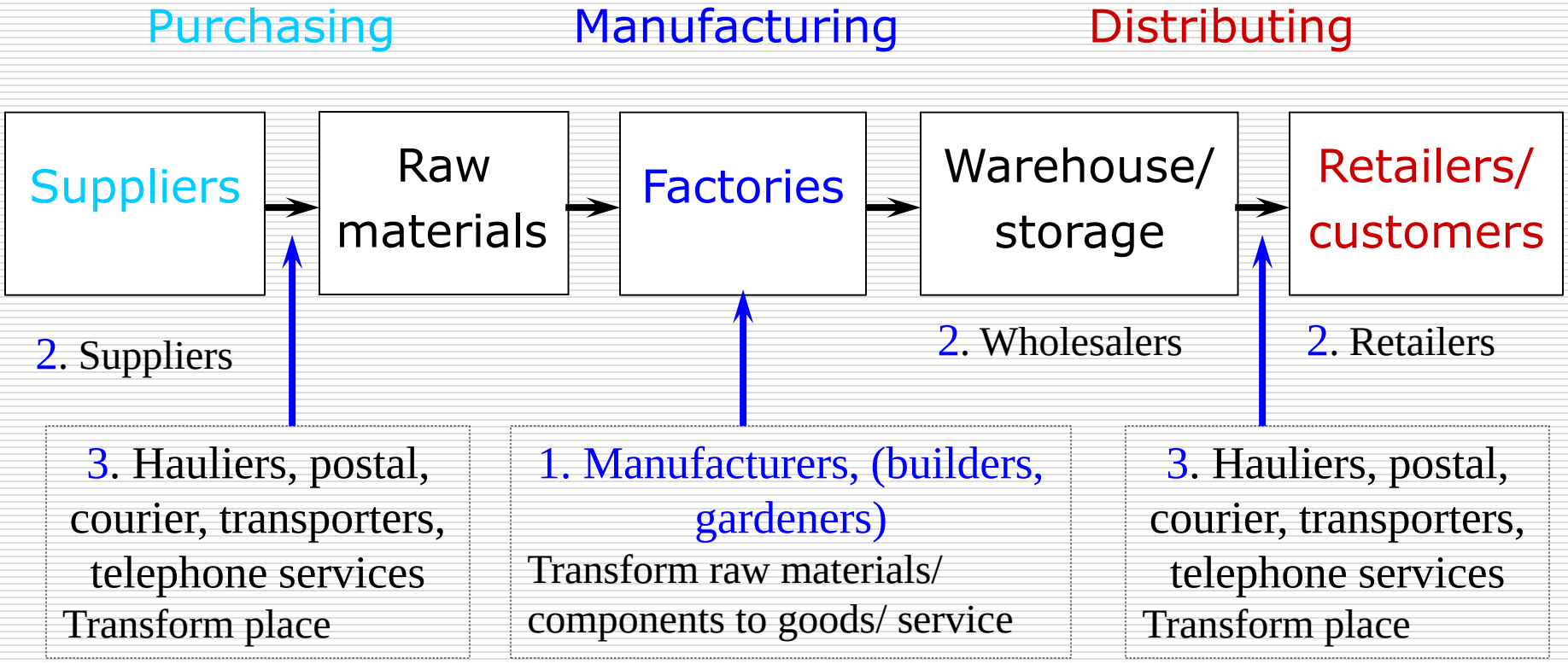
Process transformations (*4 types*)

Figure 1: Typical Supply Chain



4. Supporting services: Insurance, finance, health-care…

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Production is transformation process from *INPUT* (materials, labors, machines, management, capital) to *OUTPUT* (goods or services).

Transformation process is *efficient* process when the value of output *greater than* the total cost of input, in this case, this process makes value added.

