COST MANAGEMENT

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" Good things come to those who go out and get them. Nobody achieved greatness waiting for to find them".

- HERD

- The Chinese have an idiom. Loosely translated, it says that it's better to be a dog in a peaceful time than a man in a chaotic time.
- There's also a related curse, also often attributed to the Chinese:

"May you live in interesting times."

Cost

A monetary measure of

(1) consuming a resource or its output to achieve a specific managerial objective, or

(2) making a resource or its output available and not using it.

Costing

The process of calculating how much a product or service will cost.

COST MANAGEMENT

" Management of cost related activities achieved by collecting, analyzing, evaluating, and reporting cost information used for budgeting, estimating, forecasting, and monitoring costs. "

Expenditures, Costs & Expenses

- Expenditure – company purchases raw materials for $100
- Cost – company reports $100 of raw materials on balance sheet
- Expense – company records $100 expense on income statement when it sells the product that

Cost Terms

The term “cost” appears in many contexts and carries a number of meanings.

Different categories of cost terms are merely different ways to look at costs or to slice and dice cost information.

They are not necessarily complementary to or mutually exclusive of other cost categories.

Variable and Fixed Costs

Variable costs: costs that increase or decrease (in total) relative to increases or decreases in the level of business activity.

Fixed costs: costs that do not change (in total) relative to changes in business activity.

Sunk Costs

Sometimes called “past costs.” These costs are NOT relevant to the decision making process.

Opportunity Costs

These are the values of potential benefits foregone when a decision is made.

Direct and Indirect Costs

Direct costs: Costs that are directly traceable to some object such as a product, activity or department.

Indirect costs: Costs that are NOT directly traceable to a product, activity or department.

Controllable and Non-controllable Costs

Yet another way to slice and dice costs. This time it has to do with the degree of influence a manager has over the cost.

If a management decision can impact the cost in the short term, it is considered controllable.

Conversely, if a manager cannot influence (control) the cost in the short term, then it is non-controllable. A manager's performance should NOT include an assessment of non-controllable costs.

Cost Accounting Standards issued by Institute of Cost Accountants of India

CAS-1	Classification of Cost	For preparation of Cost Statements
CAS 2	Capacity Determination	To bring uniformity and consistency in the principles and methods of determination of capacity with reasonable accuracy.
CAS 3	Overheads	To bring uniformity and consistency in the principles and methods of determining the Production or Operation Overheads with reasonable accuracy.
CAS 4	Captive Consumption	To determine the assessable value of excisable goods used for captive consumption.

CAS5	Average (equalized) Cost of Transportation	To determine averaged/equalized transportation cost
CAS6	Material Cost	To bring uniformity and consistency in the principles and methods of determining the material cost with reasonable accuracy in an economically feasible manner.
CAS7	Employee Cost	To bring uniformity and consistency in the principles and methods of determining the Employee cost with reasonable accuracy.
CAS8	Cost of Utilities	To bring uniformity and consistency in the principles and methods of determining the Cost of Utilities with reasonable accuracy.
CAS9	Packing Material Cost	To bring uniformity and consistency in the principles and methods of determining the Packing Material Cost with reasonable accuracy.

CAS10	Direct Expenses	To bring uniformity and consistency in the principles and methods of determining the Direct Expenses with reasonable accuracy.
CAS11	Administrative Overheads	To bring uniformity and consistency in the principles and methods of determining the Administrative Overheads with reasonable accuracy.
CAS12	Repairs And Maintenance Cost	To bring uniformity and consistency in the principles and methods of determining the Repairs and Maintenance Cost with reasonable accuracy.
CAS13	Cost of Service Cost Centre	To bring uniformity and consistency in the principles and methods of determining the Cost of Service Cost Centre with reasonable accuracy.

CAS14	Pollution Control Cost	To bring uniformity and consistency in the principles and methods of determining the Pollution Control Costs with reasonable accuracy.
CAS15	Selling & Distribution Overhead	To bring uniformity and consistency in the principles and methods of determining the Selling and Distribution Overheads with reasonable accuracy.
CAS16	Depreciation & Amortization	To bring uniformity and consistency in the principles and methods of determining the Depreciation and Amortization with reasonable accuracy.
CAS17	Interest and Financing Charges	To bring uniformity and consistency in the principles ,methods of determining and assigning the Interest and Financing Charges with reasonable accuracy.

CAS 18	Research & Development Expenses	To bring uniformity and consistency in the principles and methods of determining the Research, and Development Costs with reasonable accuracy and presentation of the same.
CAS19	Joint Costs	To bring uniformity and consistency in the principles and methods of determining the Joint Costs.
CAS20	Royalty and Technical Know-How Fee	To bring uniformity and consistency in the principles and methods of determining the amount of Royalty and Technical Know-how Fee with reasonable accuracy.
CAS21	Quality Control	To bring uniformity, consistency in the principles, methods of determining and assigning Quality Control cost with reasonable accuracy.
CAS22	Manufacturing Cost	To bring uniformity and consistency in the principles and methods of determining the Manufacturing Cost of excisable goods

Two Key Ideas in Managerial Accounting

They are:

1. Decision making relies on incremental analysis—an analysis of revenues and costs that increase or decrease if a particular decision alternative is selected.

2. You get what you measure!

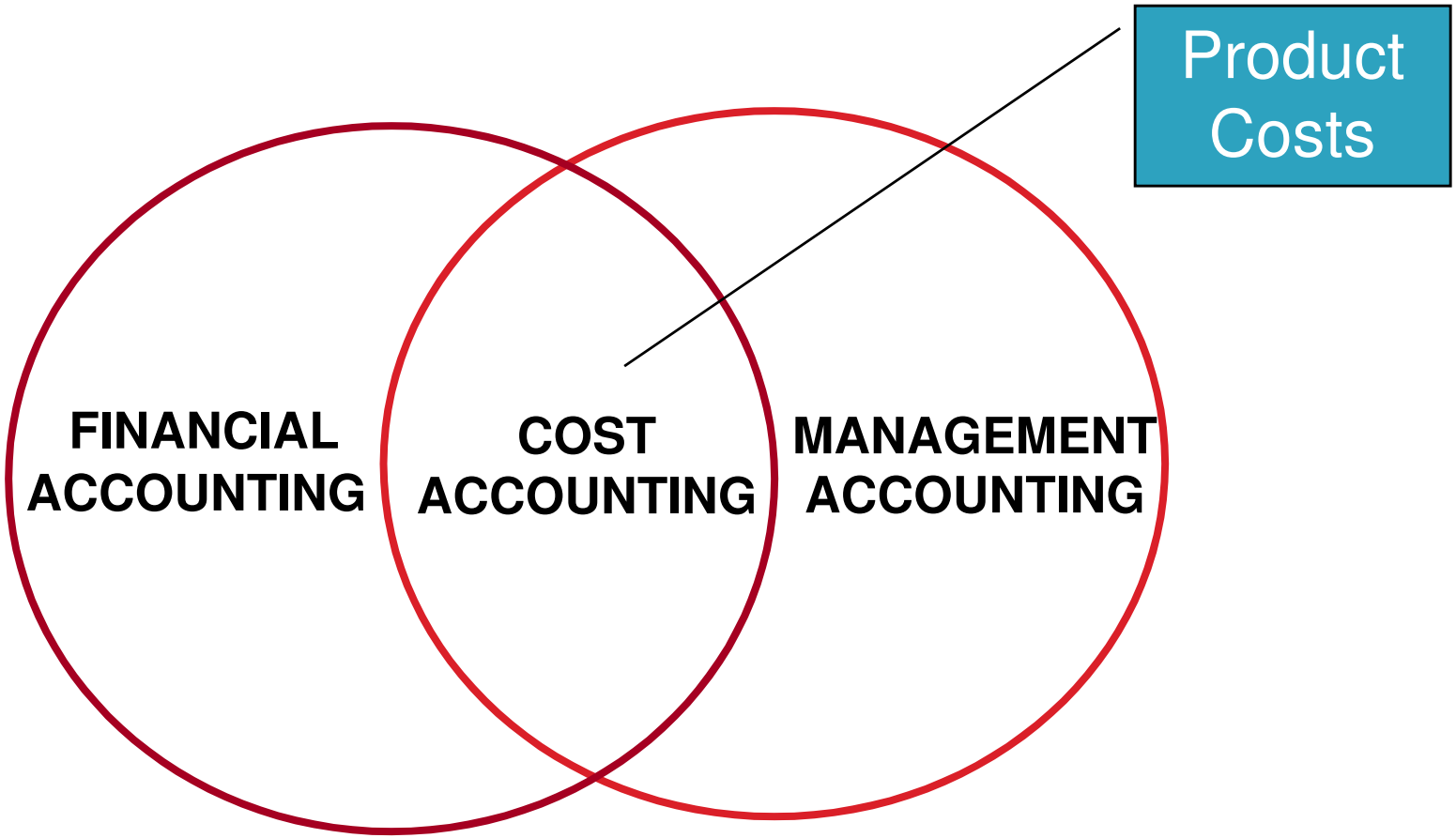
Decision Making Relies on Incremental Analysis

Incremental means “difference.” Here decision making looks at the difference between revenues and expenses if selection (a) is made as opposed to selection (b).

You Get What You Measure

Performance measurement impacts management behavior.

Relationship of Financial, Management, & Cost Accounting



- Over the last 15 years cost management practices have been revolutionized. Spurred on by the criticisms voiced by Thomas Johnson and Robert Kaplan in *Relevance Lost: The Rise and Fall of Management Accounting, accounting practitioners* and academics have joined forces to create new forms of cost management that provide decision-

- Beginning with activity-based costing in the late 1980s, the list of new cost management techniques has grown to include activity-based management, activity-based budgeting, target cost management, life cycle costing, capacity cost management, investment management, and strategic cost management, etc.,

- Efforts have also been made to link cost management to other key performance metrics,

- At the same time that these changes have taken place in cost management, there have been parallel developments in the structure and focus of organizations.
- Process, or horizontal, management has emerged as a key to improving the throughput and performance of an organization.

- The internal benefits of process thinking have been extended to include an organization's key trading partners, resulting in the creation of integrated supply chains that span an industry's value chain.

- The driving force behind these rapid changes to the information and management structures of the organization is the customer.

New Management Trends to Create Value

- Encourage Management Accounting Systems Redesign, for example.
  - Customer focus
  - Quality focus
  - Delivery focus
  - Outsourcing and the virtual company
  - Communications
  - Shortening product life cycles
  - Team development
  - Deregulation in the service sector

KEY PRINCIPLES IN THE INTEGRATED COST MANAGEMENT SYSTEM

- Strategic orientation: *A cost management system* must incorporate and reflect the strategies of the organization and the core competencies that support the achievement of strategic goals.
- Customer driven*:* Information system design, integration, and use must be centered around defining and meeting customer requirements.
- Value based: Competitive advantage and profitable growth stem from understanding how and where the organization creates value for its customers

- Process/horizontal focus: Integration must incorporate the flows of materials and information across and between organizations, highlighting interdependencies.
- Decision relevant: Information systems have to be defined around and support the key decisions of the organization.

- Cost effective: Integration should focus on the essential 20 percent of data that support 80- 90 percent of the decisions made within an organization rather than on comprehensive integration of all of the organization's available data.
- Relationship based: Integrated information systems must be based on and highlight the performance of key transactions and

Effective Cost Management in Purchasing

- Today, purchasing, procurement, contracting, and supply management professionals must be the most progressive group in the company.
- Effective cost management in purchasing can be your road map to achieving your most critical organizational objectives.

Analyze;

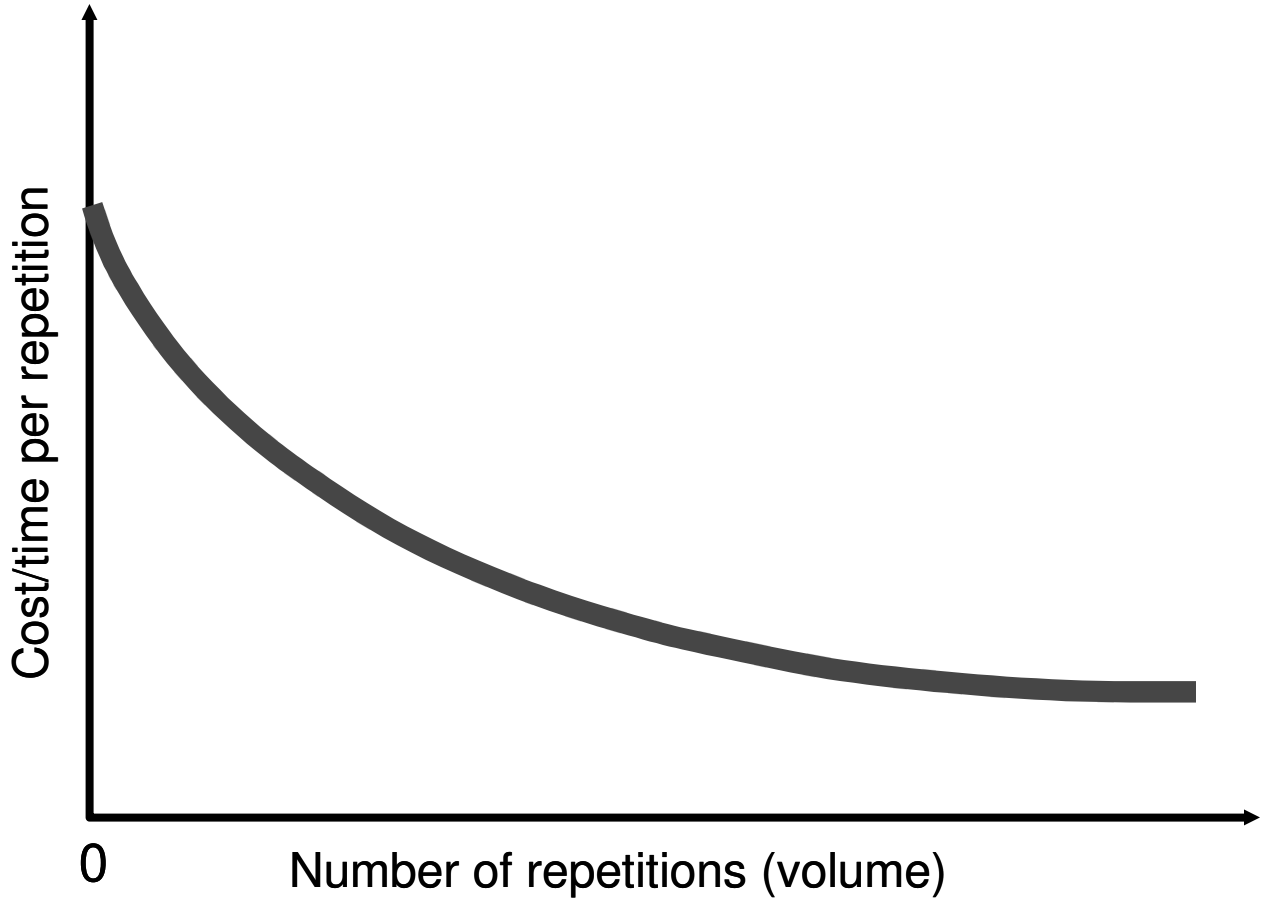
- purchase spend history,
- forecast price and market trends,
- determine total costs of ownership,
- analyze fixed and variable costs,
- conduct best-buy analyses, and
- utilize should cost analyses of prospective suppliers for qualification of quotes, bids, tenders and proposals.

- how learning curves,
- break-even analysis,
- value analysis,
- total landed cost,
- target costing, and
- life cycle costing can help you make far more accurate estimates of cost and value.

Learning Curves

- ☑ Based on the premise that people and organizations become better at their tasks as the tasks are repeated.
- ☑ Time to produce a unit decreases as more units are produced.
- ☑ Learning curves typically follow a negative exponential distribution.
- ☑ The rate of improvement decreases over time.

Learning Curve Effect



Arithmetic Approach

- ☑ Simplest approach
- ☑ Labor cost declines at a constant rate, the learning rate, as production doubles

Nth Unit Produced	*Hours for Nth Unit*
1	**100.0**
2	**80.0 = (.8 x 100)**
4	**64.0 = (.8 x 80)**
8	**51.2 = (.8 x 64)**
16	**41.0 = (.8 x 51.2)**

Logarithmic Approach

Determine labor for any unit, T_N, by

$$T_N = T_1(N^b)$$

where T_N = time for the N^{th} unit

T_1 = hours to produce the first unit

b = (log of the learning rate)/(log 2)

= slope of the learning curve

Logarithmic Example

Learning rate = 80%
First unit took 100 hours
For 3rd Unit

$$T_N = T_1(N^b)$$
$$T_3 = (100 \text{ hours})(3^b)$$
$$= (100)(3^{\log .8/\log 2})$$
$$= (100)(3^{-.322})$$
$$= 70.2 \text{ labor hours}$$

Learning Rate (%)	*b*
70	**– .515**
75	**– .415**
80	**– .322**
85	**– .234**
90	**– .152**

Breakeven Analysis

- Breakeven analysis examines the short run relationship between changes in volume and changes in total sales revenue, expenses and net profit.

- Also known as C-V-P analysis (Cost Volume Profit Analysis).

Uses of Breakeven Analysis

- C-V-P analysis is an important tool in terms of **short-term** planning and decision making
- It looks at the relationship between costs, revenue, output levels and profit
- Short run decisions where C-V-P is used include choice of sales mix, pricing policy etc.

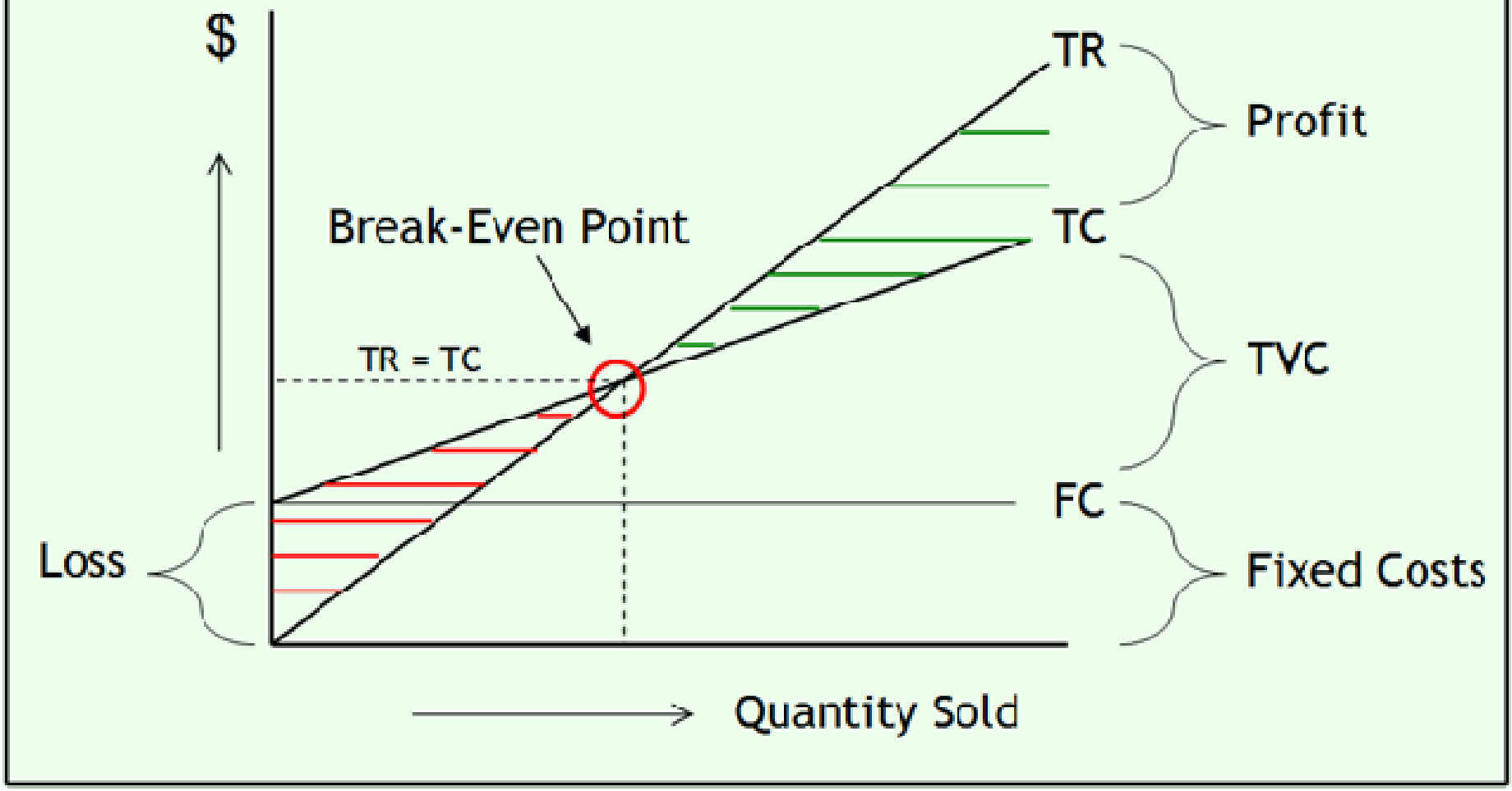
Decision making and Breakeven Analysis: Examples

- How many units must be sold to breakeven?
- How many units must be sold to achieve a target profit?
- Should a special order be accepted?
- How will profits be affected if we introduce a new product or service?

Key Terminology: Breakeven Analysis

- ***Break even point-*** the point at which a company makes neither a profit or a loss.
- ***Contribution per unit-*** the sales price minus the variable cost per unit.
- ***Margin of safety-*** a measure in which the budgeted volume of sales is compared with the volume of sales required to break even

Break-Even Chart



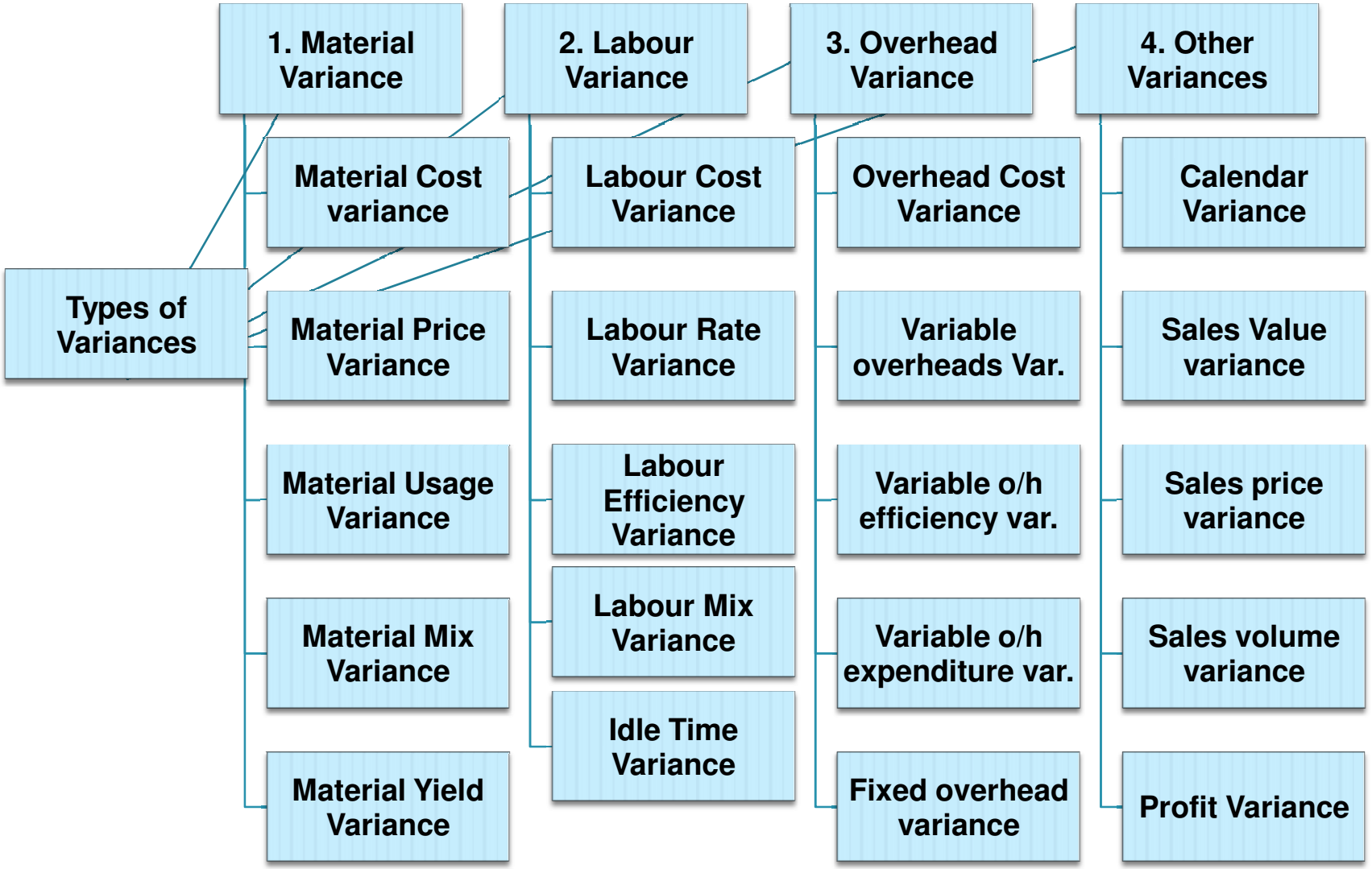
Standard Costing

- Standard costing is a control system for comparing the planned costs and revenues with actual results in order to report variances for the purpose of performance measurement and control.

- Cost variances are usually reported to management in cost reconciliation statements.
- When sales variances are included the reconciliation is usually in the form of a standard cost operating statement.

