Measuring, controlling and managing

Revision: productivity

Single Factor-Productivity

$$\frac{\text{Output}}{\text{Labor}} \qquad \frac{\text{Output}}{\text{Materials}} \qquad \frac{\text{Output}}{\text{Capital}}$$

Multifactor Productivity

$$\frac{\text{Output}}{\text{Labor + Materials + Overhead}} \qquad \frac{\text{Output}}{\text{Labor + Energy + Capital}}$$

Total Factor Productivity

$$\frac{\text{Goods and services produced}}{\text{All inputs used to produce them}}$$

Measures of Productivity

Dimensions of Performance Metrics

- Measures
  - Require no calculations and are uni-dimensional
- Metric
  - Requires calculation and often contains several measures
- Index
  - Combines two or more metrics into a single value

Purpose of measuring and managing performance

Control, Improvement, Communication, Motivation

Purpose test	Is there a clear reason for the measure?
System test	Is there a clear system to ensure the results will be acted upon to achieve the purpose?
Truth test	Does it measure what it is meant to measure?
Focus test	Does it measure only what it is meant to measure?
Consistency test	Is it consistent whenever or whoever measures it?
Access test	Are the results available and easily understood?
Clarity test	Is ambiguity possible in the interpretation of the results?
Timeliness test	Can and will the data be analysed quickly enough for appropriate action to be taken?
Cost test	Is it worth the cost of collecting and analysing the data?
Gaming test	Will the measure encourage any undesirable behaviours?