1. The important role of POM

Effective (**EFFECTIVENESS**) – producing or being able to produce an *intended result* (Focus on the quality of the output # how well the job gets done)

Efficient (**EFFICIENCY**) - being effective without *wasting time*, *expense* or some other *resource* (Focus on the output/input **ratio** # saving *TIME*, *MONEY* or *EFFORT*)

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	Effectiveness	Efficiency
Meaning	+ Effectiveness is about doing the right task, completing activities and achieving **goal**	+ Efficiency is about doing things in an optimal way, for example doing it the fastest or in the least expensive way. It could be the wrong thing, but it was done **optimally**
Effort oriented	No	Yes
Process Oriented	No	Yes
Goal oriented	Yes	Yes
Time oriented	No	Yes
	(Goal)/(Input)	(Useful output)/(Input)

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Productivity: output/input

→ Productivity increases when firms become more efficient, downsize, expand, retrench, or achieve breakthroughs.

$$\text{Partial measure} = \frac{\text{Output}}{\text{Labor}} \text{ or } \frac{\text{Output}}{\text{Capital}} \text{ or } \frac{\text{Output}}{\text{Materials}} \text{ or } \frac{\text{Output}}{\text{Energy}}$$

$$\text{Multifactor} = \frac{\text{Output}}{\text{Labor + Capital + Energy}} \text{ or } \frac{\text{Output}}{\text{Labor + Capital + Materials}}$$

$$\text{Total} = \frac{\text{Output}}{\text{Inputs}} \text{ or } \frac{\text{Goods \& service produced}}{\text{All resources used}}$$

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Productivity: example

Input and output production data	
OUTPUT	In $
1. Finished units	10,000
2. Work in process	2,500
3. Dividends	1,000
4. Bonds	/
5. Other income	/
Total output	$13,500
INPUT	In $
1. Human	3,000
2. Materials	153
3. Capital	10,000
4. Energy	540
5. Other expenses	1,500
Total input	$15,193

Total measure:

$$\frac{\text{Total Output}}{\text{Total Inputs}} = \frac{13{,}500}{15{,}193} = 0.89$$

Multifactor measures:

$$\frac{\text{Total Output}}{\text{Human + Materials}} = \frac{13{,}500}{3{,}153} = 4.28$$

$$\frac{\text{Finished units}}{\text{Human + Materials}} = \frac{10{,}000}{3{,}153} = 3.17$$

1. The important role of POM

Productivity: example

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Total measure:

$$\frac{\text{Total Output}}{\text{Total Inputs}} = \frac{13{,}500}{15{,}193} = 0.89$$

Partial measures:

$$\frac{\text{Total Output}}{\text{Energy}} = \frac{13{,}500}{540} = 25$$

$$\frac{\text{Finished units}}{\text{Energy}} = \frac{10{,}000}{540} = 18.52$$

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Input examples:

- Land
- Labor (physical, intellectual)
- Raw materials (energy, water, chemical, metals, woods, fibers,…)
- Equipment (machines, computers, trucks, vans, tools,…)
- Facilities (factories, offices, warehouse, stores…)

1. The important role of POM

Output examples:

- Goods: automobiles, clothing, computers, TV, foods, beverages, shoes, textbooks, furniture,…)
- Services: health-care, car-repair, car-wash, banking, education,…

Transformation process:

- Cutting, drilling, grinding, milling,…
- Mixing, packing, canning,
- Transporting, storing, teaching, advising,…

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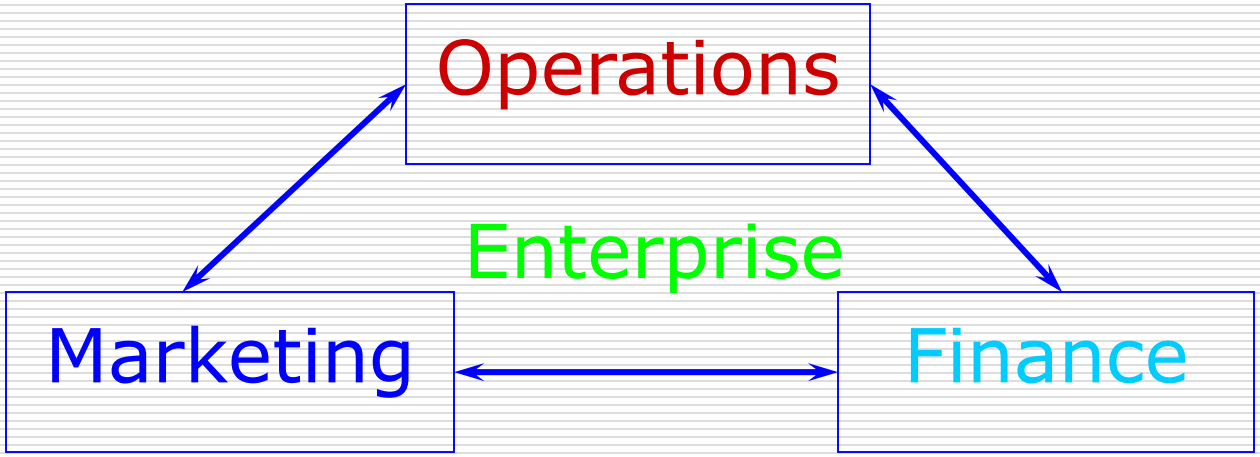
Operations as a basic function