Variance Analysis

- Cost Variance: is the difference between the standard cost and the actual costs.
- Variance Analysis: is the resolution into constituent parts and the explanation of the variances.
  - Favorable & Unfavorable Variances.
  - Controllable & Uncontrollable Variances


Types of Variances
1. Material Variance
Material Cost variance
Material Price Variance
Material Usage Variance
Material Mix Variance
Material Yield Variance
2. Labour Variance
Labour Cost Variance
Labour Rate Variance
Labour Efficiency Variance
Labour Mix Variance
Idle Time Variance
3. Overhead Variance
Overhead Cost Variance
Variable overheads Var.
Variable o/h efficiency var.
Variable o/h expenditure var.
Fixed overhead variance
4. Other Variances
Calendar Variance
Sales Value variance
Sales price variance
Sales volume variance
Profit Variance

Value Analysis

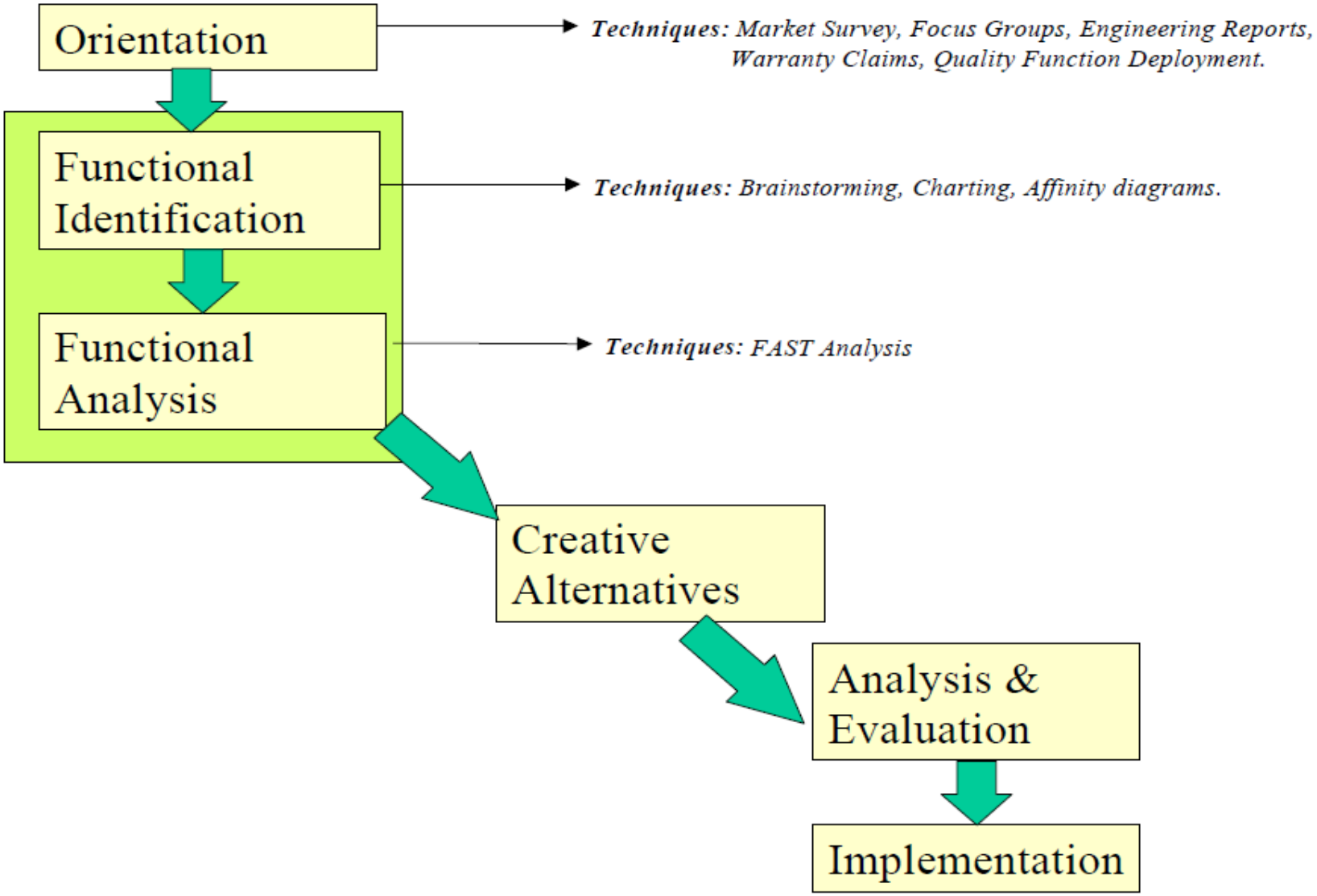
- Value Analysis is a disciplined approach which ensures the necessary functions for the minimum cost without diminishing quality, reliability, performance and appearance.
- It is a creative approach to eliminate the unnecessary costs which add neither to quality nor to the appearance of the product.

- It is a systematic application of techniques to identify the functions of a product or a component and to provide the desired function at the lowest total cost.
- 'Value' is a word that is very often used by individuals without being clearly understood.
- Even different departments of the same organization have different opinions of the 'value' of the product that the company manufactures.

- The designer equates value with reliability;
- purchase people with price paid for them;
- production personnel with that of cost from the angle of manufacture;
- sales people with what customer is willing to pay.

- In the field of value investigation, value refers to economic value, which itself can be sub-divided into four types as
- Cost value:-Sum of all costs incurred in producing the product.
- Exchange value:- the measure of all the qualities and features of the product which make it possible of being traded for another product or for money.
- Use value :- the measure of properties, qualities and features which make the product accomplish a use, work or service
- Esteem value:- the price paid by the buyer or the cost incurred by the manufacturer beyond the use value.

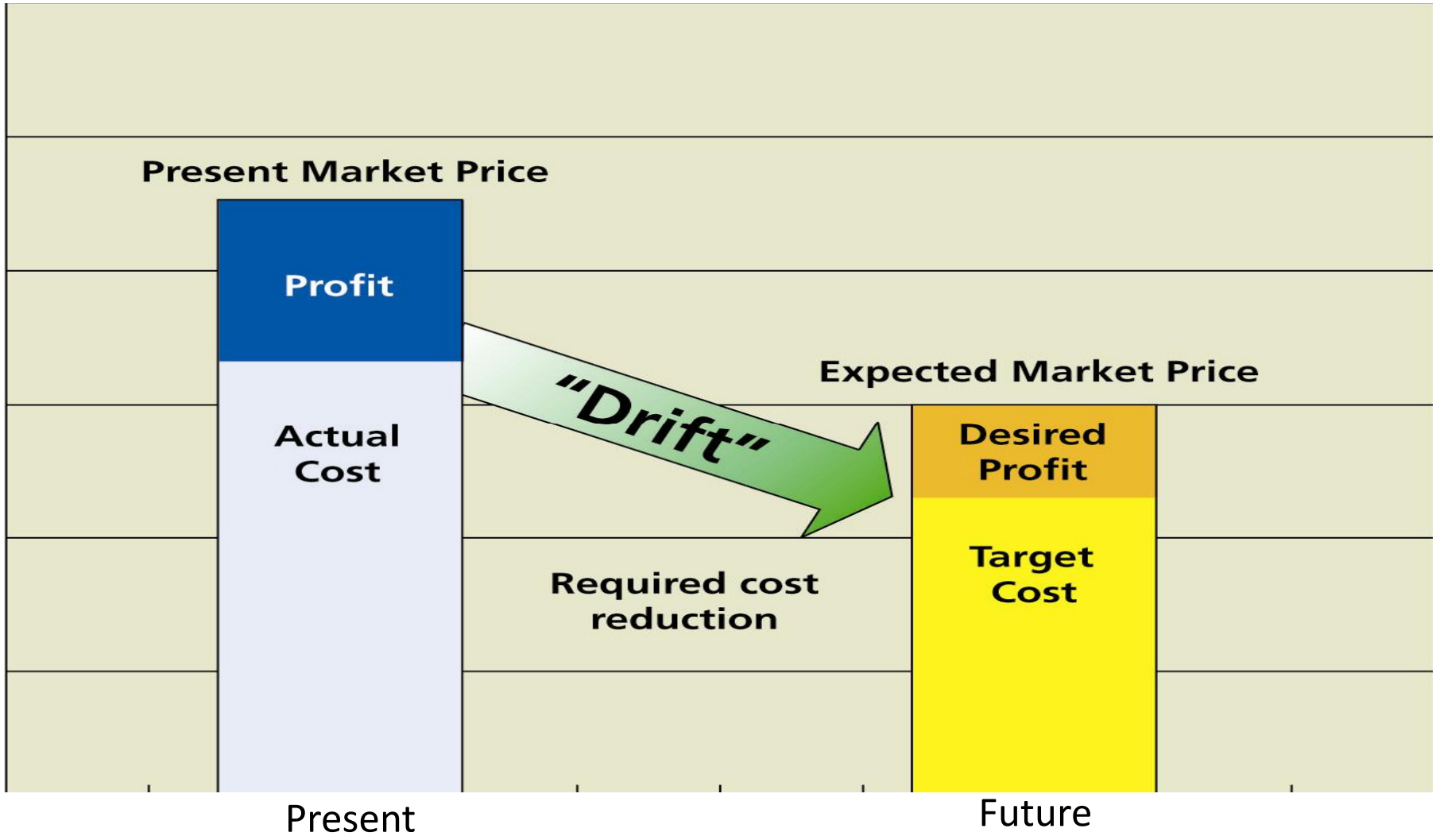
Steps in Value Analysis



Target Costing

Target Costing is defined as a cost management tool for reducing the overall cost of a product over its entire life-cycle with the help of production, engineering, research and design.

Target Costing Concept



- Target cost is the cost that can be incurred while still earning the desired profit
  - Selling price – desired profit = target cost
- The customer sets the price
  - Profit must be achieved through cost control

Target Costing Principles

- price-led costing.
- focus on customers.
- focus on design.
- cross-functional involvement.
- value-chain involvement.
- a life-cycle orientation..

Implementation

1. Price-led costing ~ market prices are used to determine target costs

2. Focus on customers ~ value to the customer must be greater than the cost of the product itself

3. Focus on design ~ cost control must occur before production

4. Cross-functional involvement ~ interfunctional product and process teams

5. Life-cycle orientation ~ minimizing total life-cycle costs

Control Points

- Top management *in case of establishing a new product*
- Cost estimating group *decomposing the preset value*
- Cross-functional target costing teams *analysing the production process*

Target Costing- Example

- Handy Appliance feels there is a niche for a hand mixer with certain features.
- Marketing Department believes that price of Rs30 would be right and that about 40,000 mixers could be sold.
- Rs2,000,000 invest required to gear up for production.
- Company requires a 15 percent ROI on invested funds.

Determine the target cost.

Target Cost

Projected sales (40,000 units × 30)	1,200,000
Desired profit (2,000,000 × 15%)	300,000
Target cost for 40,000 mixers	900,000
Target cost per mixer (900,000 ÷ 40,000)	23

Each functional area within Handy Appliance would be responsible for keeping its actual costs within the target established for that area.

Costing

- Tata Nano idea struck in the mind of Chairman when he saw a family of four (a man, his wife and two kids) riding on a scooter on a rainy day.

- He felt that there was an unfulfilled need of safe, affordable and an all weather alternative.

Purpose from which the concept emanated, which stresses upon the fact that agility and understanding the unstated/ unfulfilled need of customers is the most important source of innovation.

Tata Nano – Perfect Case of Target Costing

- Price got fixed at Rs 1 lakh without compromising
  - Aesthetics
  - Value to customer
  - Safety & environment requirements

- Normally bikes cost about 50,000 Indian Rupees (1,250 USD).

- The cheapest car in the market was Maruti 800 which costed about 2Lakhs

It was said that "The People's Car" was impossible to produce. Tata just proved the naysayers wrong. The Tata Nano is the cheapest car in the World!!

Tata Nano – Perfect Case of Target Costing

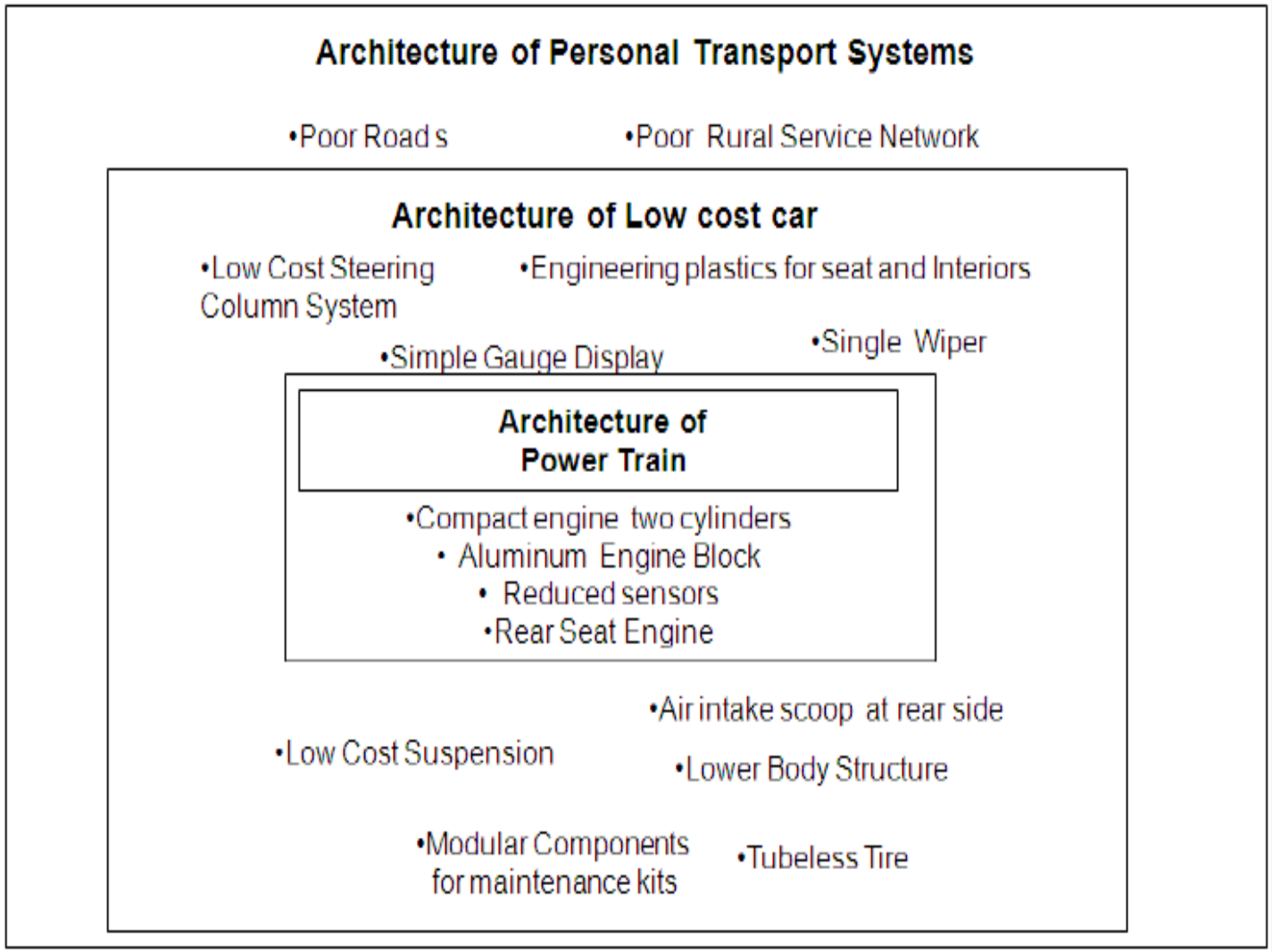
- Target Cost approach with cost savings
- Smaller size of car & component (material cost savings)
- Material substitution (e.g. engineering plastics)
- Simplified component & design
- Simplified manufacturing process

Tata Motors created breakthrough product changing the market dynamics and helped in providing a new customer experience.

Costing

- **Target Cost approach with cost savings**

Target price itself became the source of innovation, as the big names in the industry just rubbished it as false claims



Kanban

- Kanban means many things.
- Literally, Kanban is a Japanese word that means "visual card".
- At Toyota, Kanban is the term used for the visual & physical signaling system that ties together the whole Lean Production system.

- Kanban as used in Lean Production is over a half century old.

- It is being adopted newly to some disciplines as software.

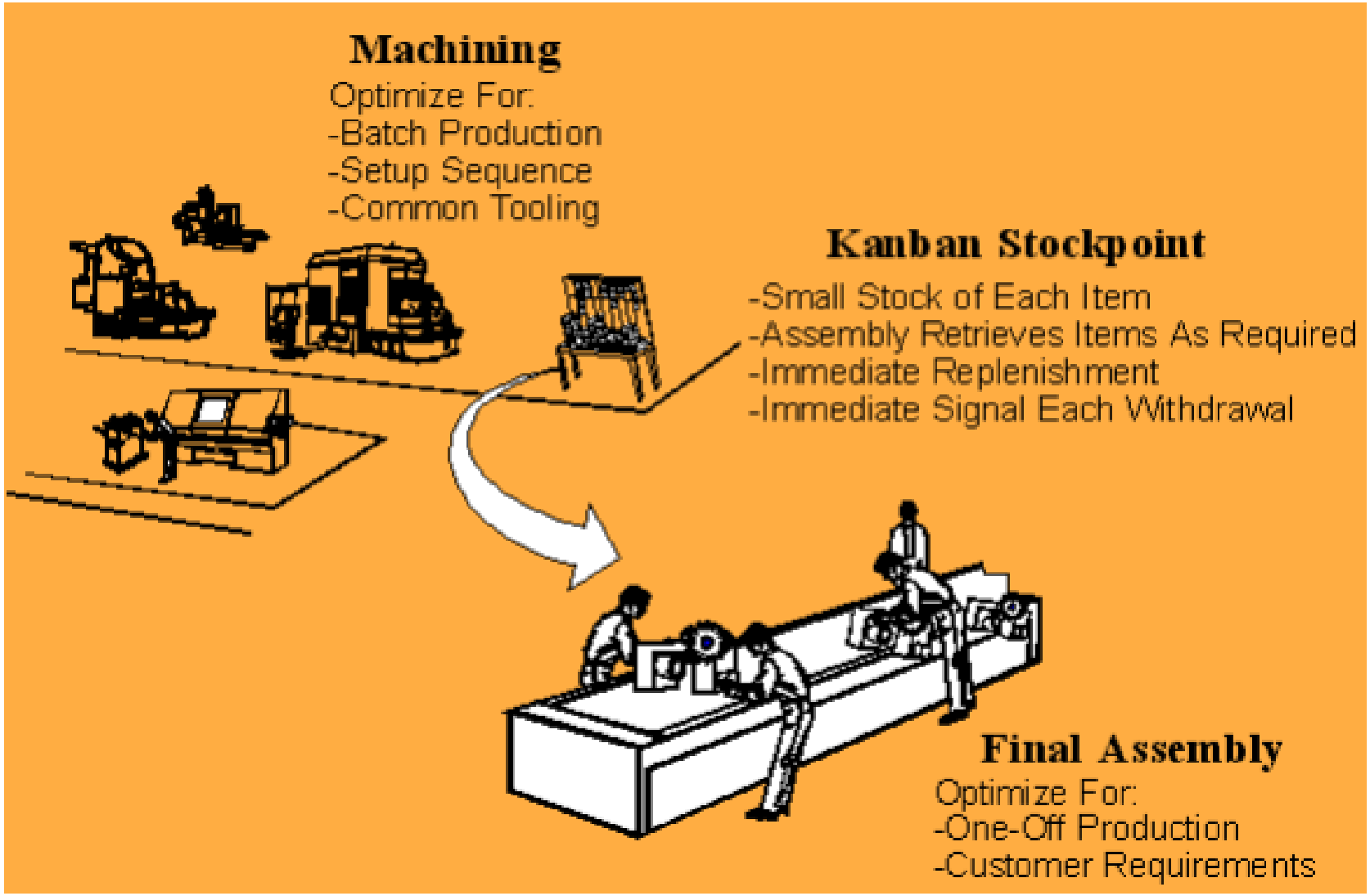
How Kanban works

There are many flavors, but the core of Kanban means:

- **Visualize the workflow**
  - Split the work into pieces, write each item on a card and put on the wall.
  - Use named columns to illustrate where each item is in the workflow.
- **Limit WIP** (work in progress) – assign explicit limits to how many items may be in progress at each workflow state.
- **Measure the lead time** (average time to complete one item, sometimes called “cycle time”), optimize the process to make lead time as small and predictable as possible.

This is a direct implementation of a lean pull scheduling system.

Example Kanban



Kaizen

Kai + zen

(Change for the better)

Kaizen Defined

- Continuous, incremental improvement of an activity to create more value with less waste. A process of continually making incremental, ongoing changes and not as a single, separate event.

Kaizen

- Small-scale improvements are easier and faster.
- The risks are lower because they generally have limited effect.
- The accumulated effect is often greater than a single large improvement

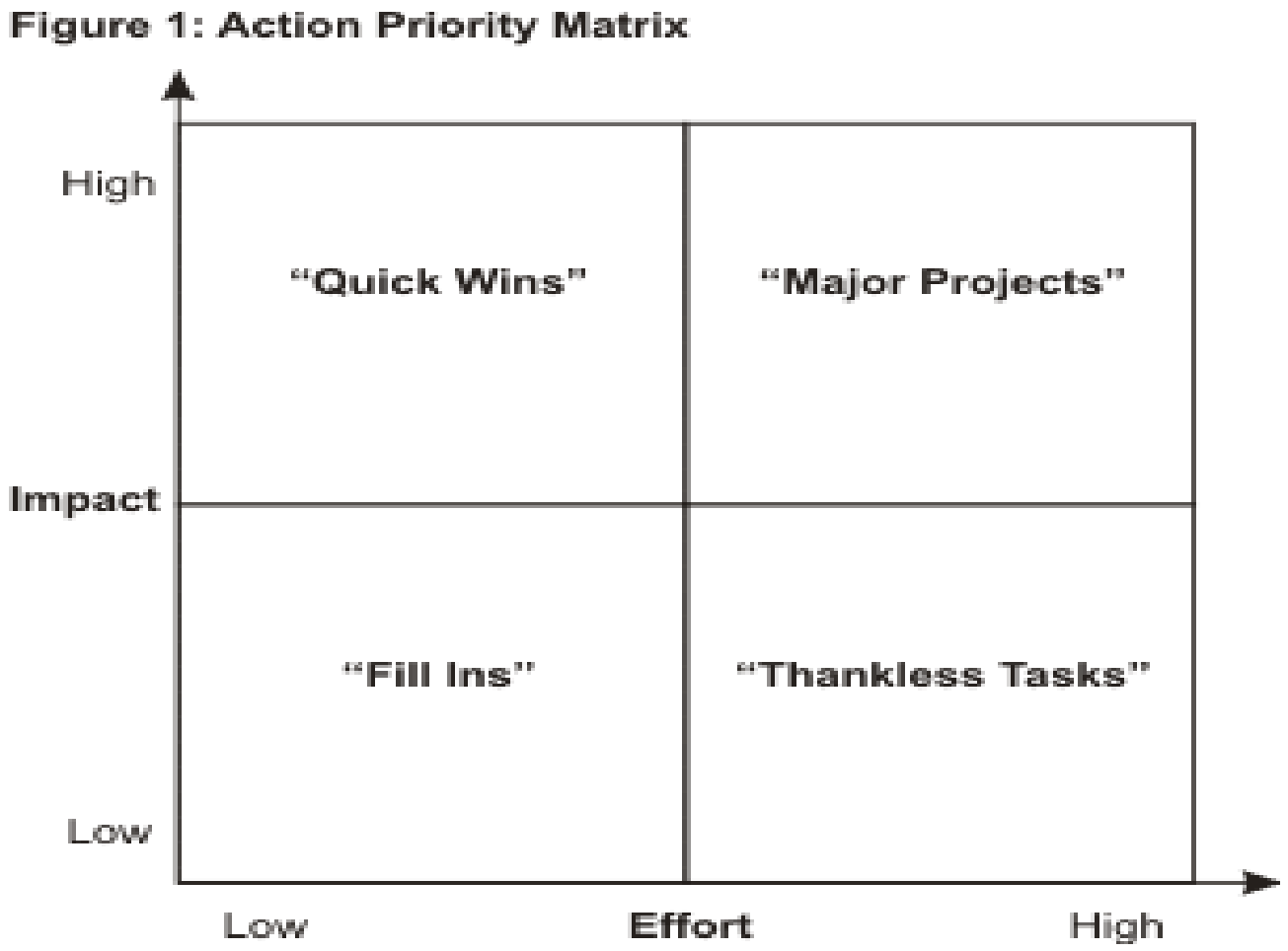
Change Management

- The Lean journey is paved by kaizen events
- Lean concepts are simple -- sustaining is hard
- Lean as a business strategy and supported by top mgt.