Figure 5.1

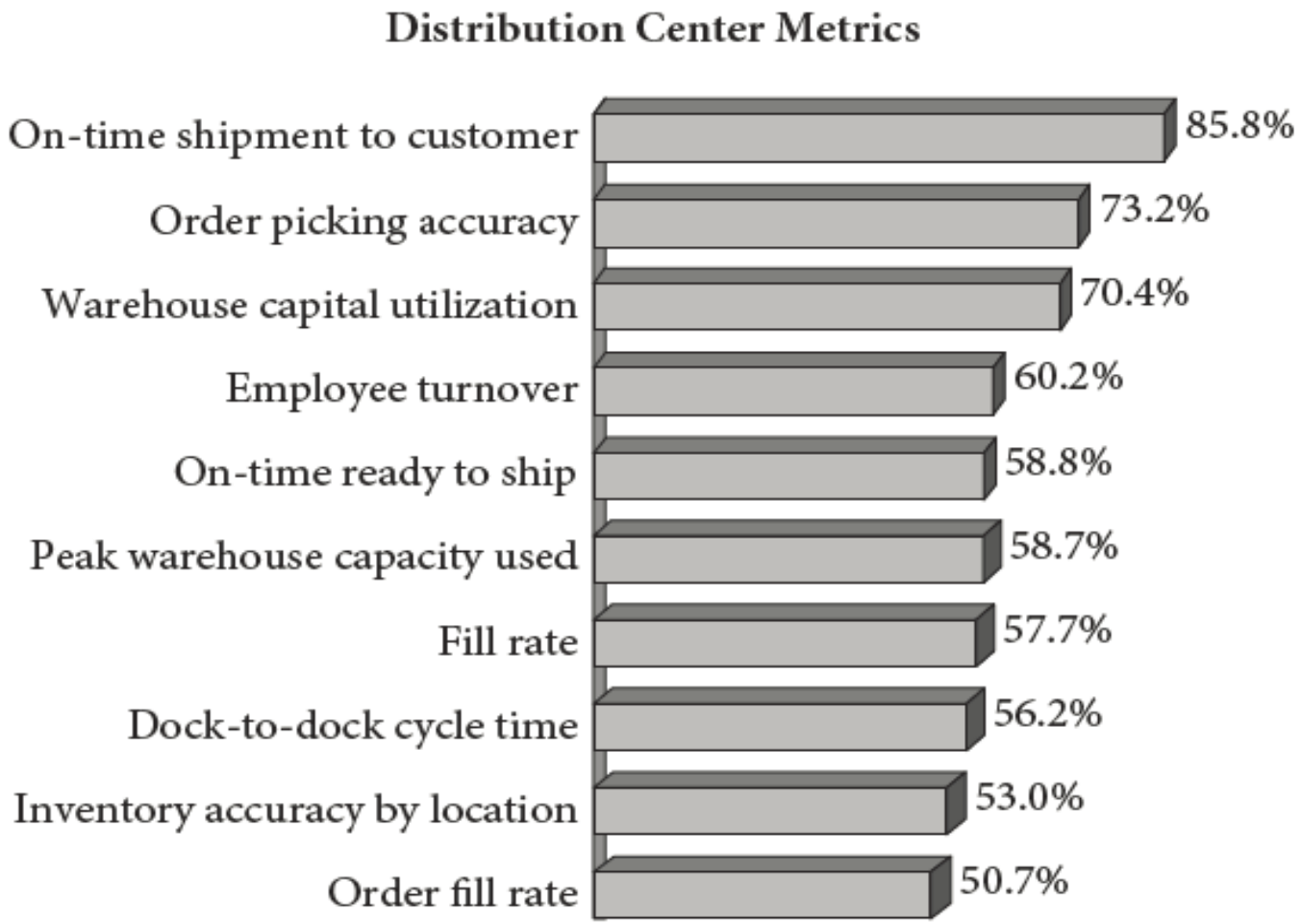
Characteristics of a Good Measure

A GOOD MEASURE	DESCRIPTION
• Is quantitative	• The measure can be expressed as an objective value.
• Is easy to understand	• The measure conveys at a glance what it is measuring and how it is derived.
• Encourages appropriate behavior	• The measure is balanced to reward productive behavior and discourage "game playing."
• Is visible	• The effects of the measure are readily apparent to all involved in the process being measured.
• Is defined and mutually understood	• The measure has been defined by and/or agreed to by all key process participants (internally and externally).
• Encompasses both outputs and inputs	• The measure integrates factors from all aspects of the process measured.
• Measures only what is important	• The measure focuses on a key performance indicator that is of real value to managing the process.
• Is multidimensional	• The measure is properly balanced between utilization, productivity, and performance and shows the tradeoffs.
• Uses economies of effort	• The benefits of the measure outweigh the costs of collection and analysis.
• Facilitates trust	• The measure validates the participation among the various parties.

Source: Koebler, Durtsche, Manrodt, & Ledyard, Keeping score: *Measuring the business value of logistics in the supply chain* (Univ. Tennesee Council of Logistics Management, 1999) p8

Figure 5.2

Distribution Center Metrics



Source: 2010 Metrics Report, *WERC*, (May 26, 2010).