Marketing: Customer need for goods or service,

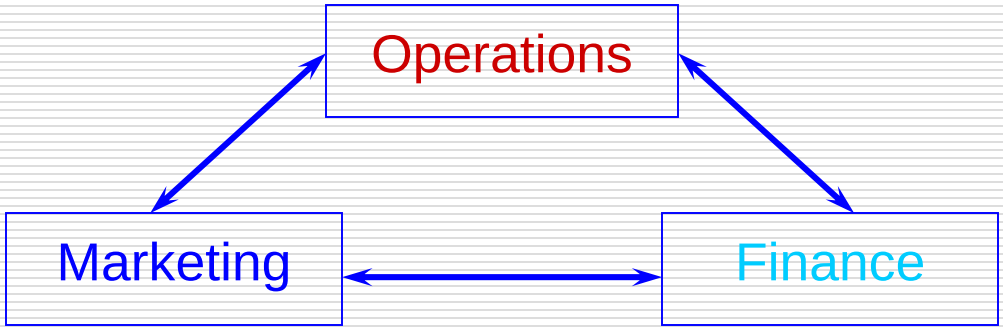
Finance: Budgeting, analysis of investment proposals

Provision of funds,

Operations: Making goods or providing services,

1. The important role of POM

Conflicts objectives



Operations: producing required quantities of items to quality & on time → need more time to produce enough quality product volume (*time* >< *quantity & quality*)

Within acceptable financial & social costs → meet serious operational costs constraint (*production cost* >< *ceiling cost permision* – *from marketing* & *finance*)

At a good sales price & an acceptable ROI → sales price affect to sales volume & revenue (*good price* >< *high reture*)

With flexibility to adjust to demand → adjust production planning to meet demand (*stable/production planning* >< *real planning*)

→ Sometimes these objectives conflict together!!!

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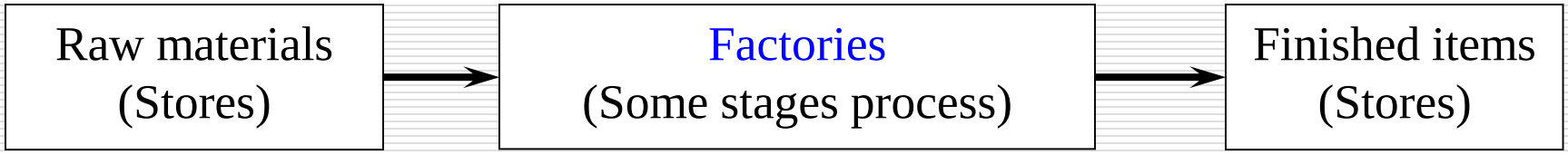
Boundary management

Figure 2: Typical production system



Innovation: short life-cycle time → need quick new product: how to produce (machines, tools, equipment, technology), cost, skill parameters (training programs),

Purchasing: procuring & storing raw materials, components, tools and equipment.

Marketing: transfer customers orders (contracts) to production, customer complain/feedback to production and R&D, delivery products to customers.