Kaizen Events
(Creativity before capitol)

- Identify a problem
- Brainstorm with employees
- Make the improvement
- Monitor results
- Adjust as necessary
- Apply to like processes

Effort and Impact Matrix



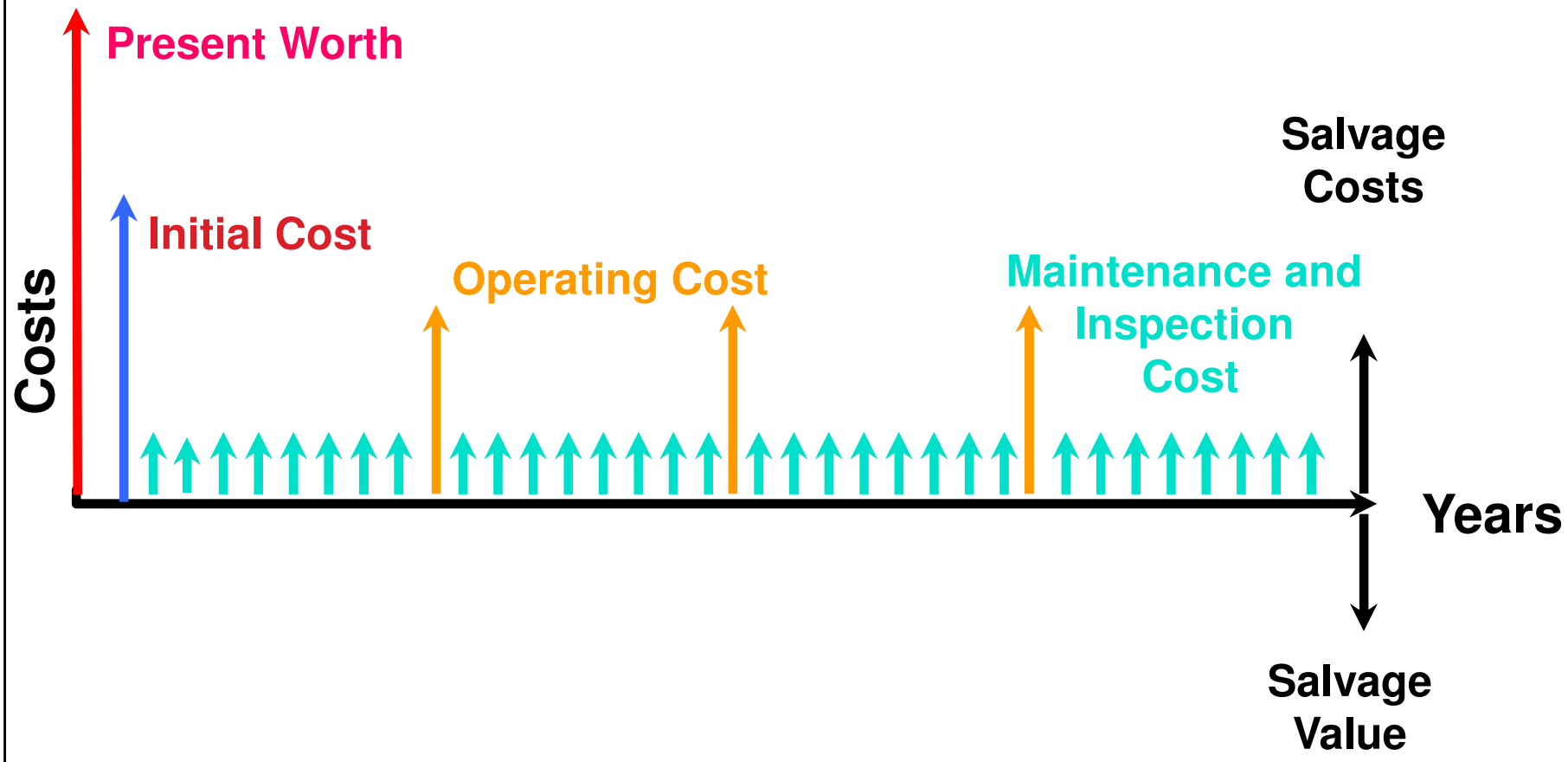
Follow-up

- Ensure that all assigned tasks have been completed (infrastructure)
- Help build the habits and discipline of lean and reinforces the concepts.

Life Cycle Costing

- The process of identifying and documenting all the costs involved over the life of an asset is known as Life Cycle Costing (LCC)

Cost Considerations



First (Initial) Cost

- Initial cost of structure
- Incentive/disincentive payments should not be included since they would reflect user benefits or costs prior to structure going into service

Time Period of Analysis

- Normally equal for all alternatives
- Should include at least one major rehabilitation
  - Needed to capture the true economic benefit of each alternative

Operating costs

- Annual cost associated with the upkeep of the structure
- Cost of failures
- Cost of repairs
- Cost for spares
- Downtime costs
- Loss of production

Maintenance costs

- Cost of corrective maintenance
- Cost of preventive maintenance
- Cost for predictive maintenance

Salvage Value/Costs

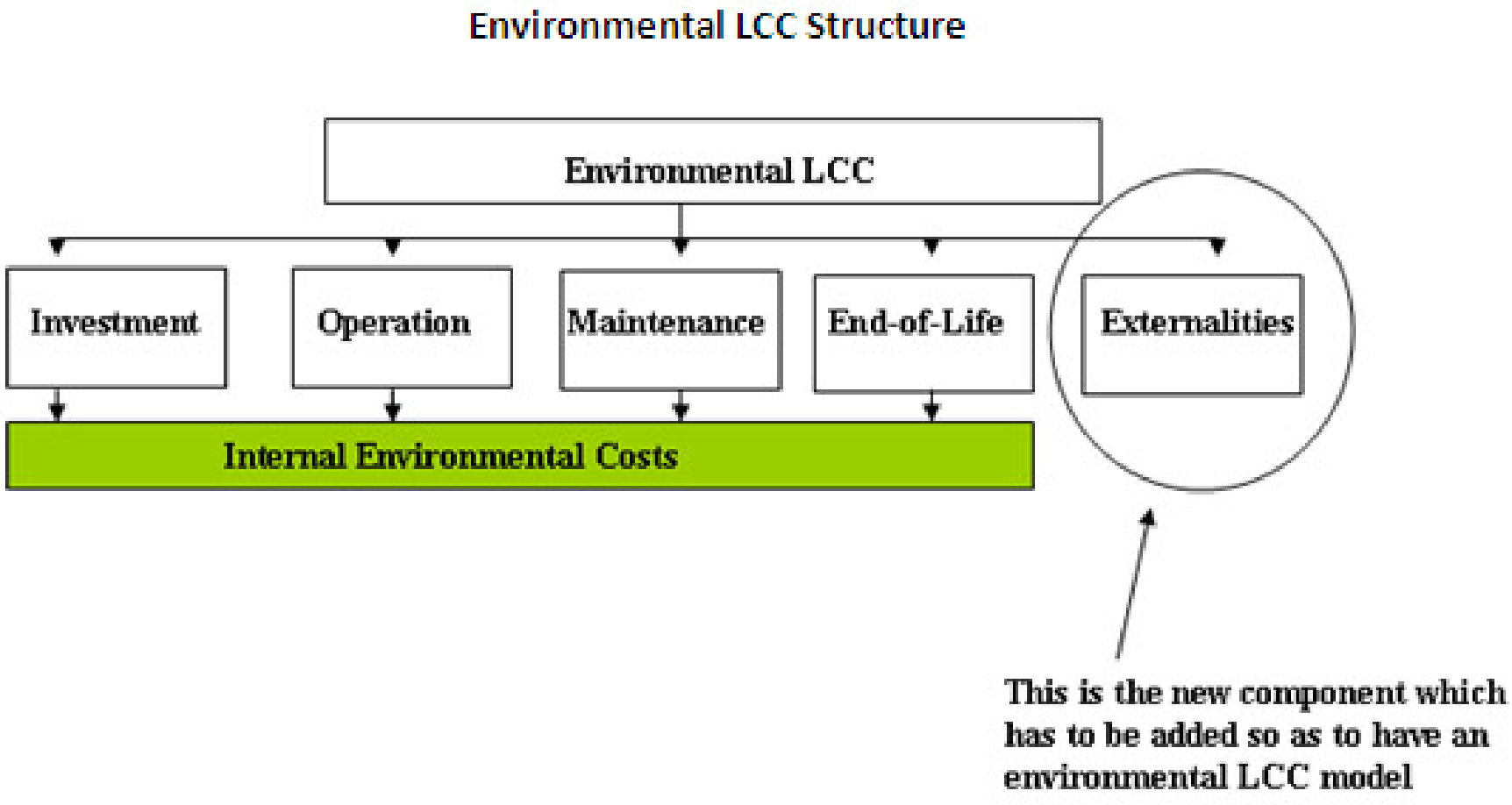
- Occurs once at end of life of structure
- Difference between
  - Removal cost
  - Salvage value

- The conventional LCC techniques most widely used by companies and/or governments is based on a purely financial valuation.

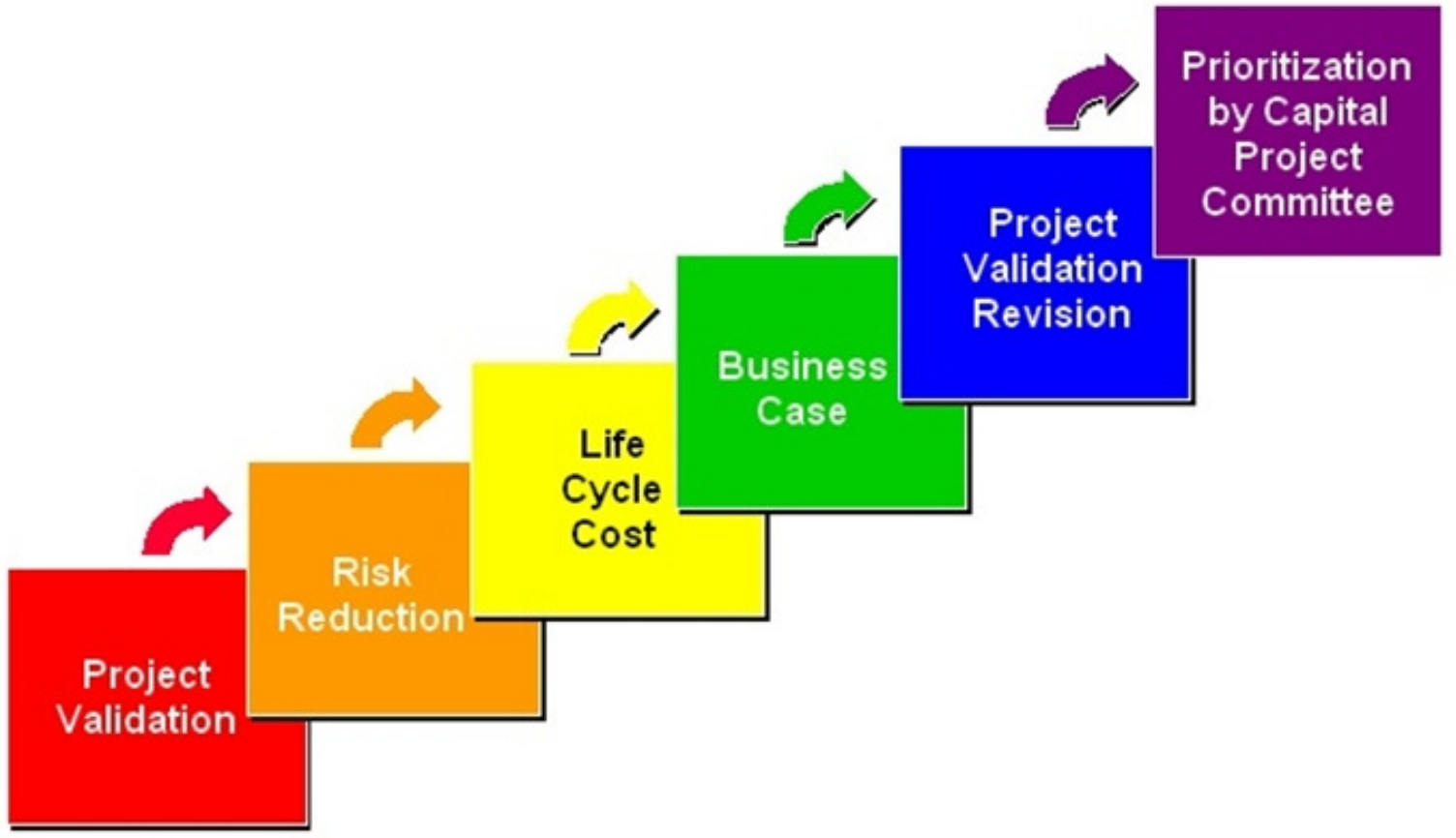
  Four main cost categories are assessed:

- Initial investment,
- operation,
- maintenance and
- end-of-life disposal expenses.

An Environmental LCC methodology takes into account the above four main cost categories **plus external environmental costs**.



Life Cycle Costing -Importance



Total Cost Management

- Total Cost Management is a process of managing the financial outcome of activities internal and external to the process of a business unit by developing the skills to use cost information unit wide as both lag and lead indicators.

- Total Cost Management (TCM) is a systematic approach to managing cost throughout the life cycle of any enterprise, program, facility, project, product or service.

- The TCM Framework is a series of integrated, annotated process maps.
- For the first time, it ties all the Cost Engineering skills and knowledge areas together into a single process and

  it establishes Cost Engineering as a unique discipline that supports business and project management alike.

Cost Is Everything

"It *costs* time"
"It *costs* resources"
" It *costs* money"

EVERYTHING
invested in assets and projects is a
COST

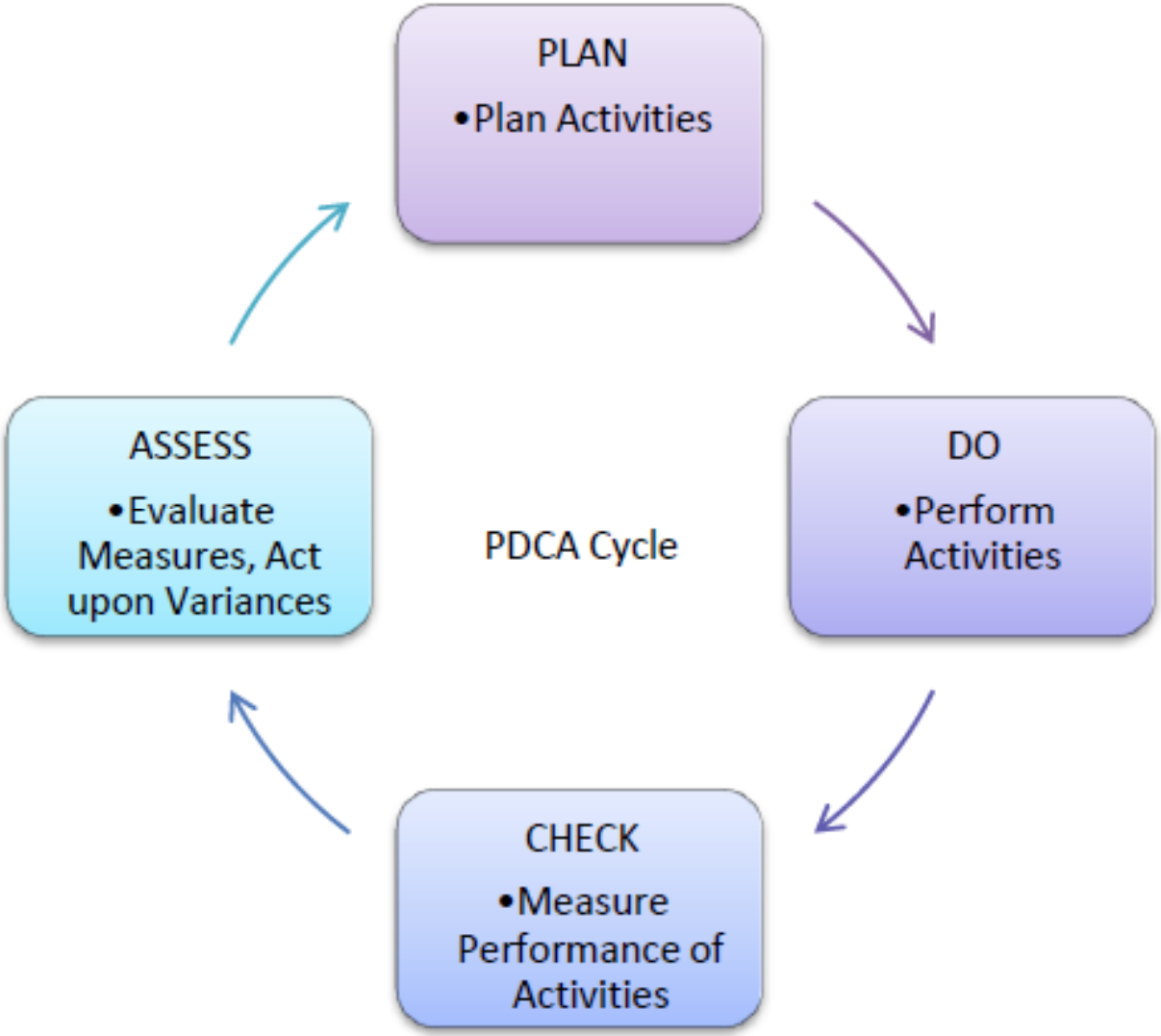
That is why it is called
TOTAL COST Management
(TCM)

- In TCM and Cost Engineering, cost includes money, time, and resources of all types.
- TCM is at heart a quality management process. Each and every TCM process map is based on the PDCA quality management/continuous process improvement model (i.e., the Deming or Shewhart model).

The PDCA cycle in TCM includes the following steps:

- **Plan** - plan asset solutions or project activities
- **Do** (i.e., execute) - initiate and perform the project or project activities in accordance with the plan
- **Check** (i.e., measure) - making measurements of asset, project, or activity performance
- **Assess** (i.e., act) - assessing performance variances from the plan and taking action to correct or improve performance to bring it in line with the plan or to improve the plan.

Plan-Do-Check-Assess



TCM Attributes

Continuous Improvement

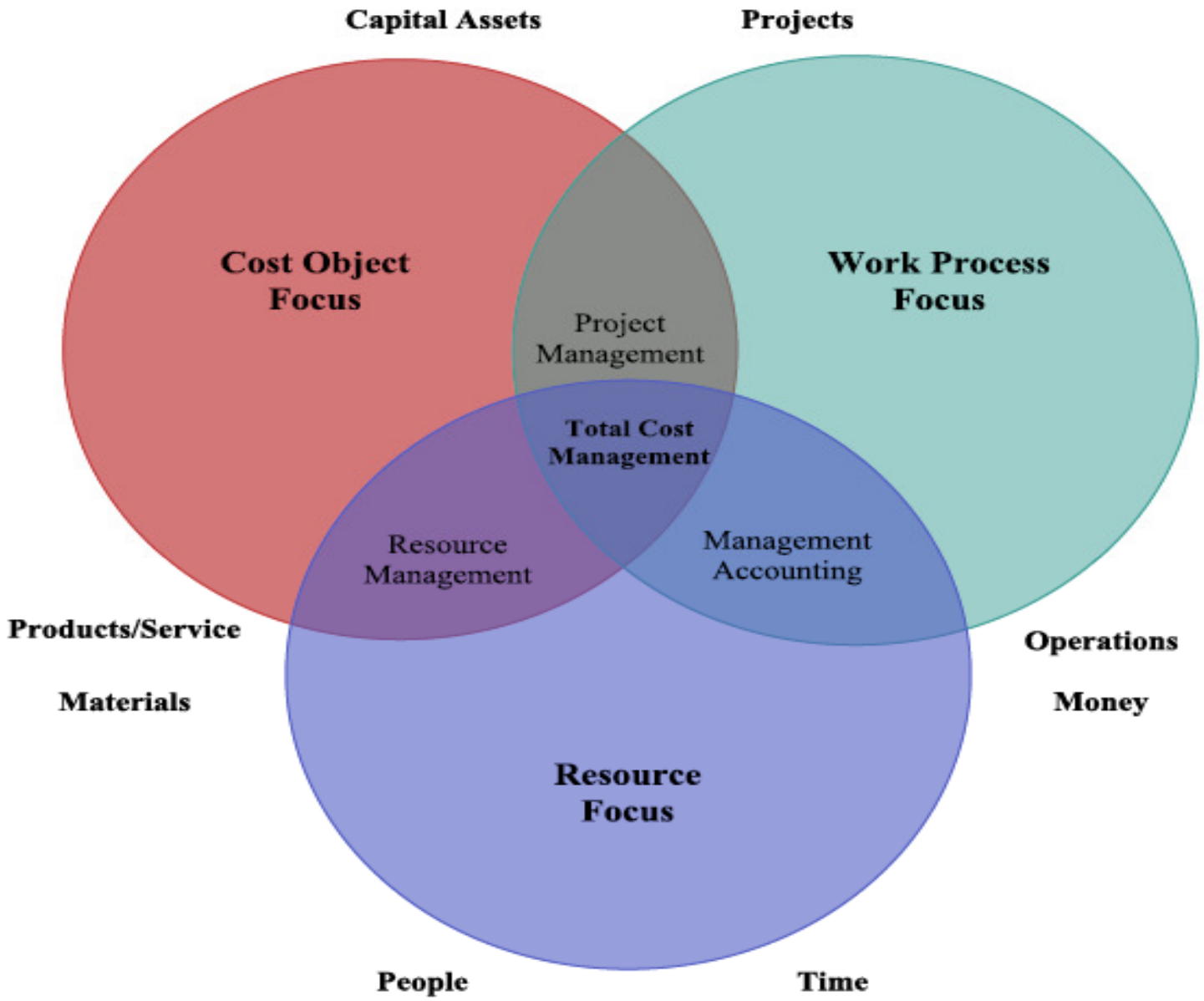
Every TCM process employs feedback and improvement!

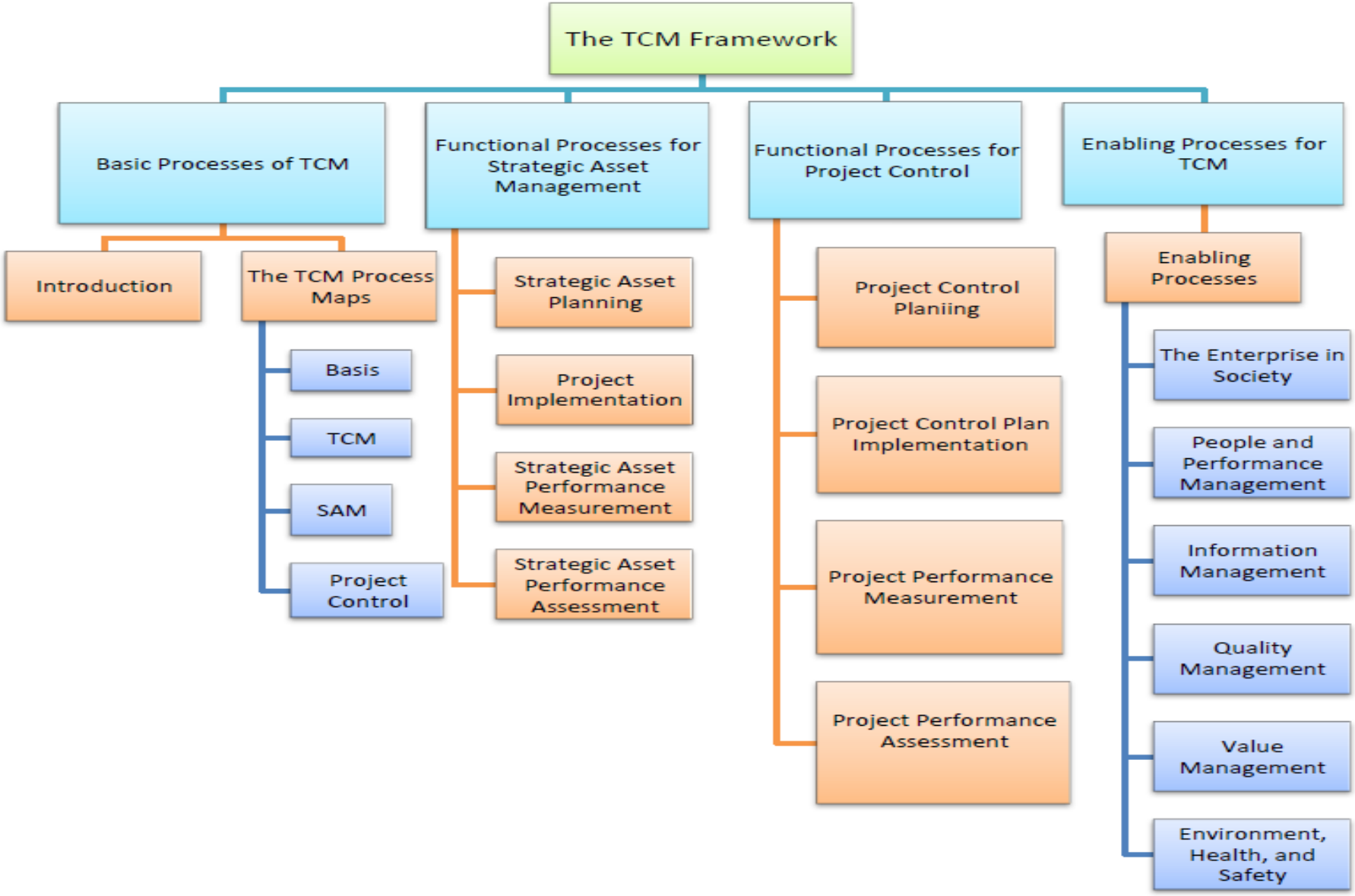
Integrated

Every TCM process has P,D,C & A steps that are *All* linked back to business strategy!