Problems in the use of the data

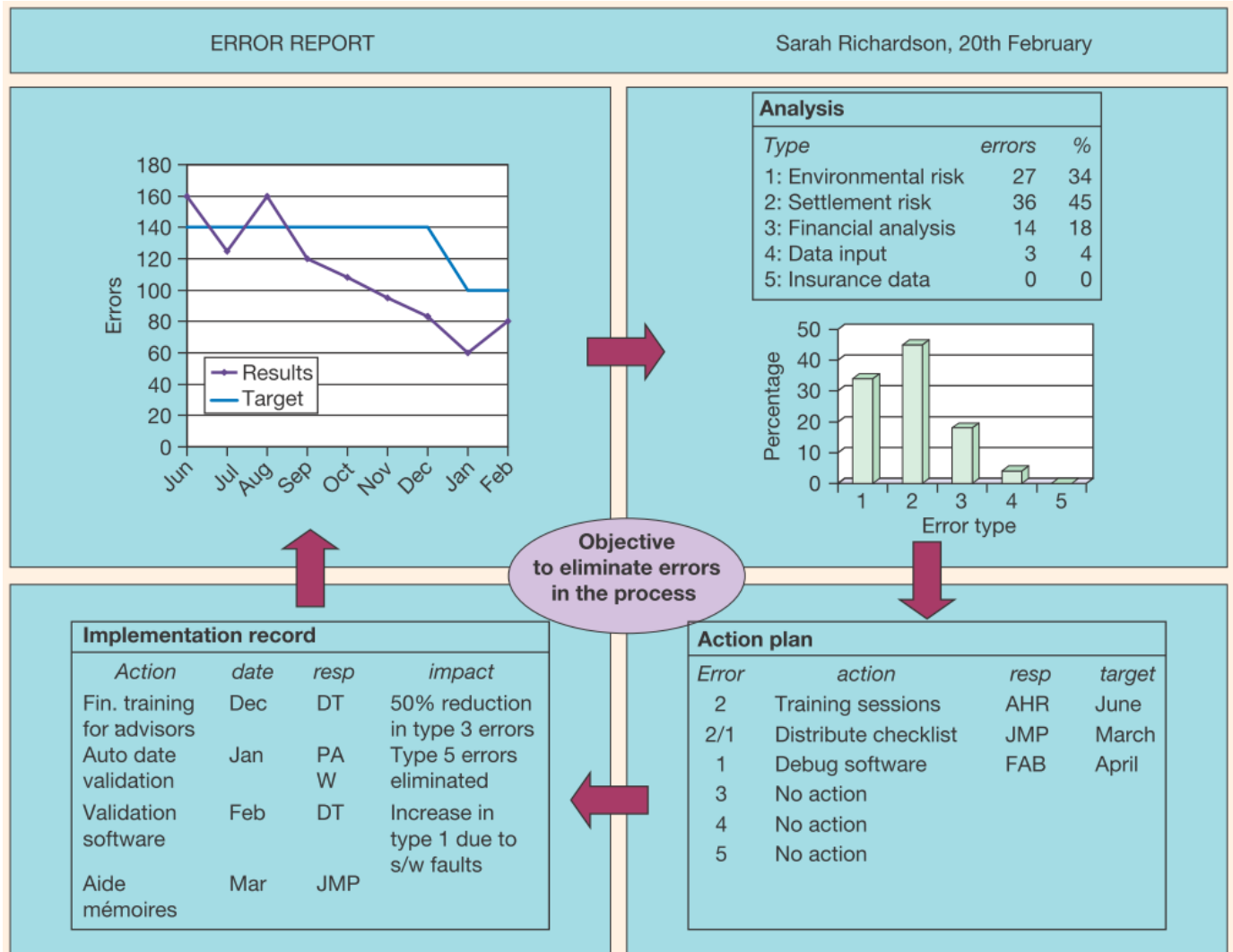
- Resource hunger
- Lack of impact
- (Customer) Satisfaction versus success
- Openness to manipulation

Customer assessment?

- The rational approach - *a weighted average*?
- The incident approach

Performance reporting

- the purpose/objective
- the person responsible
- trends over time
- performance against target
- supporting data and analysis
- identification of causes/problems
- action to be taken, by whom and by when
- an assessment of action taken