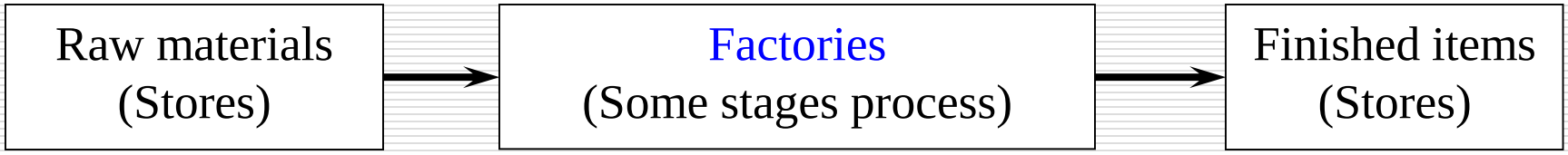
Finance & account: meet production budget (cost, wages, power, water, raw materials…), determine production cost, accounts payable & receivable

Personnel: recruitment, knowledge & skill training, design of rewards system, health & safety and industrial relations

1. The important role of POM

Boundary management

Figure 2: Typical production system



Product & service design: new product must be feasible (well functions & form, produce-able, acceptable cost, satisfy demand → cross decision making among R&D, marketing, finance and production…

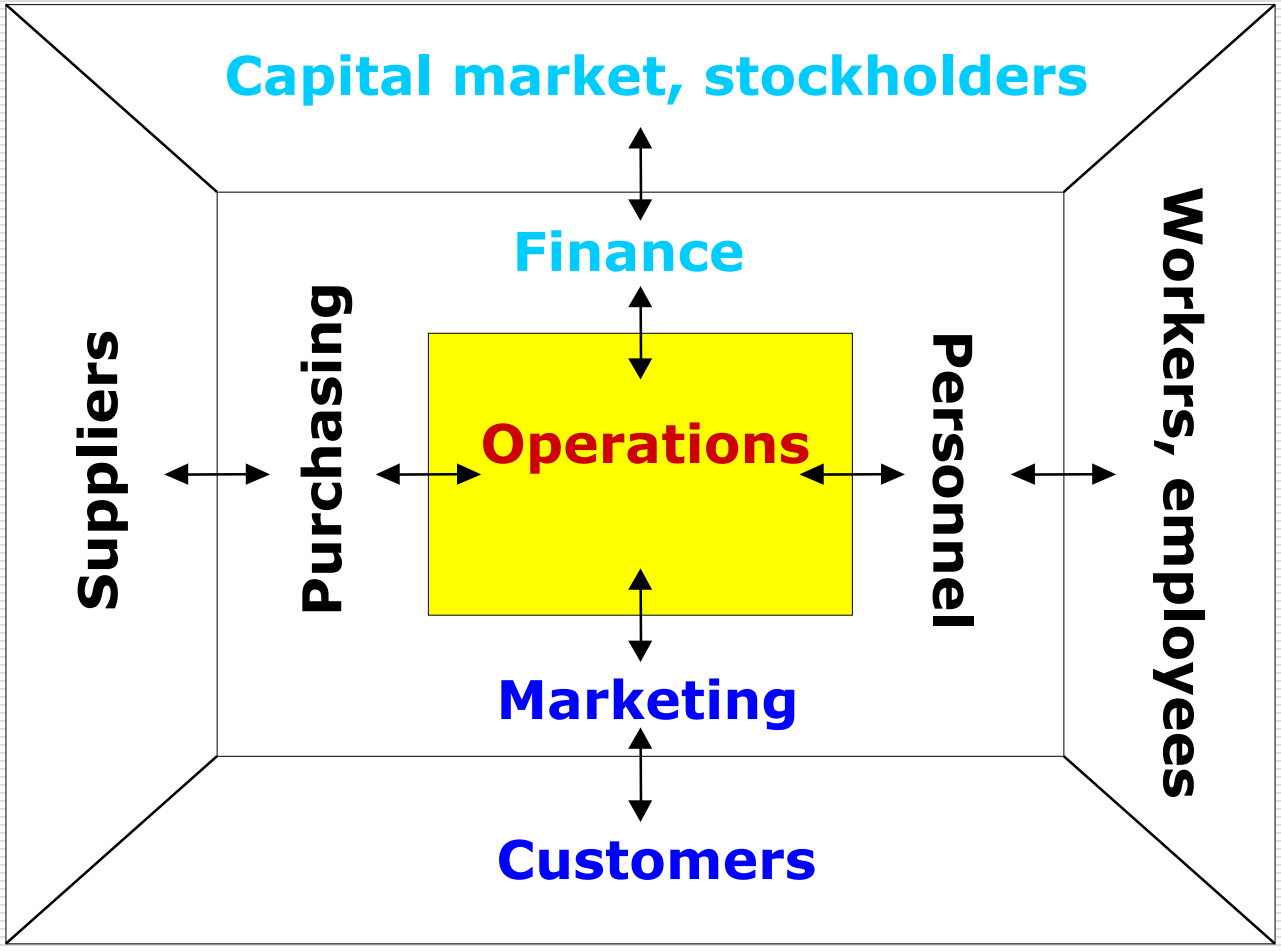
CAD (computer aided design): with graphic 3-D software → help design process quickly, accurately, effectively, reduce cost & time.