- TCM is an integrating process that not only maps the fields of practice of cost engineering, but also provides links to the fields of project management, resource management, and management accounting practice.
- TCM provides a unique technical perspective that is often missing from financially focused approaches (hence the term cost “engineering”)

- The Figure in next slide illustrates how TCM, with roots and emphasis in project management and project control, has a balanced focus on
- product and capital costs,
- project and operational work processes, and
- resources of all types


Capital Assets
Projects
Cost Object Focus
Work Process Focus
Project Management
Total Cost Management
Resource Management
Management Accounting
Products/Service
Materials
Operations
Money
Resource Focus
People
Time


The TCM Framework
Basic Processes of TCM
Introduction
The TCM Process Maps
Basis
TCM
SAM
Project Control
Functional Processes for Strategic Asset Management
Strategic Asset Planning
Project Implementation
Strategic Asset Performance Measurement
Strategic Asset Performance Assessment
Functional Processes for Project Control
Project Control Planiing
Project Control Plan Implementation
Project Performance Measurement
Project Performance Assessment
Enabling Processes for TCM
Enabling Processes
The Enterprise in Society
People and Performance Management
Information Management
Quality Management
Value Management
Environment, Health, and Safety

TIME DRIVEN ACTIVITY BASED COSTING

- Originally introduced in 1980s, ABC corrected serious deficiencies in traditional standard-cost systems.
- Traditional systems typically used three categories namely material, labour and overhead.
- Allocation of indirect costs with measures of direct labor hours or direct labor costs

- Customer focused strategy attempted to attract, retain and grow business by offering services such as the following.
- Producing and stocking greater variety of products
- Supporting more order-entry and order tracking channels

- Delivering directly to customers end –use locations , often in expedited and narrow time windows.

- Providing specialized technical applications support.

- All these activities created value and loyalty among customers but has cost implications.
- Companies has to add overhead resources for engineering, packaging, distributing, order handling, marketing, and selling.

- Overhead costs increased both relatively and absolutely as companies diversified into more product lines, customers, channels and regions and offered specialized features and services.
- Standard cost systems designed during scientific management no longer reflected the current economic reality.

- Companies are operating with distorted information about profitability of their orders, products and customers.
- Traditional cost systems may show all products as profitable.
- Economic reality is minority of products earned 150 to 300 percent of profits and unprofitable customers lost 50 to 200 percent profits

Activity Based Costing

- Activity Based Costing traces the indirect and support costs first to activities performed by the organizations shared resources and then assigning the activity cost down to orders, products and customers on the basis of each organizational activities consumed.

- Managers used the more accurate ABC and profitability information to make better decisions about process improvements, order acceptance, and rejection, pricing and customer relationships.
- The decision led to near term and sustainable improvements in product and customer profitability.

ABC pitfalls

- Interviewing and surveying process was time consuming and costly.
- The data for ABC was subjective and difficult to validate
- The data were expensive to store , process and report.
- Most ABC models were local and did not provide an integrated view of enterprise profitability

- The ABC model could not be easily updated to accommodate changing circumstances.
- The model was theoretically incorrect when it ignored the potential for unused capacity.

An elegant more accurate approach

- TDABC simplifies the costing process by eliminating the need to interview and survey employees for allocating resource costs t activities before driving them to cost objects (orders, products, customers).
- TDABC assigns resource costs directly to cost objects using two set of estimates .

- TDABC model calculates the cost of all resources- personnel, supervision, occupancy equipment and technology supplied to department or process.
- This is divided by the capacity – the time available from the employees actually performing the work of the department to obtain the capacity cost rate.

Traditional ABC calculation

Activity	Time spend (%)	Assign--ed cost (Rs)	Cost Driver Quantity	Cost Driver Rate(Rs)
Process Customer order	70	396900	49000	8.10 per order
Handle Customer enquiries	10	56700	1400	40.50 perenquiry
Perform credit check	20	113400	2500	45.36per credit check
Total	100	567000		

- The ABC project team uses these cost driver rates to assign the customer service departmental expenses to individual customer on the basis of number of orders handled , complaints processed and credit check performed on each customer.

- TDABC uses time equations that directly and automatically assign resource costs to the activities performed and resources consumed.
- Only two parameters needed to be calculated i.e. capacity cost rate for the department and the capacity usage by each transaction processed in the department.

- Capacity cost rate=

Cost of capacity supplied/

Practical capacity of resources supplied

TDABC-INPUTS

- Cost of capacity is Rs. 5,67,000
- No of frontline people is 28
- Front line employee works on average of 20 days per month (60 days per quarter)
- Paid for 7.5 hours of work each day.
- Each employee show up for work for

  20*7.5*3=450 hrs or 27000 minutes

- 75 minutes in a day is spend for in breaks , training and education.
- Practical capacity per employee is 375 minutes per day multiplied by 60 per quarter
- For 28 frontline employee the department has practical capacity of 630,000 minutes.

- The cost rate (per minute) of supplying capacity , the first estimate for TDABC is calculated as follows.

Capacity cost rate= Rs.567,000/630,000mts

=0.90/minute

Activity	Unit time (minutes)	TDABC Cost driver	Cost (Rs)
Proces customer order	8	0.90	7.20
Handle customer enquiry	44	0.90	39.60
Perform credit check	50	0.90	45

- Customer Service time (minutes)

  =8*(number of orders processed)+

  44*(number of customer enquires)+

  50*(number of customer credit checks)

Cost of performing the Activities

Activity	Unit time	Quantity	Total minutes	TDABC RATE	Total cost
Process customer cost	8	49,000	392,000	0.90	352800
Handle customer enquiry	44	1,400	61,600	0.90	55,440
Perform credit check	50	2500	125,000	0.90	112,500
Used capacity			578,600	0.90	520,740
Unused capacity			51,400	0.90	46,260
Total			**630,000**	**0.90**	**567,000**

TIME EQUATIONS

- Packaging time=0.5 +6.5(special handling required)+0.2(if shipped by air)
- ERP system already store data on order, packaging, distribution, and other characteristics.
- Order transaction specific data enables data capturing seamlessly.

ESTIMATING PROCESS TIMES

- TDABC uses time as its primary cost drivers since most resources such as personnel and equipment have capacities that can be readily measured by the amount of time they are available to perform work

- Resources as shown below measure capacity with other units

Resource	**Capacity measure**
Vehicle capacity/warehouse space	Cubic meters
Vehicle capacity	Kilograms
Data storage capacity	Gigabytes
Data badwidth	Bauds

- ERP systems today collect and store transaction data such as order header, customer identity , order detail , bills of material, and order features.
- Advanced companies use Global positioning system and radio frequency identification(RFID) technologies to track the movemnt of trucks and inventory.

- TDABC can easily tap into these databases to estimate the resource demands on process triggered by a production, sales distribution , delivery, or payment event.

ORDER PROCESSING TIME EQUATION

- ORDER PROCESSING TIME (minutes)
  =10+5(if new customer)+
  +2*number of line items
  +4*number of rate quotes
  +(if international order)
  (2*(if customs form)
  +5(if shipping declaration)
  +10(if consular clearance))
  +(if special services)
  (5(if rush order)
  +10 (if credit hold)
  +2(if hazardous material))

BUILDING TIME EQUATION

- Project teas use the following sequence to estimate time
- Begin with the most costly process
- Define the scope of the process
- Determine the key drivers of time
- Use readily available time variables
- Engage operational personnel to help build and validate the model.

BENEFITS OF TIME EQUATION

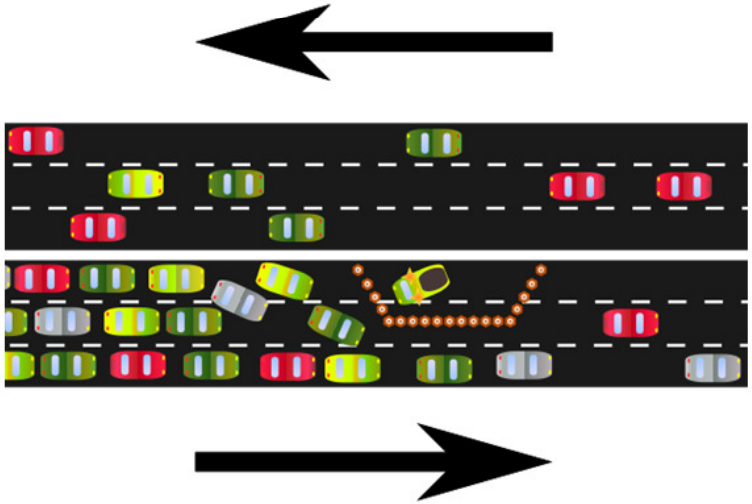
- Smaller and more scalable models-Process complexity causes only linear increases in model size as analysts add terms to existing time equations.
- Greater accuracy- data fed in by ERP, CRM and General ledger.
- Easy in building and maintaining models
- Easy in roll out.
- Ability to do capacity and predictive analysis.
- Identification of process improvement opportunities

Theory of Constraints

- The Theory of Constraints (TOC) is a systems-oriented **process improvement methodology** that is based on the theory that a system has a single goal (which is to make money, and that systems are composed of multiple linked activities, one of which acts as a constraint on the whole system.

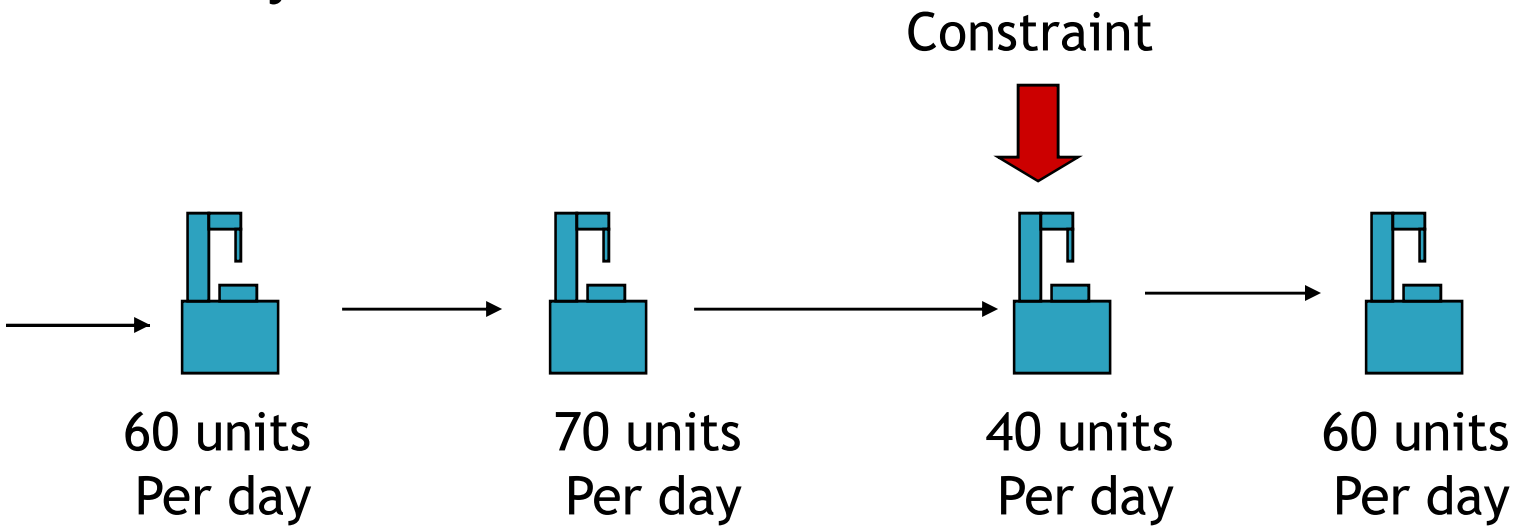
- TOC is a methodology to focus on removing and exploiting the constraint in order to optimize throughput.
- Identification of constraints allows management to take action to alleviate the constraint in the future

- A constraint is anything that limits a system from achieving its goal or a level of performance desired. A constraint can be viewed as a structural bottleneck which determines the maximum capacity of a system.



Constraints

- Any system can produce only as much as its critically constrained resource



Maximum Throughput = 40 units per day

- Constraints can be internal to the company (i.e. something which they company can easily control or change) or external (i.e. a constraint for which the company had no immediate control, but is often something for which the company can take some action to resolve in the medium to long term).

- Internal constraints may include:
  - capacity of particular machines or workstations;
  - salary levels or work environment within the company which constrain the company's ability to hire capable employees;
  - transportation bottlenecks in the production process;

- ability of the production management team to manage certain production processes;
- ability of the production planning team to schedule/allocate production efficiently;
- incorrect assumptions about maximum capacity by relevant managers.

- External constraints may include:
  - availability of sufficient raw materials;
  - availability of labor or managers in a particular location;
  - brand awareness of the company's products;
  - distribution channels for the company's products.

Five Steps Of TOC

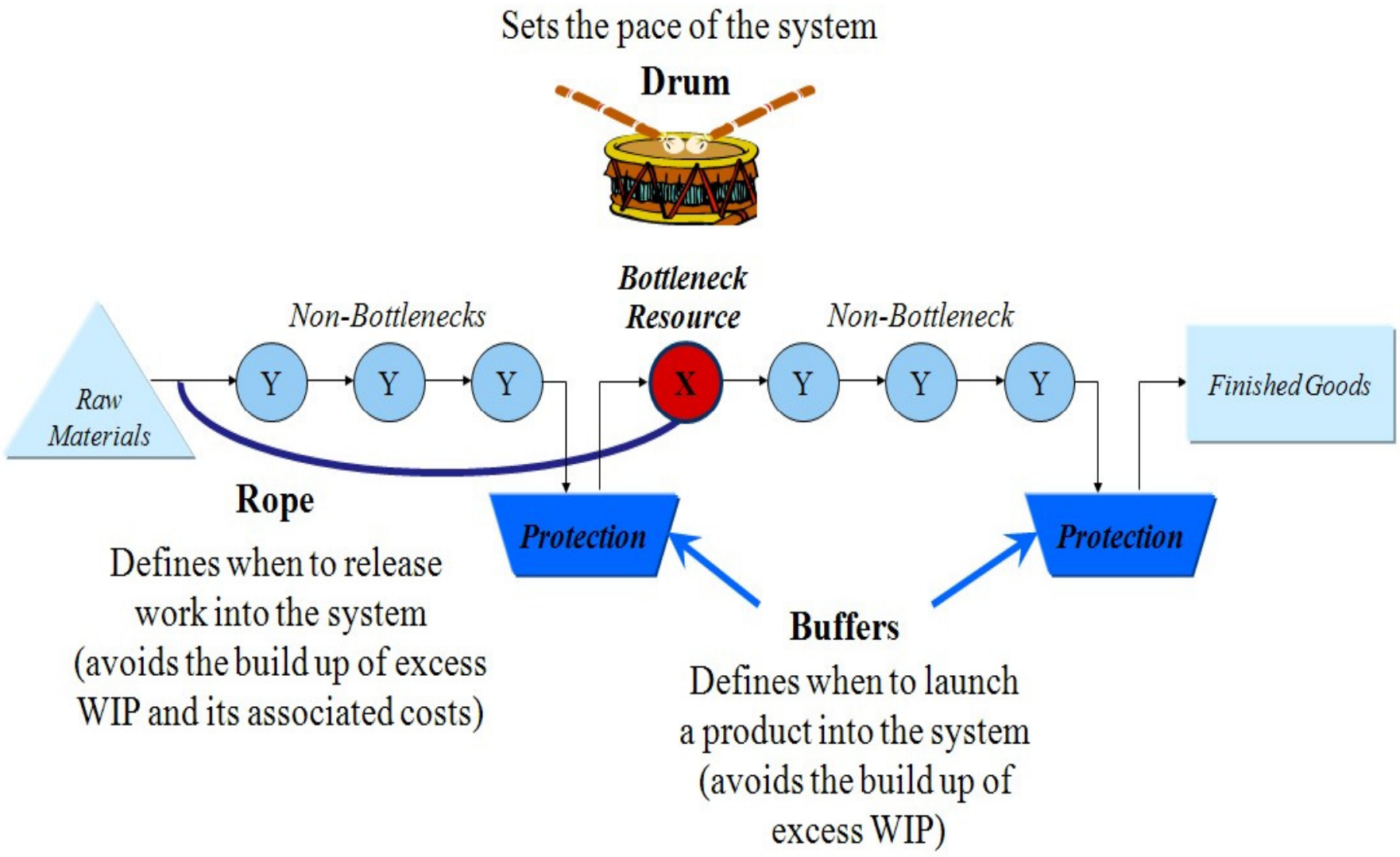
1. Identifying the constraint
2. Decide how to exploit the constraint
3. Subordinate everything else to the decision in step 2
4. Elevate the constraint
5. Go back to step 1, but avoid inertia

Drum, Buffer, Rope

- Drum, Buffer, Rope is a method to identify and exploit the constraints in a production system.
- It uses Process Mapping as a main tool to identify the bottleneck and then apply solutions.
- **Drum**: This is the constraint itself since it sets the drumbeat (pace) for the other processes. Also, the drumbeat signals the upstream operations what to produce and tells the downstream operations what to expect.

- **Buffer:** This is the stockpile of WIP in front of the constraint. It is a precaution to keep the constrained resource running at the highest possible capacity since it determines the output of the entire system. However, to some degree this may conflict with lean manufacturing principles which consider that buffers are typically a source of waste so they should always be minimized to the extent possible.

- **Rope:** Limitations placed on production in upstream operations which are necessary to prevent flooding the constraint with excess work-in-progress (WIP) which are above its capacity.


Sets the pace of the system
Drum
Bottleneck Resource
Non-Bottlenecks
Non-Bottleneck
Raw Materials
Y
Y
Y
X
Y
Y
Y
Finished Goods
Rope
Defines when to release work into the system (avoids the build up of excess WIP and its associated costs)
Protection
Protection
Buffers
Defines when to launch a product into the system (avoids the build up of excess WIP)

Throughput

- The rate at which the system generates money through sales.

  (Or, the money coming into the organization.)
- Building inventory is not throughput
- Only $ generated by the system get counted; e.g., raw materials and purchased parts are not throughput.
- T = Selling Price - Materials

Throughput Ratios.

- There are three main ratios that are calculated:
- return per factory hour,
- cost per factory hour and
- the throughput accounting ratio

- **Return per factory hour =**

  Throughput per unit/product time on bottleneck resource.

- **The cost per factory hour** =

  Total factory costs/total time available on bottleneck resource

- **Throughput accounting ratio=**

  Return per factory hour/cost per factory hour

Inventory

- All the **money** the system has invested in purchasing things which it intends to sell.
- Inventory is a liability (not an asset)
- Raw materials, work in process, finished goods and scrap are inven

Operating Expense

- All the money the system spends in order to turn inventory into throughput. (Or, the money coming into the organization.)
- All employee time (direct, indirect, operating, etc.)
- Depreciation of a machine
- Operating supplies

Sustaining TOC: Process Stability

- The following steps will make production more stable and predicable, therefore allowing for a greater level of confidence in the impact of removing the most significant constraint:
  - Measuring process and machine capacity and output in order to define the constraint point;
  - Creating clearly defined production procedures and processes;

- Implementing the 5S system at shop floor level;
- Synchronizing the production layout to better arrange workstations so as to minimize transportation bottlenecks.

Comparison of Variable Costing and Throughput Accounting

VARIABLE COSTING	THROUGHPUT ACCOUNTING
Revenue	Revenue
- Direct Materials	- Direct Materials
- Direct Labor	
- Variable Overhead	- Variable Overhead
= Contribution Margin	= Throughput
- Fixed Expenses	- Operating Expenses
= Profit	= Profit

Lean Accounting

- Concepts designed to better reflect the financial performance of a company that has implemented lean manufacturing processes.
- These may include
- organizing costs by value stream,
- changing inventory valuation techniques and
- modifying financial statements to include nonfinancial information.

Lean Manufacturing

- A strategy designed to achieve the shortest possible production cycle by eliminating waste.
- The goal is to reduce inventory and produce only to meet customer demand.
- Benefits include lower costs, higher quality and shorter lead times

Scope

- The lean accounting concepts discussed in this document apply to:
- • large and small organizations,
- • enterprises in the manufacturing and services industries,
- • public and private, and
- • for-profit and not-for-profit organizations.

- Lean accounting practices are summarized in two Statement on Management Accounting(SMAs).
- This first lean accounting SMA, Accounting for the Lean Enterprise: Major Changes to the Accounting Paradigm, includes five topics:

1. Value stream costing introduces an income statement format to control costs, promote lean behavior, and monitor performance.
2. Decision-making methods summarize how to make decisions, such as quotes, orders, and outsourcing, without using standard costing as a base.
3. Features and characteristics cost calculations provide a product-family view of product costs.

4. Budgets and financial planning reflect a value stream reporting structure including box score format and/or value stream statements.

5. Transaction elimination challenges accounting to readdress the value of collecting and recording data using transactions and reports in favor of simple visual management methods.

- The second SMA, Applying Lean Accounting Fundamentals beyond the Manufacturing Floor, strives to expand the lean accounting principles discussed in this SMA to the entire enterprise.

1. Performance Measurement Linkage: Key to the success of any organization is the thoughtful and explicit linkage of organizational goals and objectives to the value stream and cell goals and measurements.
2. Accounting Organizations: Lean processes become a part of the way all areas of the organization perform their jobs.

3. Service Organizations: The heart of lean is the management of processes. Though it is easier to visualize with a tangible product, lean principles also address organizations that provide services to its customers.

4. Sales and Marketing: Critical to the continuing growth of the business, sales and marketing must be attuned to the changes and opportunities within the value streams

5. Target Costing: In lean organizations, target costing is a major driver of change and improvement throughout the value streams.

6. Implementing Lean Accounting Practices: As operations demonstrate control over specific processes, the accounting practices that support each of those processes can adapt as well, eliminating a myriad of non-value-added transactions.

Principles

- Lean production is a term used to describe a manufacturing approach that combines the best elements of craft and mass production while seeking to avoid the high cost of the craft setting and the rigidity of mass production.

- Value: Lean starts with a definition of what constitutes value from the customer's standpoint in terms of the features and characteristics of the product or service.

Implication: Rather than targeting a predetermined standard product cost and motivating managers to overproduce in an effort to reduce variances, a lean enterprise continually redefines value based on the customer rather than an internal standard

- Value Stream: The value stream is the sequence of processes through which a product is transformed from raw material to delivery at the customer's site.

Implication: Traditional accounting seeks to calculate standard costs for a product or service by assessing the labor and other (so called) direct costs required to provide the service or make the product, and then allocating associated support costs to the individual product or service.

- Flow and Pull: The production process is designed to maximize the flow of the product through the value stream, initiated by the pull of customer demand.

Implication; Performing to budget rather than customer demand is a key performance metric. This results in excess inventory that utilizes resources and increases risk.

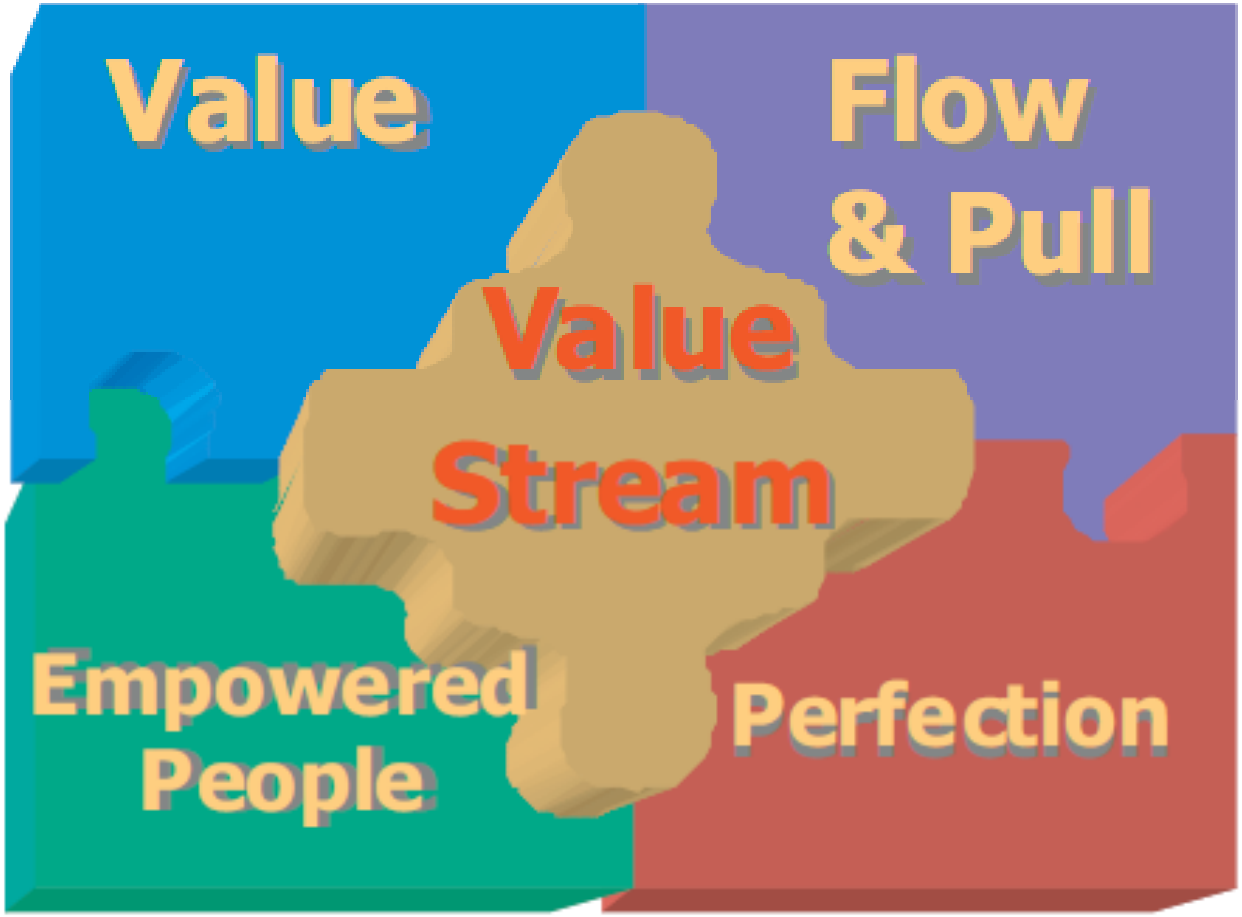
- Empowerment: The system of measurements and controls provides each employee with the information and authority to take necessary action at the time it is required.

Implication: Lean techniques help facilitate this evolution by providing information that is real-time-developed and maintained by those using the information in daily decisions.

- Perfection: Perfection is defined as 100% quality flowing in an unbroken flow at the pull of the customer. In a lean structure, empowered teams at every level within the value stream strive to continuously improve their processes so as to provide perfect, high-value products and/or services to their customers.

Implication: A lean structure, empowered teams at every level within the value stream strive to continuously improve their processes so as to provide perfect, high-value products and/or services to their customers.

EXHIBIT 1. THE FIVE PRINCIPLES OF LEAN THINKING



Customer focus and leadership are two key elements of the value principle.

- **Customer focus;**
- Lean companies speak of the “voice of the customer” as the driver of everything they do.
- In lean organizations, customer demand sets the pace of demand fulfillment.

- **Leadership;**
- Leadership is the management team's ability to translate customer requirements into
- concrete policies,
- organizational structures, and
- production strengths.

principle

- **Lean Organization;**
- In traditional organizations, problems often exist at organizational boundaries.
- This is because each organization focuses on optimizing its self-interest rather than trying to optimize the total organizational needs.

- **Improvement Culture;**
- Lean producers equip teams and individual employees to analyze strategic gaps and quality problems to find root causes and then conceive, implement, and standardize effective solutions.

- **Mapping Value Streams;**
- Value stream mapping is a technique that assists the visualization of the entire process, documenting time, waste, and cost.
- The objective of value stream mapping is to find waste, quantify throughput time, determine value-added ratio, and provide baseline for a future state map.

- **Work Cells;**
- A work cell is a group of dissimilar operations formed to produce a product family.
- Benefits of ***Cellular Manufacturing*** including high quality and efficiency,
- result from the work cell's lack of material movement,
- small batches,
- quality at source,
- flexibility, and
- self-correcting processes

Cellular Manufacturing is manufacturing done in a work cell

Elements of Flow and Pull Principle

- Partnering;
- Effective lean production requires the effective deployment of a set of cooperative, trust-based relationships between employees and suppliers.
- Instead of maintaining an arms-length contractual relationship with suppliers, lean manufacturers think of suppliers as an extension of the factory or office.

- **Single-Piece Flow Production;**
- Lot sizing affects manufacturing competitive advantage because it influences the cost, quality, lead time, and flexibility of manufacturing.
- The drawback of large lot sizes is that even when they minimize dollar costs, they lead to greater non-dollar costs associated with increased production lead times, hidden defects, and reduced scheduling flexibility.
- Lean production acknowledges the problems and wastes connected with using large lot sizes

- **Setup-Time Reduction;**
- Simplified setup and reduced setup time permit reduced-lot-size production and result in
- increased production capacity,
- flexibility, and
- resource utilization, as well as improved product quality and
- customer satisfaction.

- **Pull-Production System;**
- Pull production is a way of controlling a process and reacting quickly to changes without relying on inventory.
- In a pull system, each stage of a process produces exactly what the immediate downstream stage requests; in effect, material is pulled through the process by each stage, producing only what is demanded of it from the next stage.

- **Lean Equipment Management;**
- One of the outcomes of lean production is the recognition that reliability is an essential element of a stable, effective flow.
- Total preventative maintenance (TPM) or the scheduled analysis, repair, and adjustment of machines are used to reduce the risk of unscheduled downtime.

- **Empowerment;**
- The involvement of line and shop-floor workers is fundamental to lean production initiatives.

- For this reason, companies should elicit and listen to workers' ideas about improvement and empower them to make more decisions and perform tasks that are improvement related.

- **Information Architecture;**
- Lean processes necessitate the creation of a framework that supports a team-based lean organization and distributes information efficiently.

- **Standard Operations;**
- Without standard operations, improvement potential is very limited.
- Things will fall back into a chaotic state.
- Standard operations are the work procedures, sequences of tasks, and times prescribed for production of a unit of output.

Major Changes to Accounting Paradigm

- Traditional accounting systems present a “frozen” view of operations that doesn’t reflect the continuous improvement goals of the lean enterprise.

1. Lean and simple business accounting applies lean methods to accounting processes eliminating waste embedded in transaction processes, reports, and accounting methods.

2. Accounting processes that support lean transformation focus on measuring and understanding the value created for the customer by concentrating on the entire value stream rather than individual products or services.

3. Clear and timely communication of information is evidenced by easy-to-understand accounting reports that are provided frequently and not locked in to a monthly reporting cycle.

4. Planning from a lean perspective involves people who are responsible for achieving results and are actively involved in setting goals.

5. Strengthen internal accounting control when eliminating

Value Stream Costing

- Value Stream Costing facilitates in growing the business, increasing customer value, eliminating waste from every process, and increasing cash flow and profitability.

Value Stream Income Statements

- Traditional income statements present information on cost of goods sold, applied overhead, and manufacturing variances, value stream statements highlight material purchases, employee and equipment costs, and facility costs.

- Whenever possible, costs are assigned directly to value streams rather than allocating to cost objects.
- This includes costs associated both with personnel and with machines.

Traditional and Value Stream Income Statements

Traditional Plant-Wide Income Statement

Sales	$5,563,374	100.00%
COGS at standard	$3,711,884	66.70%
Gross Profit	$1,851,490	33.30%
Material Variances	24,485	0.40%
Labor Variances	31,380	0.60%
OH Variances	64,527	1.20%
Scrap	$34,392	0.60%
Total Variances	$154,784	2.80%
Gross Operating Margin	$1,696,706	30.50%
Operating Expenses		
SG&A	$96,006	1.70%
Distribution Costs	$429,797	7.70%
Total Operating Exp	$525,803	9.50%
Net OI	$1,170,903	21.00%

Value Stream Income Statements

	VS1	VS2	Sustaining	Total Plant
Sales	$ 2,708,333	$ 2,855,041		$ 5,563,374
Material costs	$ 1,040,000	$ 691,189		$ 1,731,189
Employee costs	$ 190,667	$ 393,575	$ 358,963	$ 1,095,413
Equipment-related costs	$ 156,000	$ 357,682		$ 496,780
Occupancy costs	$ 120,022	$ 234,826	$ 36,528	$ 391,376
Other value stream costs	$ 296,942	$ 114,461		$ 411,403
Value stream profit	$ 904,702	$ 1,063,308	$ (395,491)	$ 1,437,213
	33%	46%		28%
Inventory reduction or (increase)				$ 181,436
Profit				$ 1,255,777
Corporate allocation				$ 84,874
Net OI				$ 1,170,903
ROS				21.0%

Decision Making in VSC

In value stream costing, we cost the value stream, not the products. It may be difficult to see how a business can be run without knowing the cost of its products.

These are some of the reasons companies use standard product costs:

- Margin and profitability analysis,
- Product pricing and quoting,
- Make vs. buy decisions,

- Performance measurement,
- Financial reporting,
- Product or customer rationalization,
- Measuring cost improvements,
- Transfer pricing, and
- Valuing inventory.

- **Decision Making in Lean Accounting**
- When using lean accounting, regular decisions relating to such things as profitability, make vs. buy, sourcing, product and customer rationalization, and so forth, are made using value stream cost and profitability information, not the costs of individual products.

- Instead of calculating the margins for a product or an order, decisions can be made based on the effect on the value stream as a whole.

- The value stream information is better for decision making because:
- It is real information and does not contain the complex (often baffling) assumptions of full absorption product costing.
- The cost and revenue information is clearly understood by the people using the information, which enables them to make more informed decisions.
- The financial information is up to date, often to the current week

LEAN PRACTICES IMPLEMENTATION PHASES

Phase	Steps
Developing a conceptual design	Confirm objectives and scope Find burning platform Map value streams
Creating a new organization to channel the value stream	Reorganize by product family and value stream Create a lean business function Devise a policy for excess people Develop a growth strategy Instill a "perfection" mindset
Installing a business system to encourage lean thinking	Introduce lean management accounting Implement transparency Deploy right-sized machines
Completing the transformation	Apply these steps to suppliers and customers Make transition from top-down to bottom-up improvement initiatives

CUSTOMER-SUPPLIER RELATIONSHIPS

	Traditional	Partnership
Purchase criteria	Lowest bid	Competency, ability, capacity, and willingness to work with customer to improve price, quality, and delivery.
Design source	Customer	Customer and supplier
Number of suppliers	Several for each item commodity group	One or a few for each item or commodity group
Customer business volume per supplier	Limited: multiple suppliers share business	High: one or few suppliers get all of the business

Type of agreement	Purchase order; contracts to meet immediate requirements	Contract plus agreement about working relationship
Terms of Agreement:		
Duration	Short-term, or as needed by customer	Long-term, multiple years
Price/cost	Lowest bid, inefficiencies and waste keep prices/costs high	Negotiated price/cost savings from supplier improvements shared with customer
Quality	Variable; customer relies on incoming inspection	High; quality at the source; supplier uses SPC, TQM, etc.

Shipping frequency/size/location	Infrequent/large/dock or stockroom	Frequent/small/point-of-use
Order mechanism	Mail or phone	FAX, phone, EDI, or kanban
Customer-supplier interaction	Formal information exchange limited to customer requirements; no teamwork; supplier service limited to minimal requirements	Frequent formal and informal exchange of plans, schedules, problems, ideas; teamwork and mutual commitment based on trust; cooperation to resolve problems and improve supplier's products and processes. This often results in joint improvement projects and sharing of information.

Business Analytics

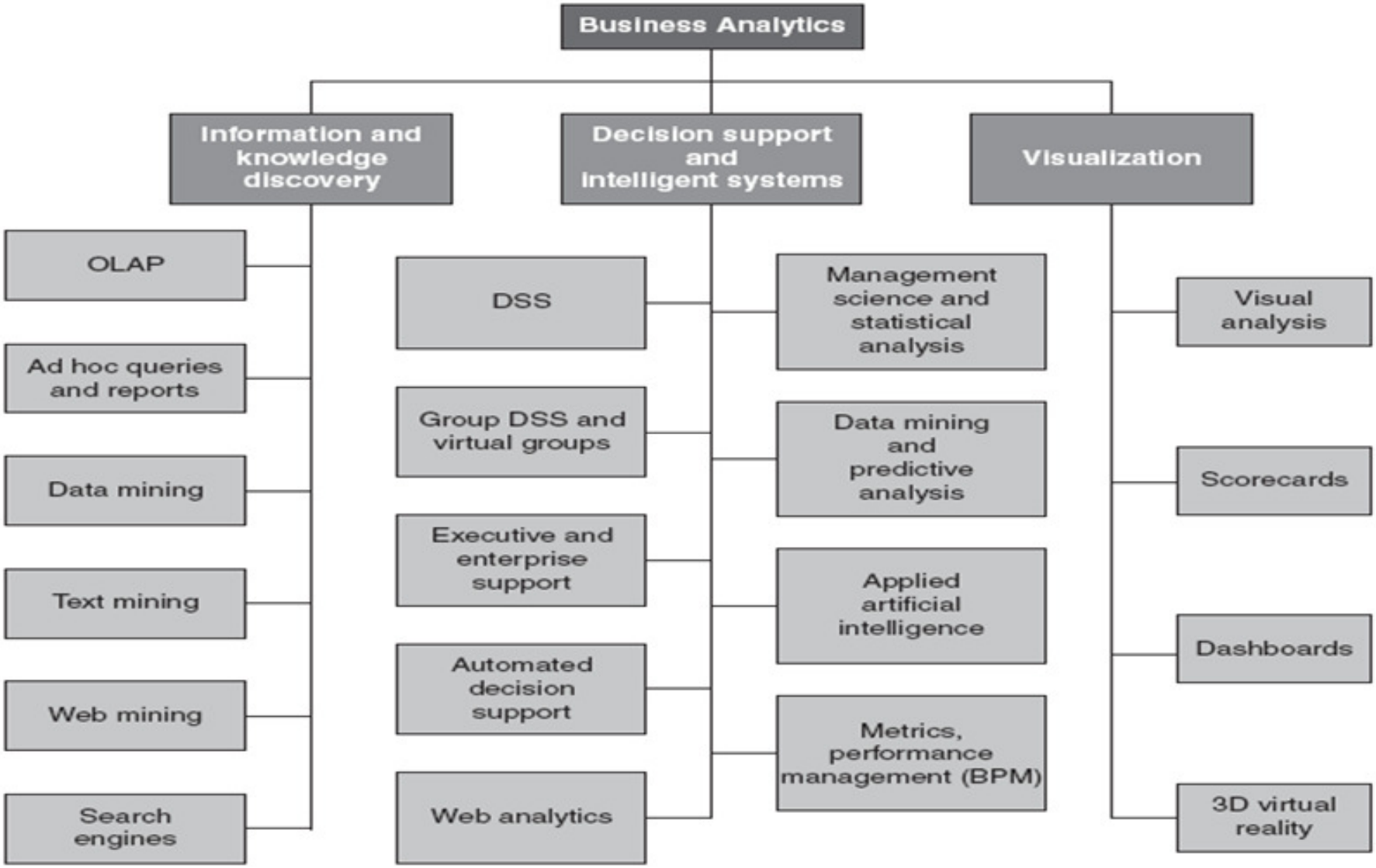
- Business Analytics (BA) is the study of data through statistical and operations analysis, the formation of predictive models, application of optimization techniques and the communication of these results to customers, business partners and colleague executives.

Business Intelligence

- Business intelligence (BI) can be defined as a set of processes and technologies that convert data into meaningful and useful information for business purposes

- BI is focused on querying and reporting, but it can include reported information from a BA analysis.
- BI seeks to answer questions such as what is happening now and where, and also what business actions are needed based on prior experience.
- BA, on the other hand, can answer questions like why something is happening, what new trends may exist, what will happen next, and what is the best course for the future.

The Business Analytics (BA) Field: An Overview

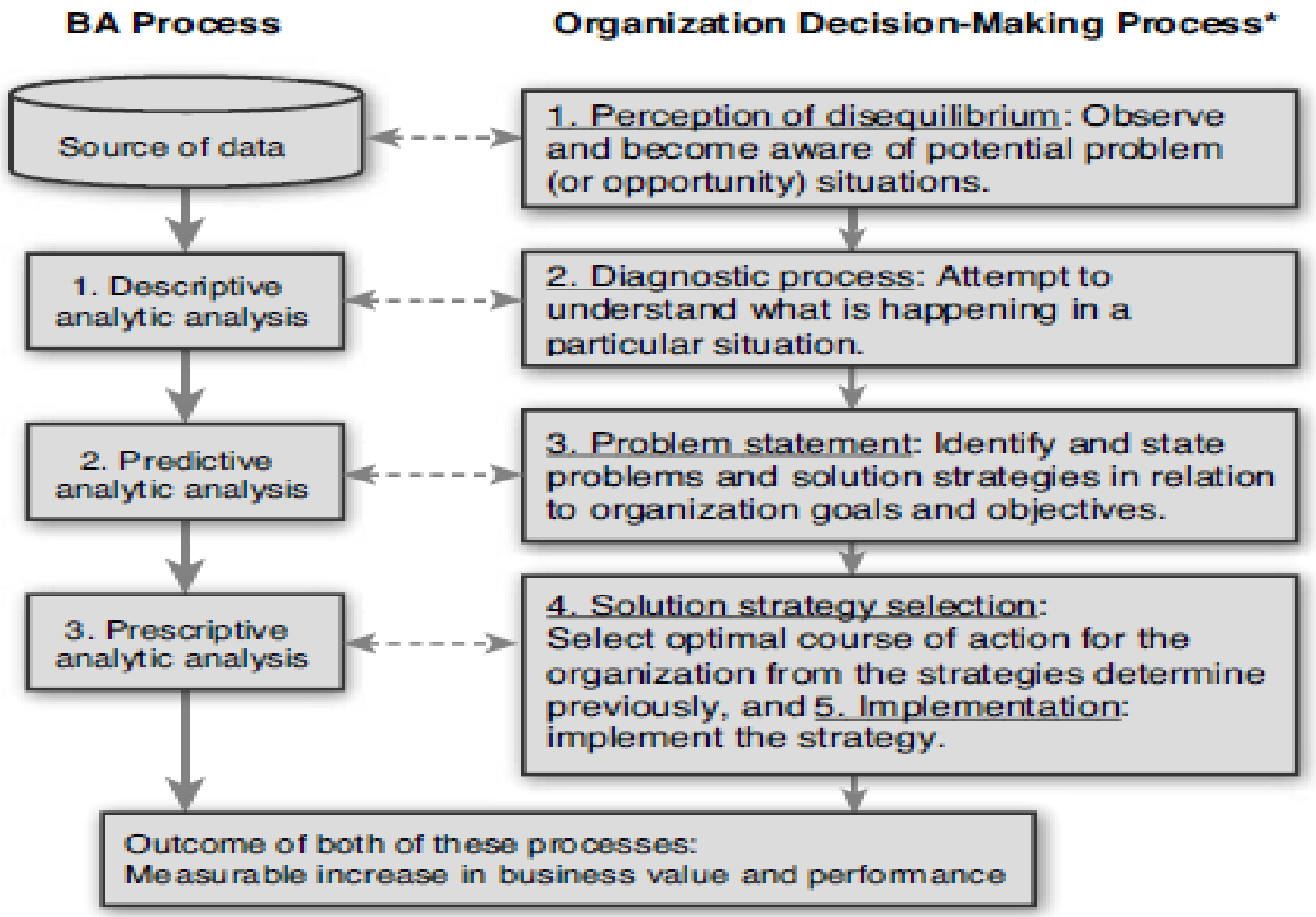


Relationship of BA Process and Organization Decision-Making Process

- The BA process can solve problems and identify opportunities to improve business performance.
- In the process, organizations may also determine strategies to guide operations and help achieve competitive advantages.
- Typically, solving problems and identifying strategic opportunities to follow are organization decision-making tasks.

Organization Decision-Making Process

- The organization decision-making process (ODMP) developed by Elbing(1970) and is focused on decision making to solve problems but could also be applied to finding opportunities in data and deciding what is the best course of action to take advantage of them.


BA Process
Organization Decision-Making Process*
Source of data
1. Descriptive analytic analysis
2. Predictive analytic analysis
3. Prescriptive analytic analysis
1. Perception of disequilibrium: Observe and become aware of potential problem (or opportunity) situations.
2. Diagnostic process: Attempt to understand what is happening in a particular situation.
3. Problem statement: Identify and state problems and solution strategies in relation to organization goals and objectives.
4. Solution strategy selection: Select optimal course of action for the organization from the strategies determine previously, and 5. Implementation: implement the strategy.
Outcome of both of these processes: Measurable increase in business value and performance

Value Chain Management

- Development of a set of functional-level strategies that support a company's business-level strategy and strengthen its competitive advantage

Value chain

- Coordinated series or sequence of functional activities necessary to transform inputs into finished goods or services customers value and want to buy.

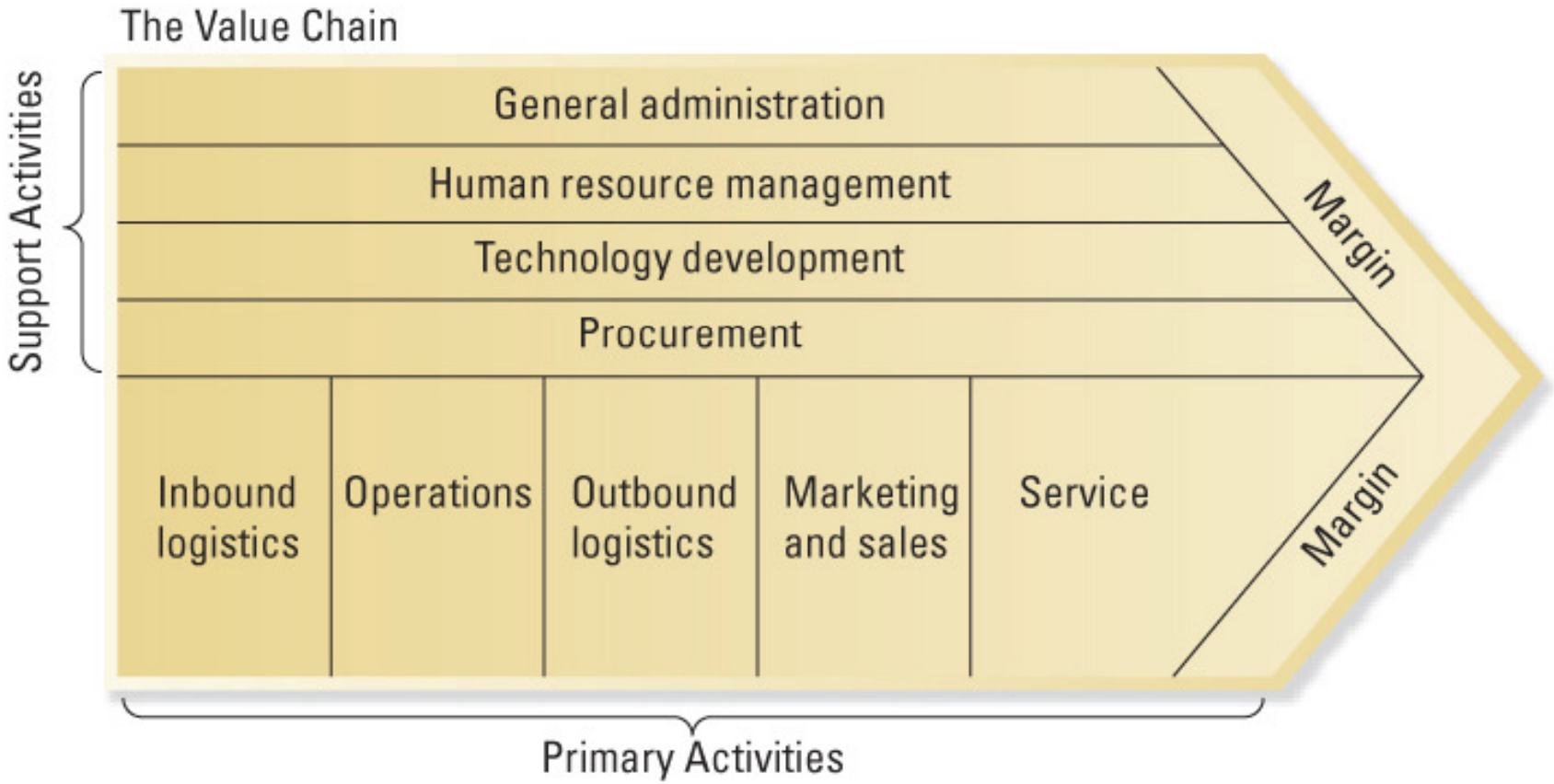
- Porter's value chain consists of a "set of activities that are performed to design, produce and market, deliver and support its product".

Porter's value chain

- Porter distinguishes Value Chain between
- primary activities and
- support activities

- Primary activities: inbound logistics, operations, outbound logistics, marketing and sales, service in the core value chain creating directly value

- Support activities: procurement, technology development, human resource management, firm infrastructure supporting the value creation in the core value chain


The Value Chain
Support Activities
General administration
Human resource management
Technology development
Procurement
Margin
Inbound logistics
Operations
Outbound logistics
Marketing and sales
Service
Margin
Primary Activities

Concepts to Manage the Value Chain

- Three research areas with respective sub-topics are relevant to the problem
- of managing a global value chain end-to-end by volume and value:

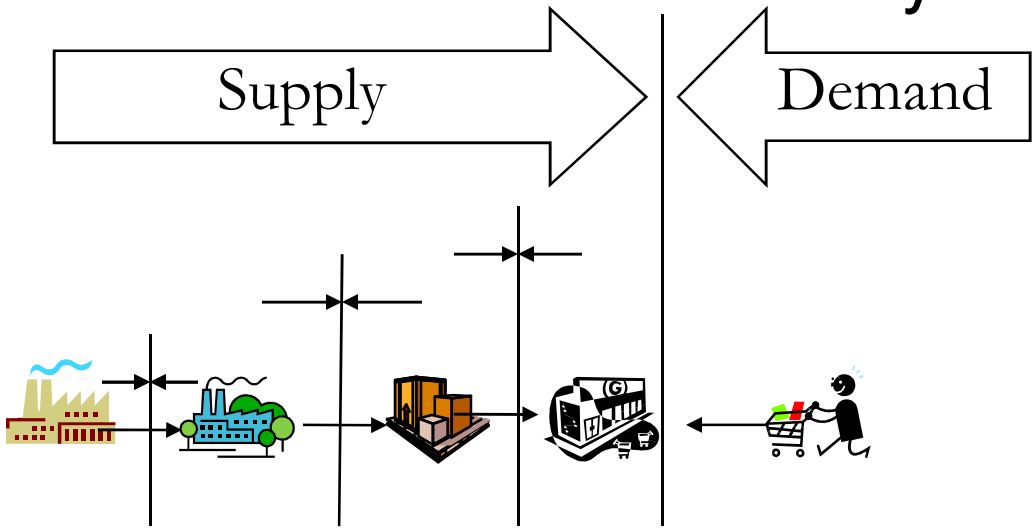
- Concepts to manage values in the value chain
- Concepts to manage demand in the value chain
- Concepts to manage supply in the value chain

Value-based management indicators

Indicator	Formula	Descriptions
ROCE	EBIT/ (Total assets - current liabilities)	Indicator to measure pre-tax interest rate on total invested capital excluding current short-term liabilities.
ROA	Net profit/ Total assets	Indicator to compare total profit return on assets specifically in asset-intensive industries.
EVA	NOPAT – (NOA * WACC)	Profit indicator deducting capital costs from net operating profit after taxes excluding interests; consideration of financing structure of the company.

Supply Chain Management

Supply Chain Management is the design and management of processes across organizational boundaries with the goal of matching supply and demand in the most cost effective way.