Standardization/modularization: modular system is a form of standardization, easily apply standard process, skills and requirements, quickly changing production planning → reduce the production cost.

Locational decisions: locate machine, tools, equipment in workshops as well as raw materials, components, items in stores → support operations.

1. The important role of POM

Operations as the technical core



Production & service operations have central role in most firms. They typically account for 70 – 80% of a firm's assets, expenditure & people.

1. The important role of POM

Others functions support operations/manufacturing:

Marketing: forecast customers' demand, feedbacks, orders.

***Finance*:** analysis investment proposals, budget, investment funds, stockholders' requirement

Personnel: training programs, hired or fired employees (recruitment)

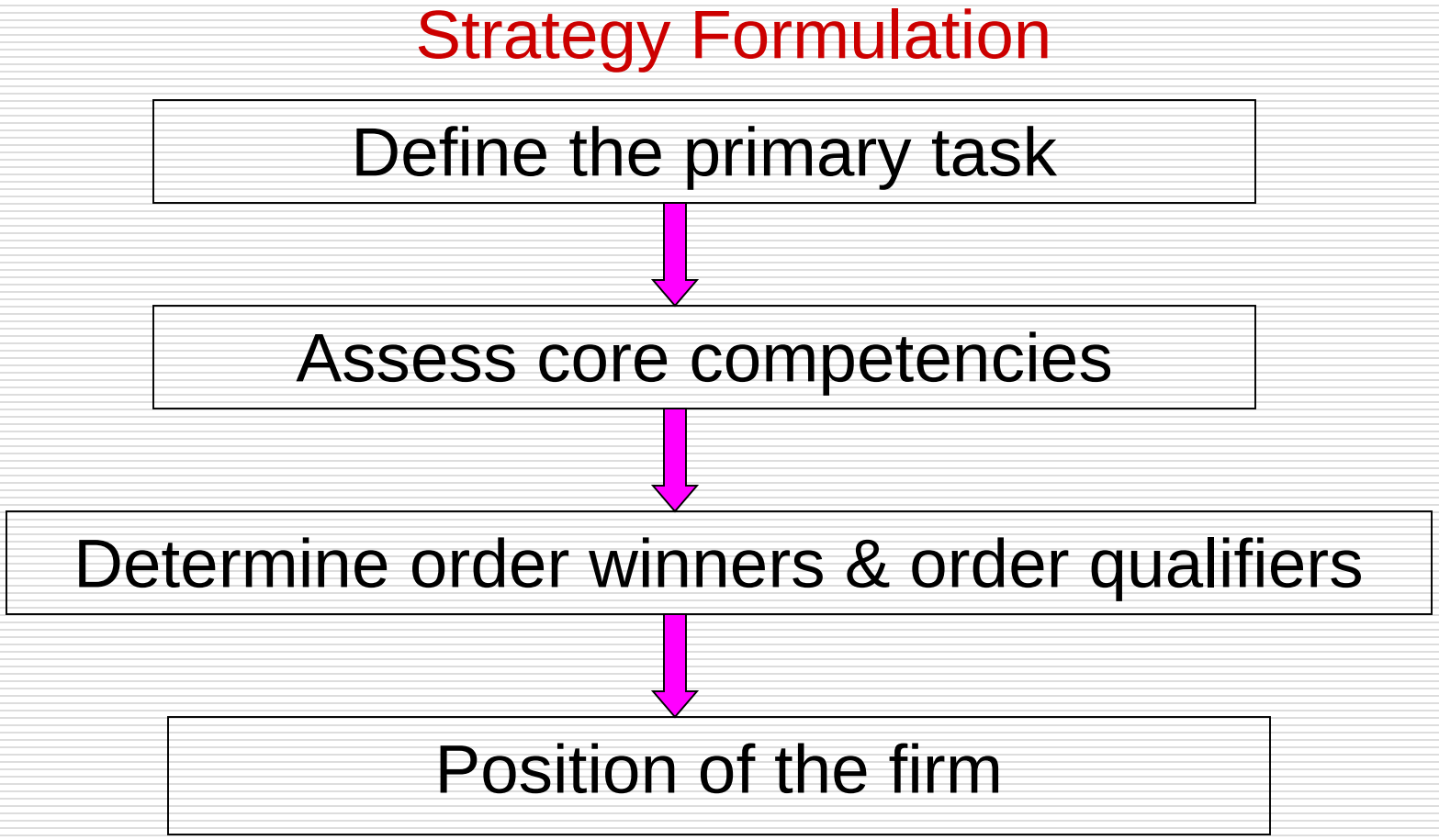
Purchasing: meets material requirement planning, tools, equipment to operations.