SCM Generated Value

Minimizing supply chain costs

while keeping a reasonable service level

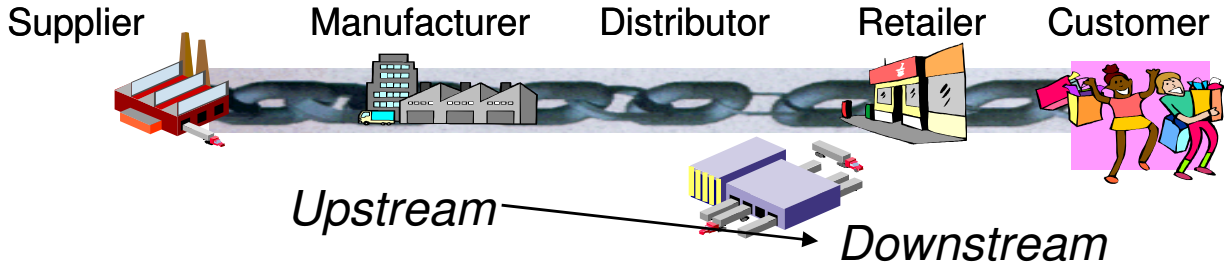
customer satisfaction/quality/on time delivery, etc.

This is how SCM contributes to the bottom line

SCM is not strictly a cost reduction paradigm!

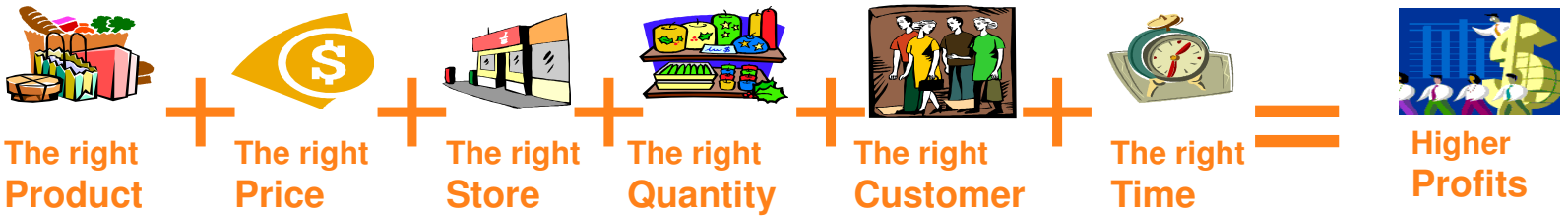
A picture is better than 1000 words!

- A supply chain consists of

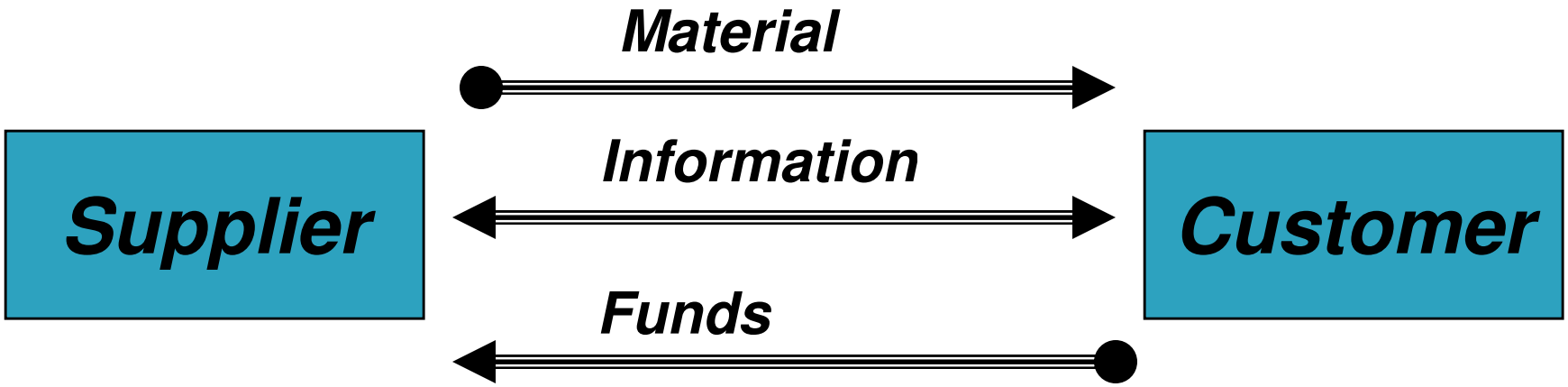


- aims to Match Supply and Demand, profitably for products and services

- achieves



Flows in a Supply Chain



The flows resemble a chain reaction.

Push vs. Pull System

- What instigates the movement of the work in the system?

- In Push systems, work release is based on downstream demand forecasts

  Keeps inventory to meet actual demand

  Acts proactively

  - e.g. Making generic job application resumes today (e.g.: exempli gratia)

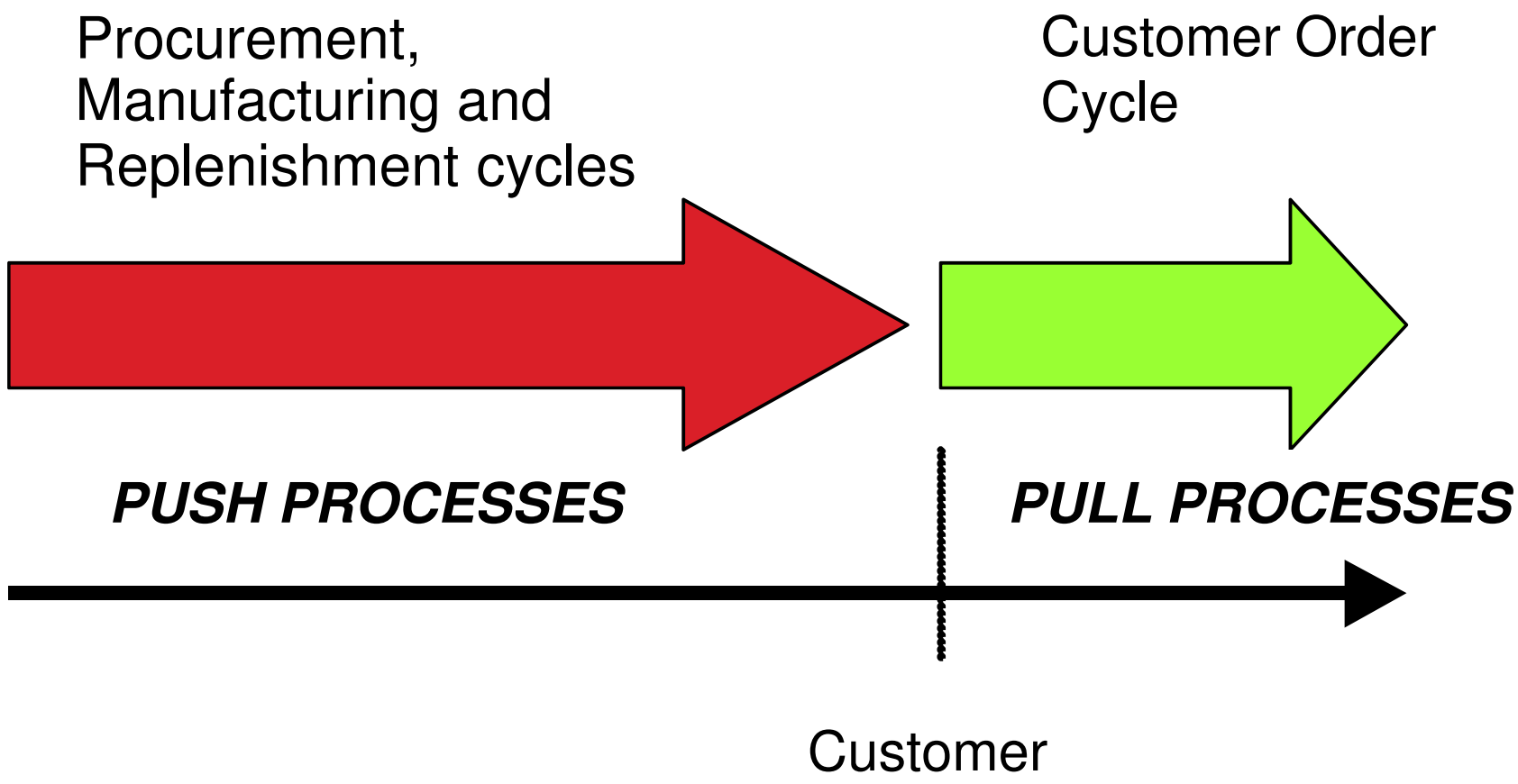
- In Pull systems, work release is based on actual demand or the actual status of the downstream customers

  May cause long delivery lead times

  Acts reactively

  - e.g. Making a specific resume for a company after talking to the recruiter

Push/Pull View of Supply Chains



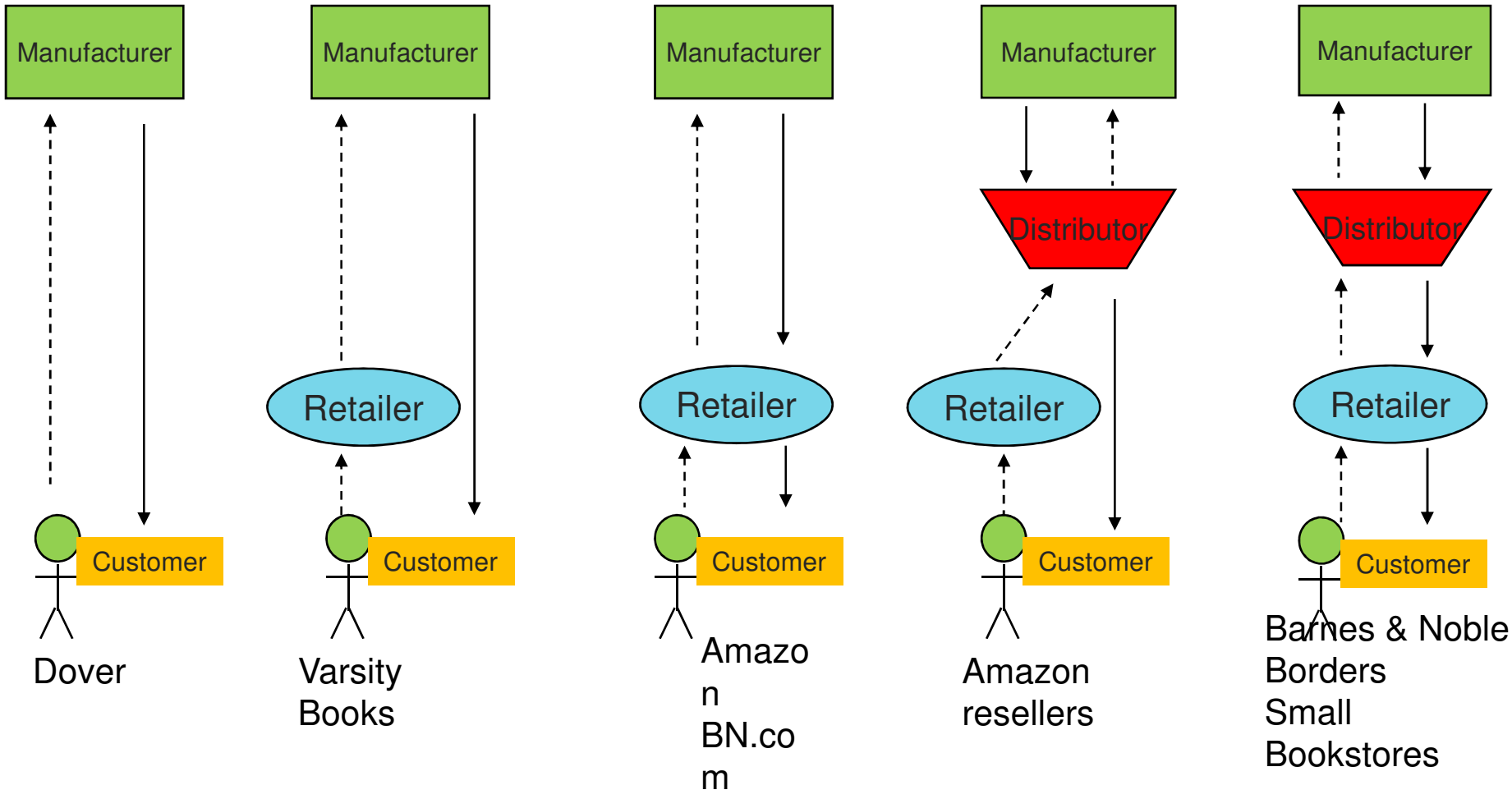
Supply Chain Management

- Strategic, tactical and operating issues
  - Strategic - long term and dealing with supply chain design
    - Determining the number, location and capacity of facilities
    - Make or buy decisions
    - Forming strategic alliances
  - Tactical - intermediate term
    - Determining inventory levels
    - Quality-related decisions
    - Logistics decisions
  - Operating - near term
    - Production planning and control decisions
    - Goods and service delivery scheduling
    - Some make or buy decisions

- Key issues in supply chain management include
  - Distribution network configuration
    - How many warehouses do we need?
    - Where should these warehouses be located?
    - What should the production levels be at each of our plants?
    - What should the transportation flows be between plants and warehouses?
  - Inventory control
    - Why are we holding inventory? Uncertainty in customer demand? Uncertainty in the supply process? Some other reason?
    - If the problem is uncertainty, how can we reduce it?
    - How good is our forecasting method?

- Distribution strategies
  - Direct shipping to customers?
  - Classical distribution in which inventory is held in warehouses and then shipped as needed?
  - Cross-docking in which transshipment points are used to take stock from suppliers' deliveries and immediately distribute to point of usage?
- Supply chain integration and strategic partnering
  - Should information be shared with supply chain partners?
  - What information should be shared?
  - With what partners should information be shared?
  - What are the benefits to be gained?

Supply Chain Alternatives



Examples of Supply Chains

Dell / Compaq

- Dell buys some components for a product from its suppliers after that product is purchased by a customer. Extreme case of a pull process

- Zara, Spain's answer to Italy's Benetton
  - Sells apparel with a short design-to-sale cycle, avoids markdowns.
- Toyota / GM / Volkswagen, in the course notes
- McMaster Carr / W.W. Grainger, sell auto parts
- Amazon / Barnes and Noble
- Frozen food industry/Fast food industry/5 star restaurants
- Internet shopping: Webvan / Peapod

Balanced Scorecard

- The balanced scorecard is a strategic planning and management system that is used extensively in business and industry, government, and nonprofit organizations worldwide to align business activities to the vision and strategy of the organization, improve internal and external communications, and monitor organization performance against strategic goals.

Balanced Scorecard Perspectives

- Learning and Growth
  - Use the organization's intellectual capital to adapt to changing customer needs or to influence new customers' needs and expectations through product or service innovations
- Internal Business
  - Things to do well to meet customer needs and expectations
- Customer Value
  - How well the organization is doing relative to important customer criteria
- Financial
  - Address stockholders/stakeholders concerns about profitability and organizational growth


Financial/
Stewardship
"Financial
Performance"
Customer/
Stakeholder
"Satisfaction"
Vision
and
Strategy
Internal Business
Process
"Efficiency"
Organizational
Capacity
"Knowledge
and Innovation"
Strategic Objectives
Strategy Map
Performance Measures & Targets
Strategic Initiatives

- Kaplan and Norton recommend a nine-step process for creating and implementing the balanced scorecard in an organization.

- 1. Perform an overall organizational assessment.
- 2. Identify strategic themes.
- 3. Define perspectives and strategic objectives.
- 4. Develop a strategy map.

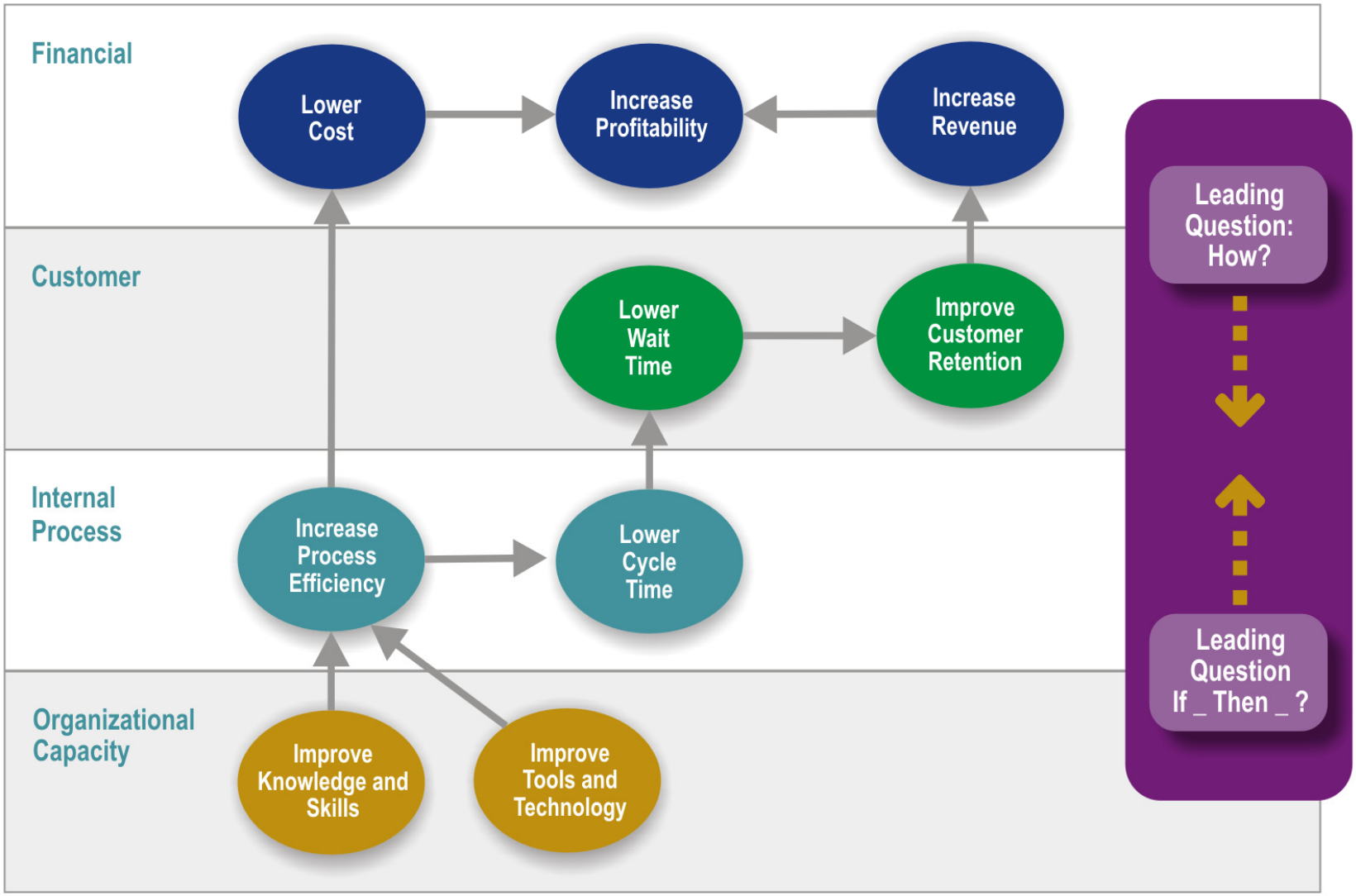
- 5. Drive performance metrics.
- 6. Refine and prioritize strategic initiatives.
- 7. Automate and communicate.
- 8. Implement the balanced scorecard throughout the organization.
- 9. Collect data, evaluate, and revise

Strategy Maps

- A strategy map provides a visual framework for an organization's strategy – how it intends to create value.
- Specifically, a good strategy map will link together:

- 1. The desired productivity and growth outcomes.
- 2. The customer value proposition which will be needed.
- 3. Outstanding performance in internal processes.
- 4. The capabilities required from intangible assets.

Strategy Mapping



Balanced Scorecard Measures

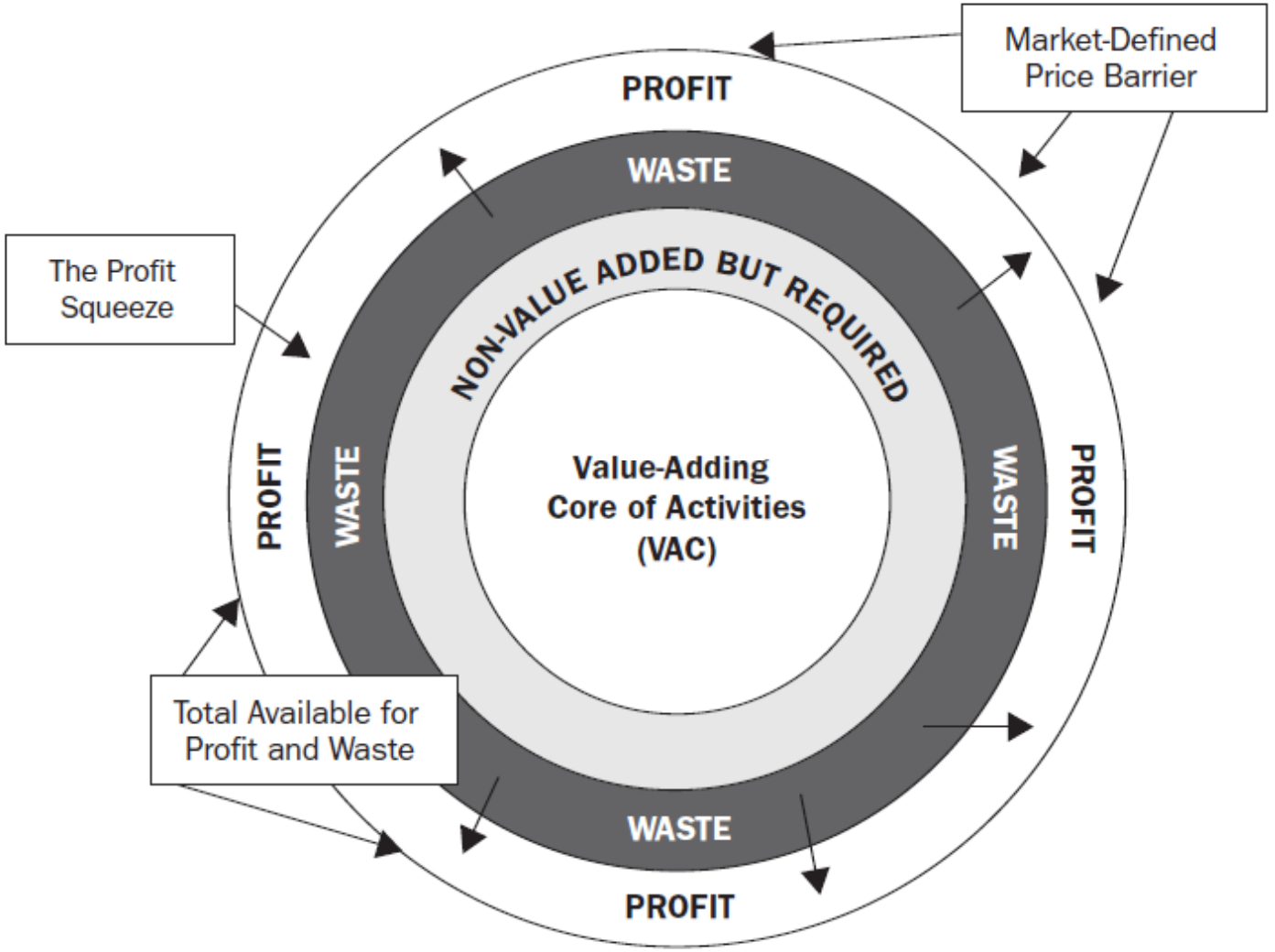
- Short-term and long-term
- Internal and external
- Financial and nonfinancial

Total Capacity management

- Capacity is the maximum output or producing ability of a machine, person, factory, etc.
- Capacity can be measured in physical terms
  - Measure of the amount of work done
  - Capacity is the measure of the maximum amount of work that can be done in a given time

- Capacity has a cost
  - Cost to acquire or rent the facility, machine, operating costs, wages, utilities, insurance, etc.
  - The cost is incurred even if capacity is underused

Business


Market-Defined
Price Barrier
PROFIT
WASTE
NON-VALUE ADDED BUT REQUIRED
The Profit
Squeeze
PROFIT
WASTE
Value-Adding
Core of Activities
(VAC)
WASTE
PROFIT
Total Available for
Profit and Waste
WASTE
PROFIT

- The market price represents an upper boundary on the amount of resources a company can use in providing goods and services to it customers.
- If the company uses excess resources, then it suffers a loss.
- The logic of the market dominates, whether the organization operates in the public or private sector.

Measuring the Cost of Capacity

- Traditional measures do not reflect the cost of capacity usage or over capacity
  - Costs are part of overhead and allocated to production
    - Focus is on inventory valuation, not managing capacity
    - Allocation base is chosen from five alternatives
      - Theoretical
        - Maximum output when operating continuously at maximum efficiency

- Practical
  - Level of output under current conditions, allowing for normal downtime for setups, maintenance, vacations, etc.
- Normal
  - Average level of output achieved or anticipated over several years
- Budget
  - Level of output anticipated for the current year
- Actual
  - Level of output actually achieved in the current year

Managing Capacity Costs

- Capacity costs may be fixed, but can still be managed
  - Reduction of idle capacity
    - Increasing sales to use unused capacity
    - Renting unused capacity to others
    - Reduction in “days off”

- Reduction of nonproductive capacity
  - Reduction of setup time, defects, etc.
- Reduction of rated capacity
  - Replace the asset with one having less capacity
    - Lower capacity asset can be more fully utilized

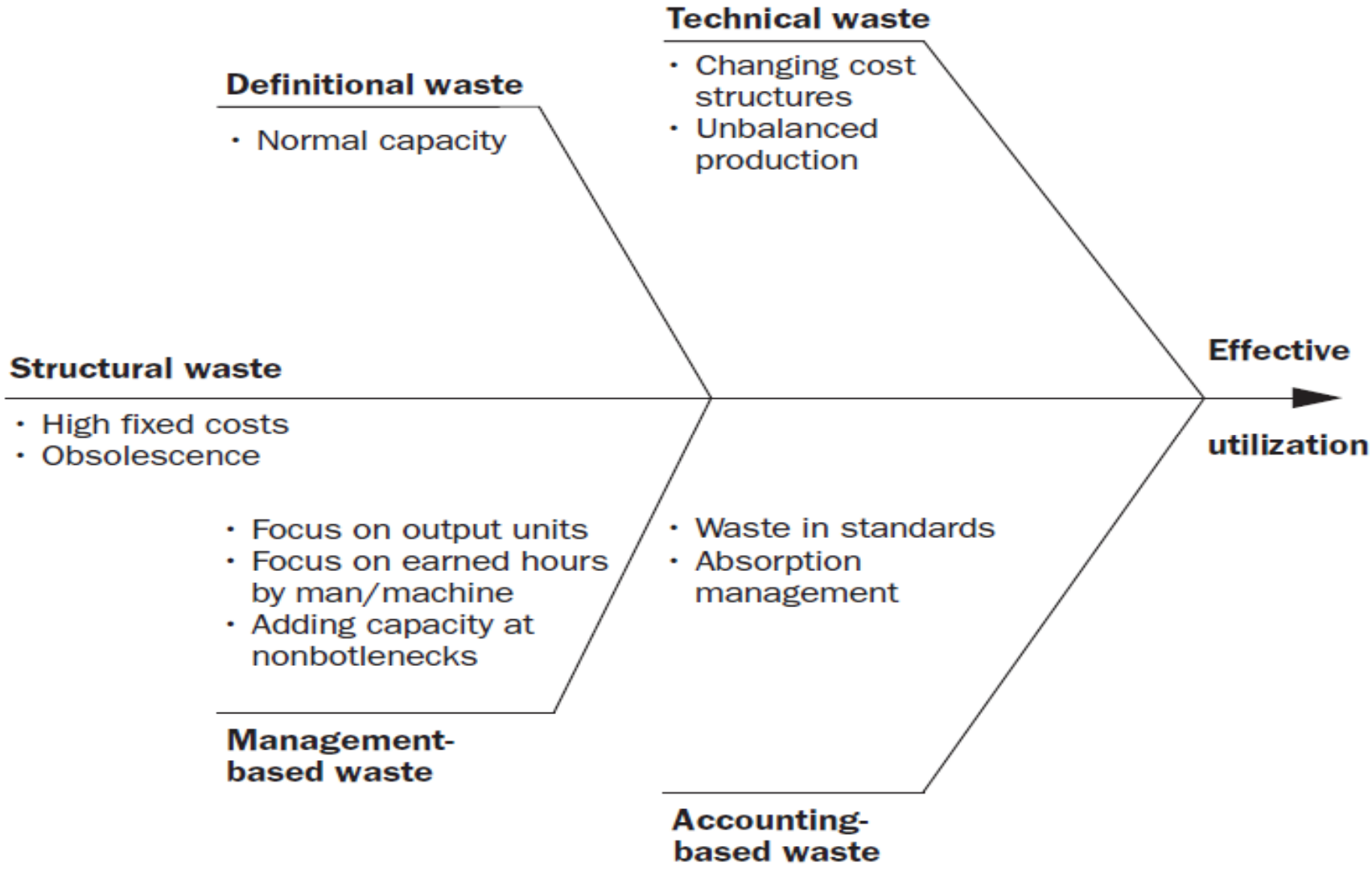
Practical Considerations in Measuring Capacity

- How is capacity defined?
  - Worker, machine, factory, etc.
    - Higher-level capacity (process, factory, etc.) is determined by the lowest capacity component
- Capacity may change over time
  - Assets slowing with age
  - Technological improvements to assets

- Capacity may depend on the mix of work processed on the asset.
  - The machine may take longer to stamp one type of product than it takes to stamp another type

- Six key issues that combine to create the basic language of capacity cost measurement are:
- resource capability;
- baseline capacity measures;
- capacity deployment;
- capacity utilization measures;
- time frame of analysis; and
- organizational focus.

DIAGNOSING CAPACITY UTILIZATION



Total Quality Management

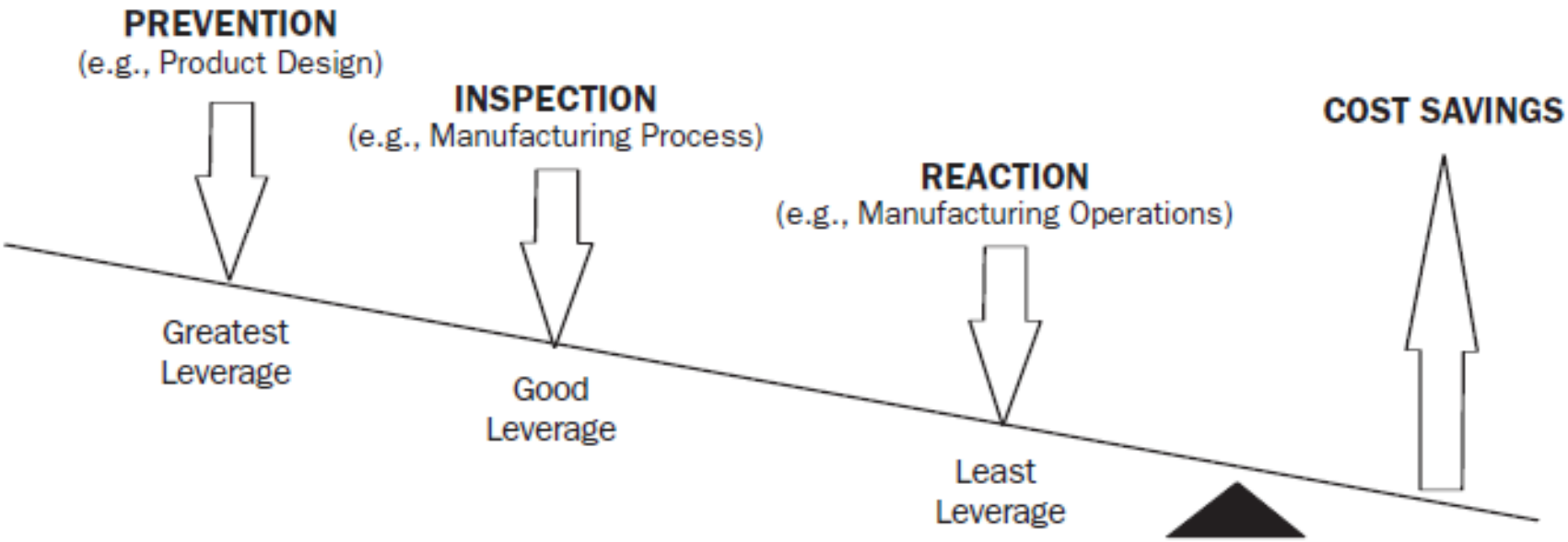
- Total Quality Management means that the organization's culture is defined by and supports the constant attainment of customer satisfaction through an integrated system of tools, techniques, and training.
- This involves the continuous improvement of organizational processes, resulting in high quality products and services.

Basic Concepts of TQM

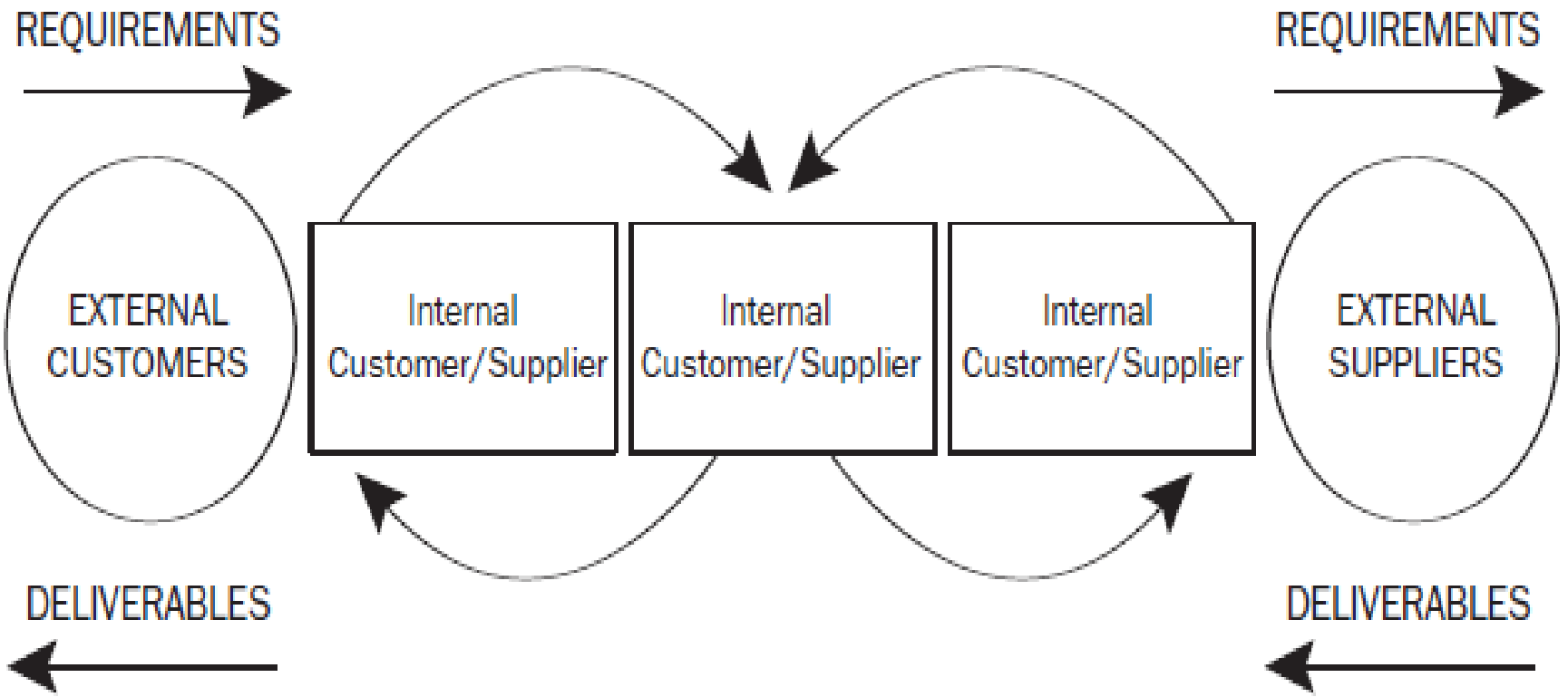
- Customer Focus
- Continuous Process Improvement - Kaizen
- Employee Empowerment – Everyone is responsible for quality
- Quality is free - focus on defect prevention rather than defect detection for it is always cheaper to do it right the first time

- Benchmarking – Legally stealing other people's ideas
- Customer-Supplier Partnerships
- Management by fact..by numbers..by data – Balanced scoreboard (financial, customer, process, learning)

Quality Lever



TOTAL QUALITY MANAGEMENT



Cost of Quality

- The Cost of Quality is a measure of what an organization is spending for its overall quality.
- It can be viewed as the difference between the actual cost of making and selling products and services and the cost if there were no failures of the products and services during manufacture or use.

- The Cost of Quality has two basic components:

A) Cost of conformance, i.e.,

- cost of prevention
- cost of appraisal

B) Cost of non-conformance or failures, i.e.,

- cost of internal failure
- cost of external failure or lost opportunity

Cost of Prevention

- The cost of prevention is the cost to ensure that customer requirements are met.
- It is associated with maintaining quality systems, such as quality control systems.
- These are incurred prior to or during production to prevent defective units of output.

- Examples of preventive actions include:
- quality planning
- quality engineering
- training to improve quality
- maintenance and calibration of production and
- inspection of equipment
- supplier assurance.

- **Cost of Appraisal**
- The cost of appraisal is the cost to ensure the work processes are producing outputs that meet customer needs or requirements, such as the inspection of raw materials.
- These are incurred after production, but before sales, to identify defective items.

- Examples include:
- quality data acquisition and analysis
- quality measurement criteria
- quality audits
- laboratory acceptance testing
- field evaluation and testing
- inspection and testing
- raw materials testing
- in-process testing
- review of test and inspection data.

- **Cost of Internal Failure**
- These are costs of not meeting customer requirements, such as the cost of having to do work again (rework).
- These are easy to identify because many accounting systems already track them.
- They are incurred to fix or dispose of the defective items before they are sold.
- Unlike the cost of prevention and appraisal, these costs are not value added and *never necessary.*

- Examples include:
- scrap
- rework or repair
- trouble shooting
- re-inspect and re-test.

- **Cost of External Failure or Lost Opportunity**
- These costs represent the lost profits associated with not meeting external customer needs or requirements.
- If the external customers become dissatisfied with an enterprise's offerings, they are likely to return the product, not buy from the firm again and, more importantly, tell other potential customers about their experience.
- The cost of lost opportunity, therefore, includes lost profits from order cancellations and market share loss.

- Examples include:
- customer service faults
- products or services rejected and returned
- products or services recalled for modification
- repairs and replacements or added service
- provided under warranty
- admitted repairs beyond warranty
- product liability
- customer losses due to poor quality.

OPTIMAL QUALITY COST

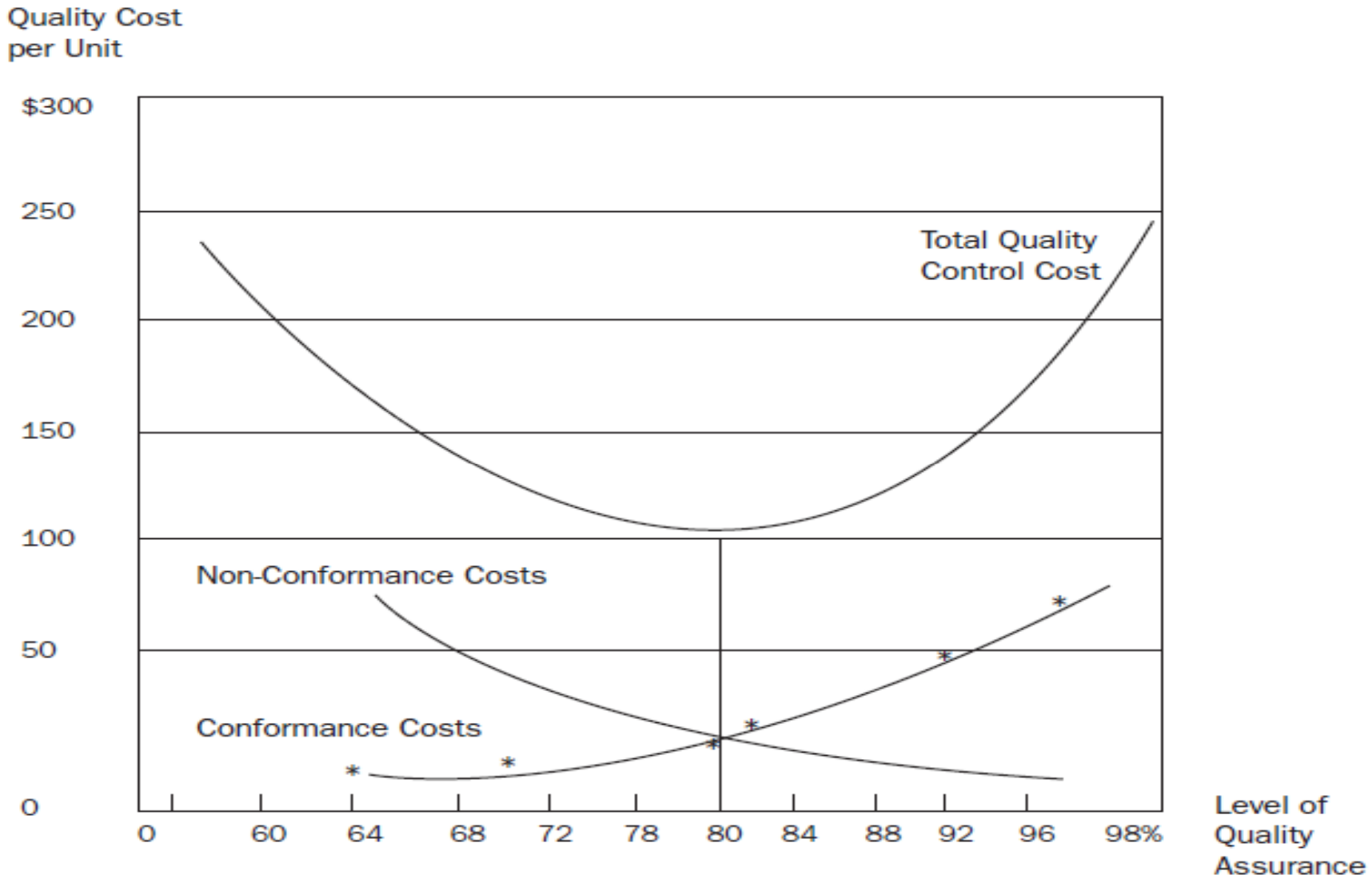


EXHIBIT OF QUALITY REPORT

	Year 2	Year 1	% Change
PREVENTION COSTS			
Training	$ 90,000	$ 50,000	+80
Processes/Procedures	50,000	35,000	+42
Quality Planning	86,000	65,000	+32
Other Quality Improvement Efforts	60,000	45,000	+33
Data Analysis	40,000	30,000	+33
Total	**$326,000**	**$225,000**	**+45**
APPRAISAL COSTS			
Testing	140,000	90,000	+55
Performance Measurement	75,000	50,000	+50
Supplier Monitoring	65,000	40,000	+62
Customer Surveys	30,000	20,000	+50
Total	**$310,000**	**$200,000**	**+55**
INTERNAL FAILURE COSTS			
Rework and Reject	55,000	100,000	–45
Reinspection and Testing	35,000	40,000	–13
Equipment Failure	30,000	35,000	–14
Other Failures	20,000	30,000	–33
Total	**$140,000**	**$205,000**	**–31**
EXTERNAL FAILURE COSTS			
Warranty	70,000	200,000	–65
Cost of Warranty	100,000	120,000	–16
Customer Losses (estimated)	600,000	1,140,000	–47
Total	**$ 770,000**	**$1,460,000**	**–47**
TOTAL QUALITY COSTS	**$1,546,000**	**$2,090,000**	**–26**

Process Capability (Cp, Cpk) and Process Performance (Pp, Ppk)

- **Process Capability Measurement:**
- A measurement to determine if a process can produce output that is both centered on the target and well within the specifications limits.
- A process is “capable” if it fully conforms to customer requirements; meets predetermined levels of centering on the target value and variability within the specifications limits; and is in control.

- **Process Quality Assurance:**
- A system that verifies that the process is being followed, that the enablers for the process are in place, and that the process is consistently capable of achieving specified outputs.

- Way to report process capability and process performance is through the statistical measurements of C_p, C_{pk}, P_p, and P_{pk}.
- C_p= Process Capability.
- A simple and straightforward indicator of process capability.

  C_{pk}= Process Capability Index.
- Adjustment of C_p for the effect of non-centered distribution.

- P_p= Process Performance.
- A simple and straightforward indicator of process performance.

  P_{pk}= Process Performance Index.
- Adjustment of P_p for the effect of non-centered distribution.

- "C_p should always be greater than 2.0 for a good process which is under statistical control. For a good process under statistical control, C_{pk} should be greater than 1.5."

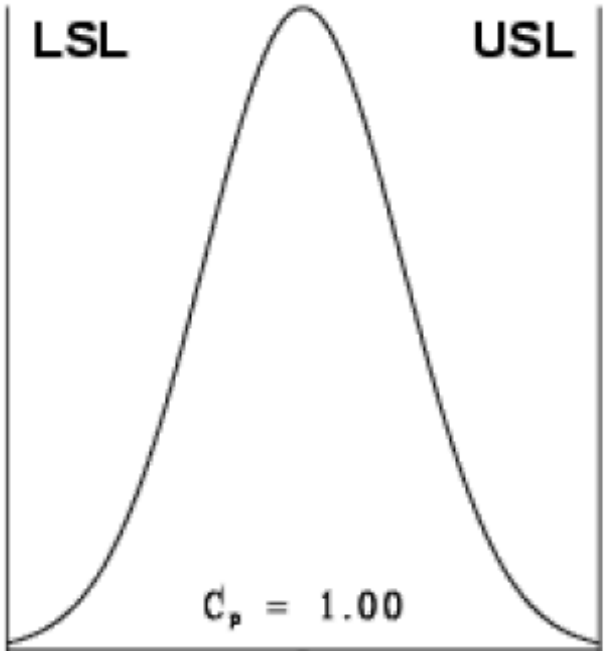
- Ranganadha Kumar

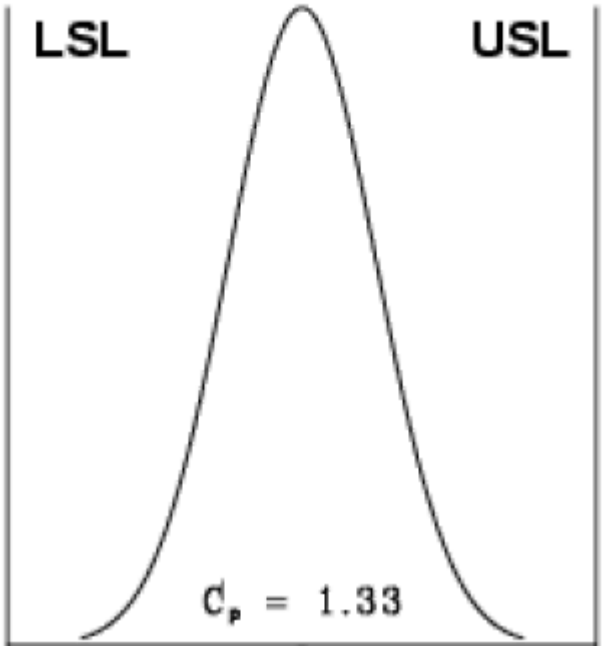
List of Quality measurements in manufacturing industries

- Installation failures
- Scrap and rework
- Re-inspection and retest
- Redesign and engineering changes
- Soft toolings
- Abandoned programs

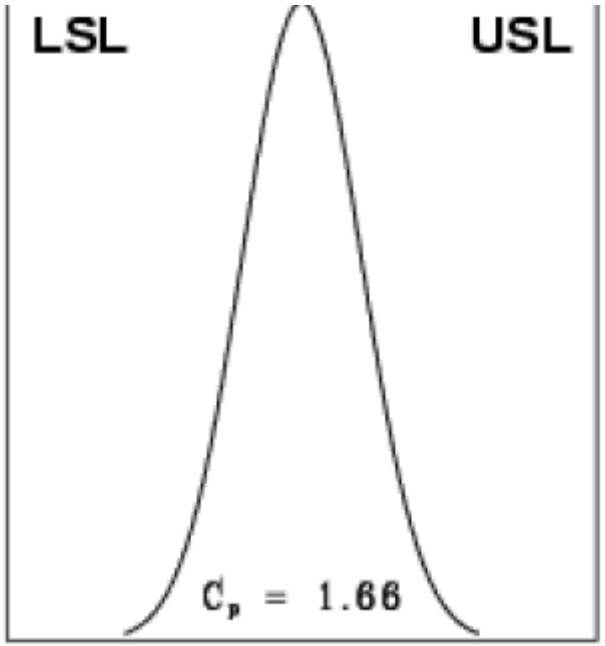
- Billing errors
- Bad debts
- Premium shipping costs
- Supplier cancellation costs
- Overdue accounts receivable
- Off-spec/waivers
- Excess inventory

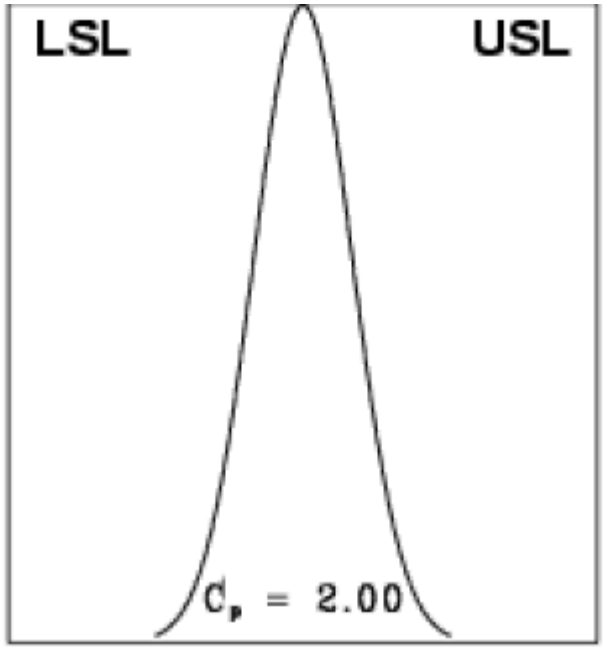
Process Capability (Cp)





Process Capability (Cp)