1. The important role of POM

Issues & Trends In Operations

1. Intense competition
2. Global markets, global sourcing, global financing
3. Importance of strategy
4. Product variety and customization
5. More services
6. Emphasis on quality
7. Flexibility
8. Advances in technology (*internet & software*)
9. Worker involvement
10. Environmental and ethical concerns

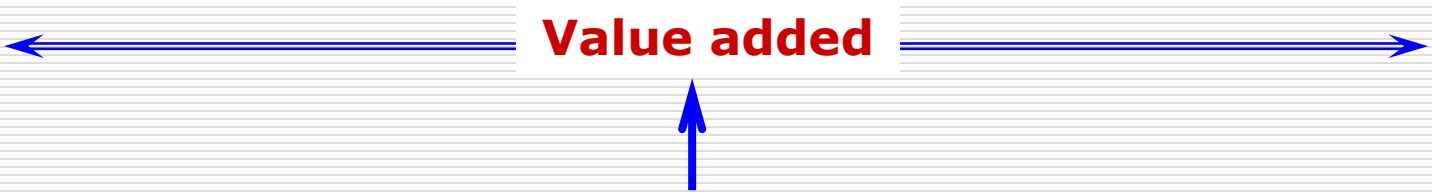
2. POM strategies



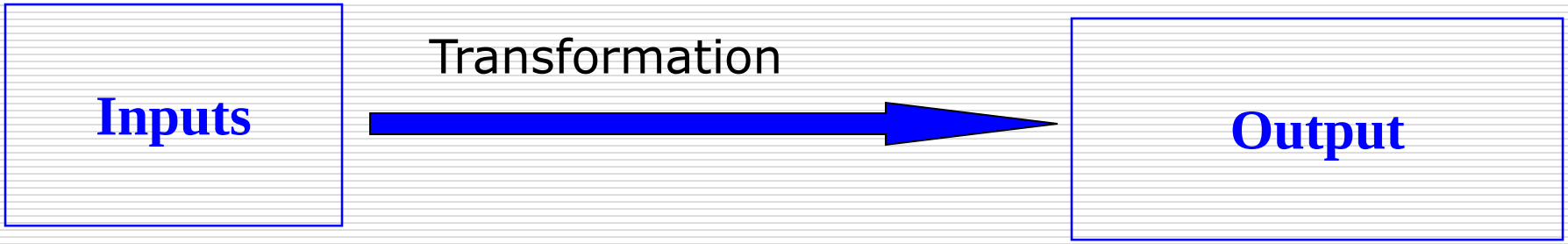
If we know where we are & where we want to get to, we have some chances of getting there – otherwise we are lost.

2. POM strategies

The value added chain



Operation managers must address every activities, they are engaged with on the value added chain → performance measurement!