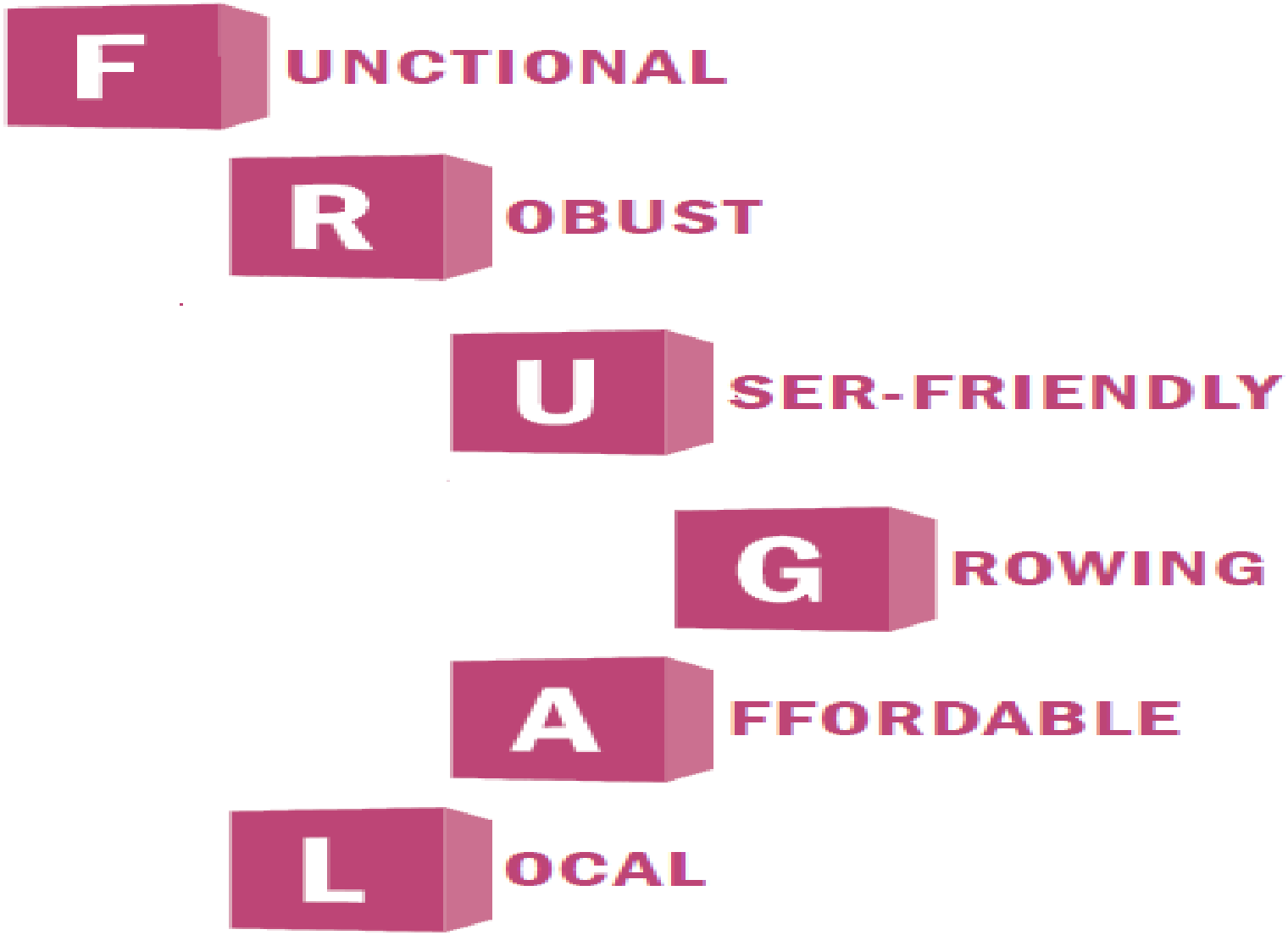


Frugal Innovation or **Frugal Engineering**

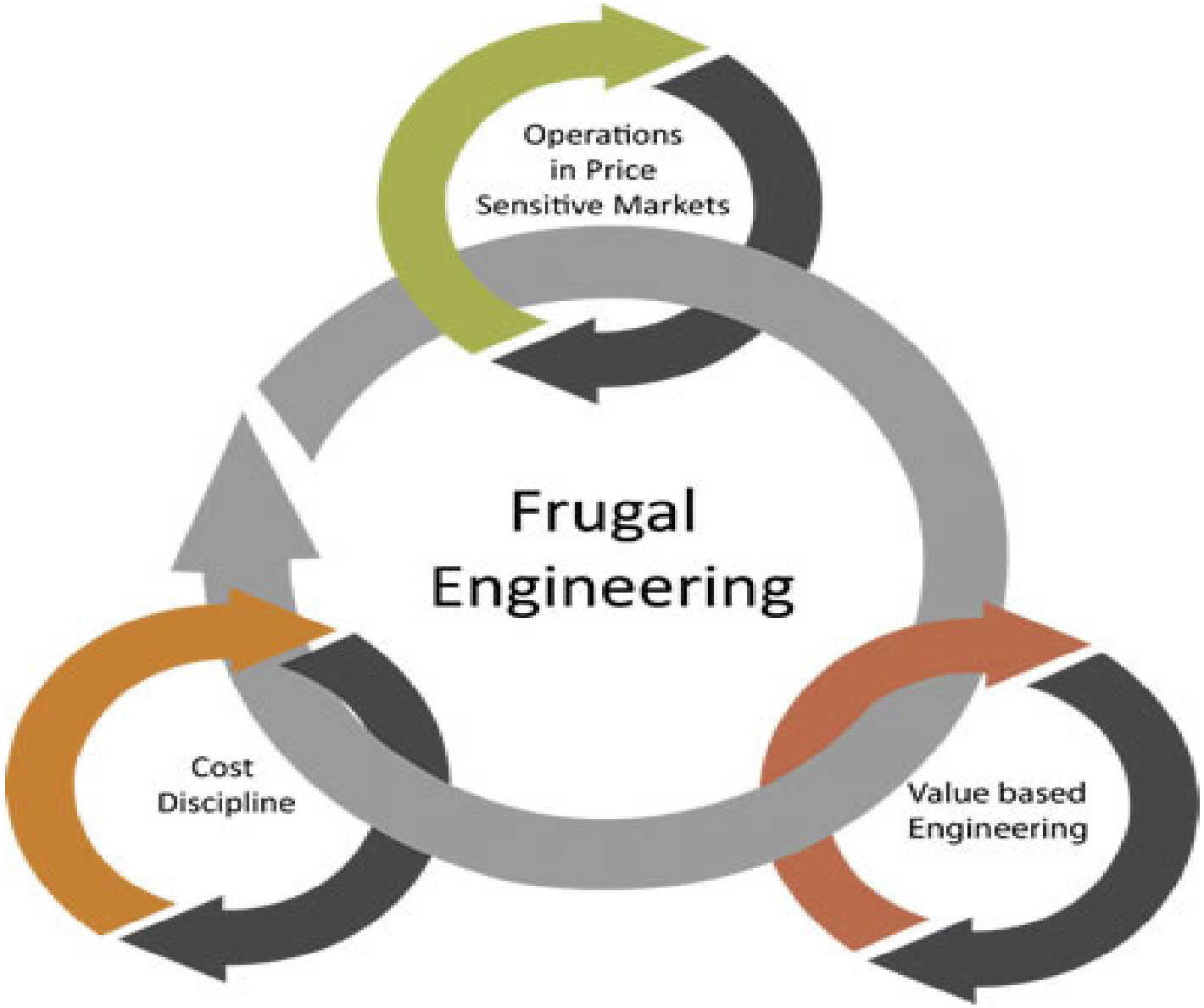
- The Frugal Engineering (FE) philosophy involves breaking up and rebuilding a cycle that culminates in a simpler, more robust, easier-to-handle final process and cost-effective final product.

- FE has been leveraged by several industries to reduce overheads and develop products that meet the critical-to quality requirements, by eliminating requirements that are not must-haves

CHARACTERISTICS OF FRUGAL PRODUCTS



- Frugal Engineering (FE) involves the breaking up and rebuilding cycle that culminates in a final product that equals more expensive, complex equivalents.
- In recent times, Value Engineering (VE) has gained prominence as a methodology adopted by manufacturers for developing innovative and cost-effective products.
- VE is a systematic approach aimed at obtaining the desired functions of a product at minimum cost, providing maximum value while maintaining or enhancing performance, quality, reliability, and safety, and adhering to environmental norms.


Operations
in Price
Sensitive Markets
Frugal
Engineering
Cost
Discipline
Value based
Engineering

Frugal innovation Six success factors

1. Fitness check:

   Define target markets and customer segments.

   First, ask whether the current product or service range is suitable for new markets and what potential it has.

2. Market analysis:

Look at the defined target markets and target customer segments in detail. What do the new customers really need? And especially, what don't they need? How much are they willing to spend on which product features?

3. Product design:

Image you are designing the product. What is its core? What is indispensable? What extra features do you need? What fits the desired user behavior and what doesn't? All these questions can be answered by a technological concept including target costs and a bill of materials

4. Value chain integration:

- This involves deciding how much to outsource and creating a tailored solution for each stage of the value chain — from development (where will the product be made?) to marketing and sales (is a dual brand strategy best?).

6. Change management:

- Frugal innovation transforms thinking at all levels. Executives and employees often meet such changes with incomprehension and skepticism, or they create obstacles.
- That wastes time and money. Change management processes accompany the transformation; not just to overcome reservations, but also to create enthusiasm for the new idea.

5. Roadmap:

- The roadmap doesn't just describe the situation; it also includes the conclusions and the preferred solution. It is a straightforward business case — with an honest risk assessment, implementation plan and clearly allocated responsibilities.

Example

- The application of FE principles is the Jaipur Leg- low cost artificial leg that was developed in Jaipur, India.
- The prosthetic is a rubber-based alternative to the composite carbon fiber variant. It was designed to be inexpensive, water-resistant, and quick to manufacture and fit.
- The primary material used was polyurethane, which is water-proof, increases the durability and enables convenience of use.
- The choice of materials and mechanisms helped to mimic a

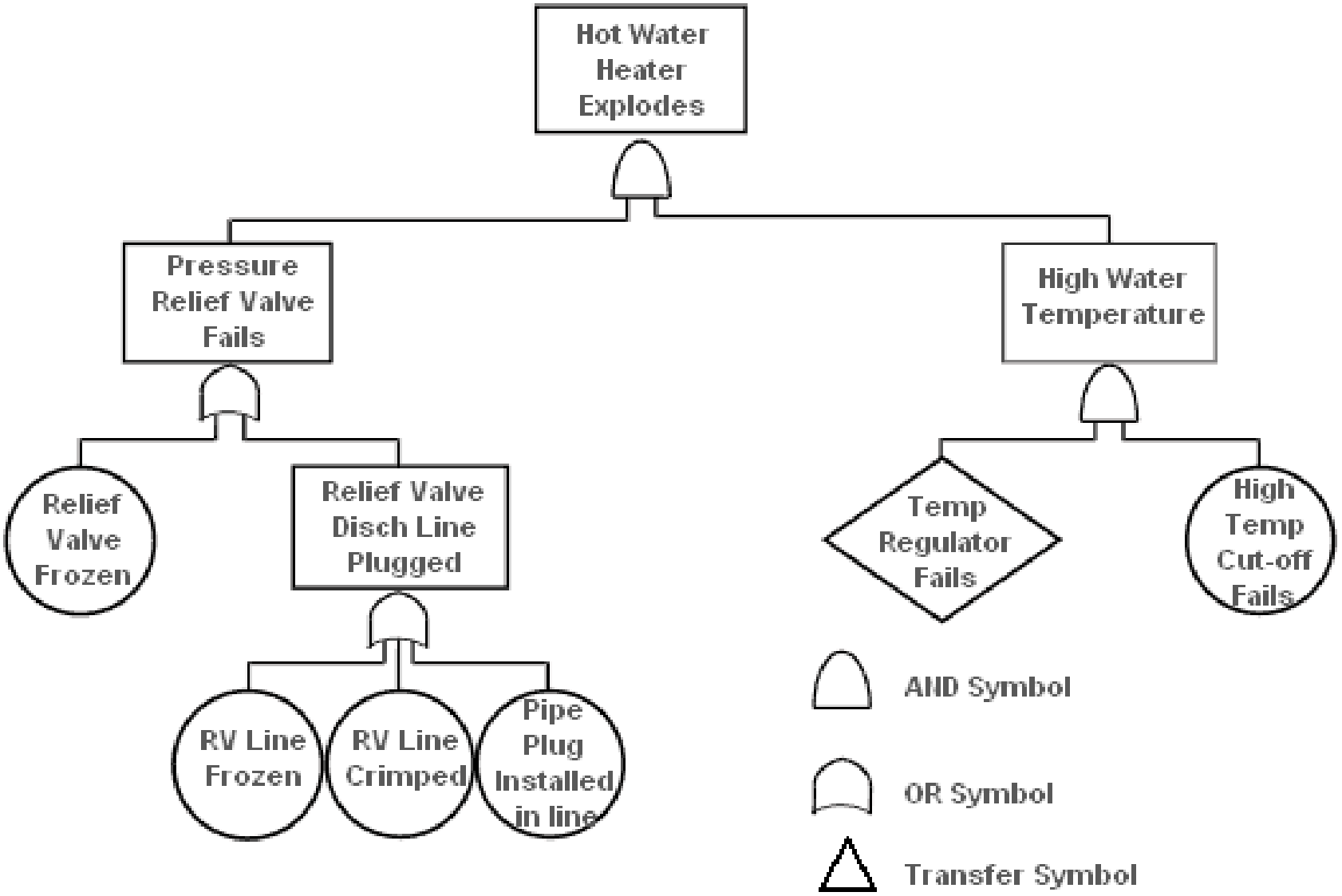
Preventive maintenance

- PM program emphasizes the need to
- Maintain normal operating requirements,
- Maintain equipment requirements
- Keep equipment facilities clean and organized , monitor equipment daily , schedule preventive maintenance , manage business information ,use Predictive maintenance.

Failure Mode Effects Analysis (FMEA)

- Failure modes and effects analysis (FMEA) is a step-by-step approach for identifying all possible failures in a design, a manufacturing or assembly process, or a product or service.

FEMA -Example



Cost Tables

- A cost table is a computerized multidimensional data base in which cost is captured for several levels of a number of attributes for either the parts or functions of a product

CLASSIFICATION OF COST TABLES

- ✓ Design Cost Tables:

Cost Tables are used during various stages in the design process e.g.

Concept design cost table

Basic design cost table

Detailed design cost table

Manufacturing process design cost table

- ✓ Production cost Table:

Production cost table help managers to decide the most beneficial production methods. E.g.

Purchasing and subcontracting cost Table

Moulds and Tools Cost Table

- Distribution Cost Table:

Distribution cost table gives managers a financial basis for choosing between alternative channels of distribution.

Another classification of cost table

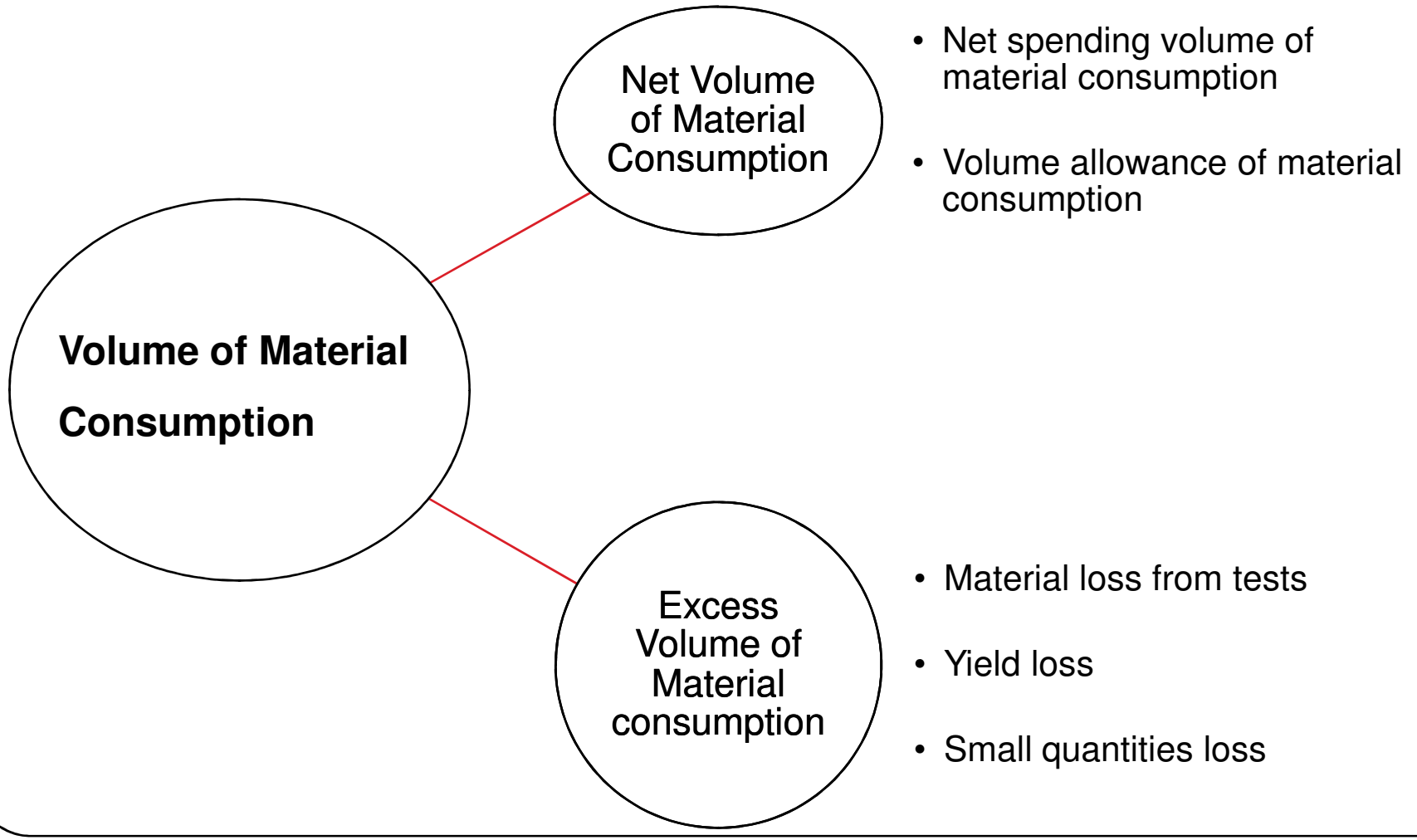
- Bottom - Up or Addition Method:

  This table makes easy to compare the cost of each process stages in the production. There are two methods namely, concentrating on *Physical product (Parts of a product)* or the *Functions of a product.*

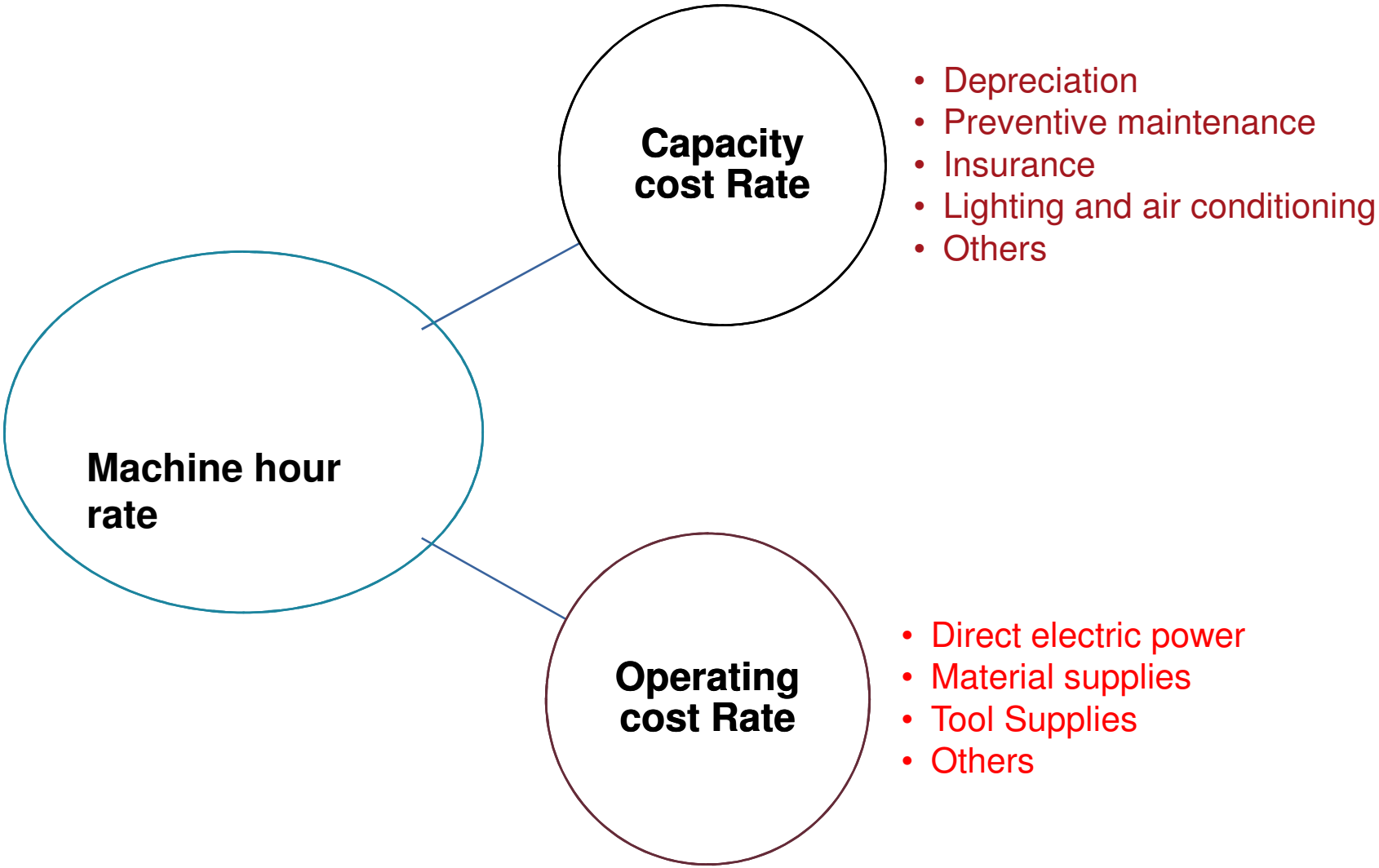
- The basic rule for the bottom - up approach is that the greater detail in which the cost of product is to be estimated, the more subdivisions are required of the cost items.

The following diagrams indicate the detail involved in some cost items

Direct material cost



Development and Design cost



Top - down approach

The top down approach to cost tables can be based either on the physical product or on the functions of a product.

- Based on Physical Product:
  - > Uses Group Technology
  - > It involves grouping products together on the basis of size, shape, quality, manufacturing method.
  - > Helps to take decision about how far to break down the products into its various components

- Based on Function:

  > Determines the relationship between the functions(Properties) of the estimation object (Product)and its actual cost.

  > Usually this relationship is expressed by a chart or mathematical formula.

- Cost tables based on functions of a product or service classified into,

  Using Theoretical values

  Using Actual Values

Compiling Cost Tables

- The compiling of cost table vary depending on whether the cost table based on the physical product, function, bottom-up or top down approach.

Practical Application of Cost Tables

Cost Table for Engine System

SI No	Products/Components	Number of units	Unit Price	Product life (km)	Quantity /km	Value /km
1	Cylinder Head	1		900000	0.00000111	
2	Cylinder Head Gasket	1		300000	0.00000333	
3	Cylinder liner set	6		300000	0.00002000	
4	Piston Set	1		400000	0.00000250	
5	Piston ring set	1		400000	0.00000250	
6	Cam Shaft bush kit	1		300000	0.00000333	
7	Connect rod assy	1		900000	0.00000111	
8	Crossed fan belt	3		100000	0.00003000	
9	Housing	1		900000	0.00000111	
10	Fly wheel ring	1		100000	0.00001000	
11	Main bearing set	1		300000	0.00000333	
12	Connecting rod bearings	1		300000	0.00000333	
13	Oil cooler	1		900000	0.00000111	
14	Oil filter	1		24000	0.00004167	
15	Rocker arm shift	1		500000	0.00000200	
16	Water pump assy	1		400000	0.00000250	
17	Rocker lever	1		400000	0.00000250	
18	Overhaul gasket kit	1		900000	0.00000111	
19	Compressor valve kit	1		400000	0.00000250	
20	Sun gasket	4		300000	0.00001333	
21	Material costs					
22	Trade discounts					
23	Material costs					
24	KVAT	1		100000	0.00001000	
	Total Cost					

	Total Cost of Operation/Km			
	Variable Cost Table			
	Fuel Cost			
	Lubrication			
A	**Fuel Aggregates**			
B	**Tyres and Tubes Aggregates**			
	Material Cost			
	Engine System			
	Fuel Injection System			
	Exhaust System			
	Electrical System			
	Clutch system			
	gear box system			
	propeller Shaft system			
	brake system			
	Body & Frames			
	Power Steering System			
	Suspension system			

C	**Material Maintenance Cost Aggregates**			
	Labour			
	Engine system			
	Clutch system			
	Brake system			
	Electrical System			
	Steering system			
	Wheel system			
	Suspension system			
	Front axle housing			
	Rear axle housing			
	Propeller shaft			
	Gear box			
D	**Labour Maintenance Aggregates**			
	Total Variable Cost Aggregates			

	Fixed Cost Table			
	Salaries and Allowances			
	Depreciation			
	Financing Cost			
	Insurance			
	Motor Vehicle tax			
	General Overheads			
	Working capital interest			
	Total Fixed Costs			
	Fixed cost /km			

Acknowledgement;

- Institute of Cost Accounts of India
- CII Cost Congress Presentations - 2015
- Institute of Management Accountants, USA (Guidelines)
- Chartered Institute of Management Accountants, UK
- International federation of Accountants
- CAM I

Thank you