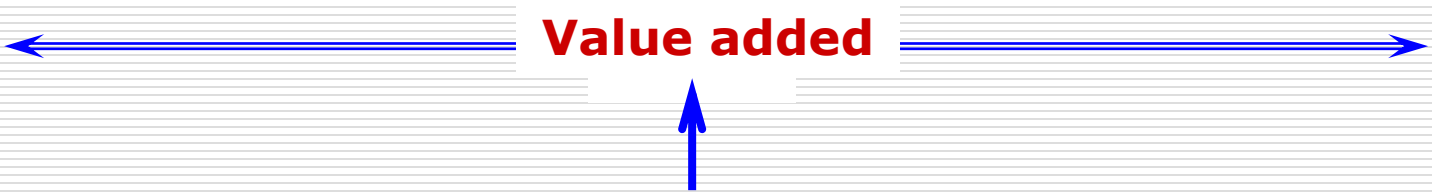


Value added objectives:

- Producing to target, to cost → meet customers' requirements at low operational cost
- Quality – doing things right – error free process → reduce defective products, re-works, quality cost, increase customers satisfaction
- Speed or time compression – customer responsiveness, lead time & elimination of delay, bottlenecks & inventory → reduce wastes in operations!

2. POM strategies

The value added chain



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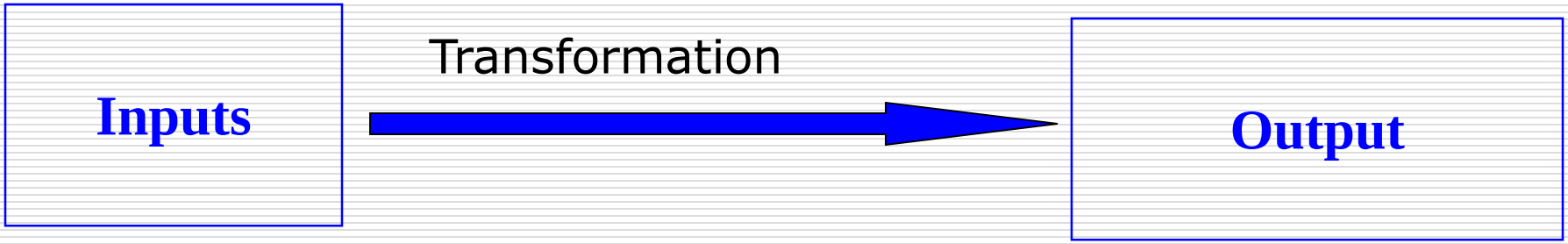


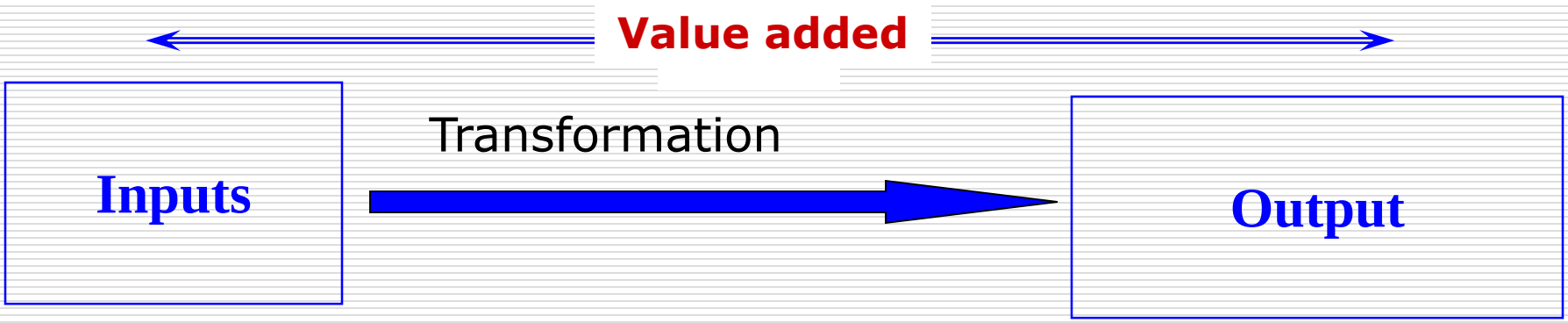
Value added objectives:

- Predictability – to control events, actions & relationship in orderly measured ways but with an eye on flexibility (new products, product/service range, volume & delivery. Improve control over the supply chain → balanced current & new products design.

- Controls over costs (staff, facilities/technology, materials) → via statistical data!

2. POM strategies

The value added chain



NB: production can be in house, but production & service activities in value added chain can be bought in/out sourced.

Value added stages:

- Need identification (management consultants) & design of product/service processes.
- Securing supplies & other inputs.
- Manufacturing components from raw materials
- Assembling components into finished goods/services
- Distributing finished products to wholesalers, retailer and end users.
- Providing maintennace and after care.

2. POM strategies

Programmes in an operations strategy

- Policies, plans / programmes
- Budgets / allocations
- Actions / behaviours
- Open communications

2. POM strategies

Key elements in an operations strategy

- Product development and product life cycle,
- Being an Innovators or an Imitators
- Self-sufficiency/vertical integration or out sourcing
- Automation & technological change
- Adjusting the process service mix
- Product width & variety
- Delivering quality, price & availability
- Market qualifying & order winning
- Choosing & improving processes
- Project, jobbing, small & large batch, continuous/flow line adaptation
- Location & logistic
- Planning & control systems

2. POM strategies

Determine CORE COMPETENCIES

Why?

Over competitors → success

Core competence → operations strategies.

Maximize profit → maximize sales & minimize costs.

2. POM strategies

How to determine CORE COMPETENCIES

Strategy #1: top leader in cost

Key technologies: machines, equipment, tools with cost efficiency → reduce cost

Economic of scale: mass volume.

Minimize set up time: quickly changing.

Reduce transportation & distribution cost: advanced lines and factory, area distribution centers, sales & marketing efficiency

2. POM strategies

How to determine CORE COMPETENCIES

Research & development (R&D)

Strategy #2: price focus

Profit via setting up high price? Excellent product or service → customers accept product with high price.

Differentiation for product or service.

Example: high price vs standard product.

Marketing is key to success this strategy.

2. POM strategies

How to determine CORE COMPETENCIES

Research & development (R&D)

Strategy #3: segment focus

Selected some segments. (current customers).

Low, medium income segments focus → PRICE

High income segments focus → QUALITY

3. Planning and control

Planning

- *Long-term planning* (> 12 months)
- *Medium-term* (1 month to 12 month)
- *Short-term (< 1 month)* daily/weekly operations.

Long-term (or strategic planning): the important decisions such as production lines, new machines investment or equipment replacement.

Medium-term: focus on purchasing raw materials or using human resource.

Short-term: focus on specific operations (daily or weekly) in scheduling and sequencing.

3. Planning and control

Control

Two essential responsibilities for POM managers: planning & control.

Control is measurable way that the POM managers can manage the efficiency of operational planning.

Control volume & quality of output → some necessary data in MIS such as: revenue, Sales, Costs, Volume, No. of served customers, Product quality, & No. of returned customers.

4. Competition

Competing on COST

Important key → Eliminate all waste.

In the past:

Product standardization for mass demand

Level production,

Productivity standardization,

Automatization,

Now: → *focus on total input cost*

4. Competition

Competing on QUALITY

➔ Please the customers

Minimization defective products

Requirement in design & production

Meet customers' requirement

→ not only reduce defective products but also rework costs.

4. Competition

Quality → advanced in competition.

David Garvin:

- Customer defined quality (Customers' perspective - customers focus)
- Trade off customers' demand & costs
- Competition weapon
- Quality as a strategic issue
- All employees responsible for quality

4. Competition

Competing on AVAILABILITY

Speed to market (*quickly*),

Flexibility (*product flexibility → effect to production & efficiency*),

Good distribution (meet customers' demand, delivery on time…)

4. Competition

+ Flexibility is important key in competition.

- A lot of product kinds,

- Quick changing product,

- Meet customers' demands.

Example: Honda VS Yamaha in 80s

4. Competition

Competing on CUSTOMIZATION

Product differentiation (*focus on customers' requirement, segment*),

5. POM decisions

1. Quality

Q is the most important decision in operations

2. Product/service design

Beginning of production process.

3. Process & technology planning

Based on product design.

4. Facility layout

Assign & locate machines and tools for efficient operations.

5. POM decisions

5. Material handling and work-in-process

Meet production requirements.

6. Job design

More productivity & quality

7. Demand forecasting

Quantity & time for production

8. Scheduling and sequencing

Using and arranging production resources to meet customers' demand.