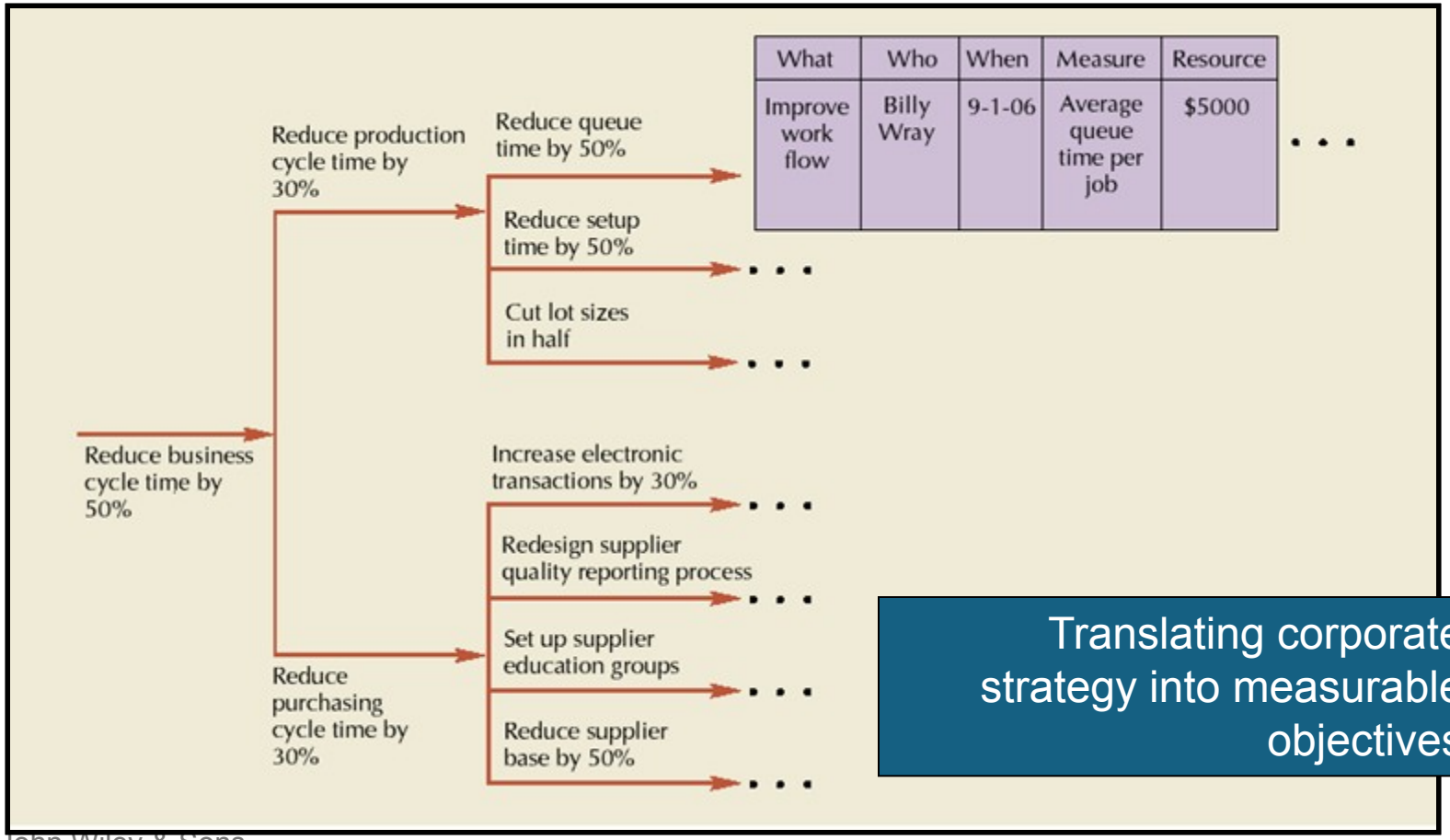


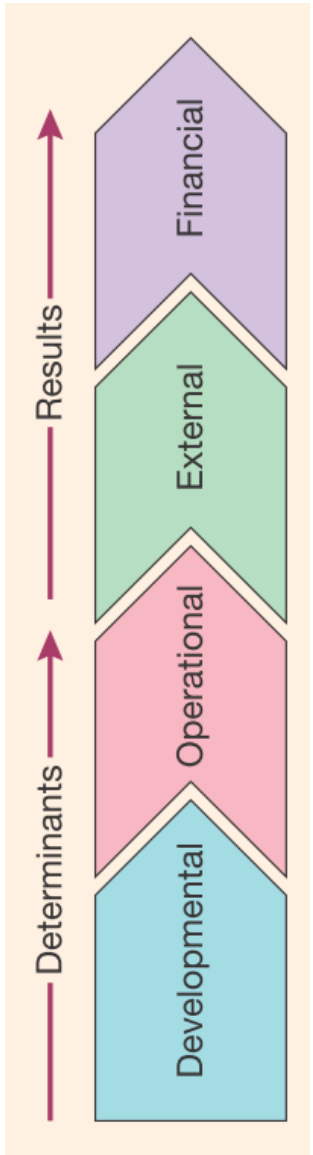
Performance measurement is certainly NOT about profit alone

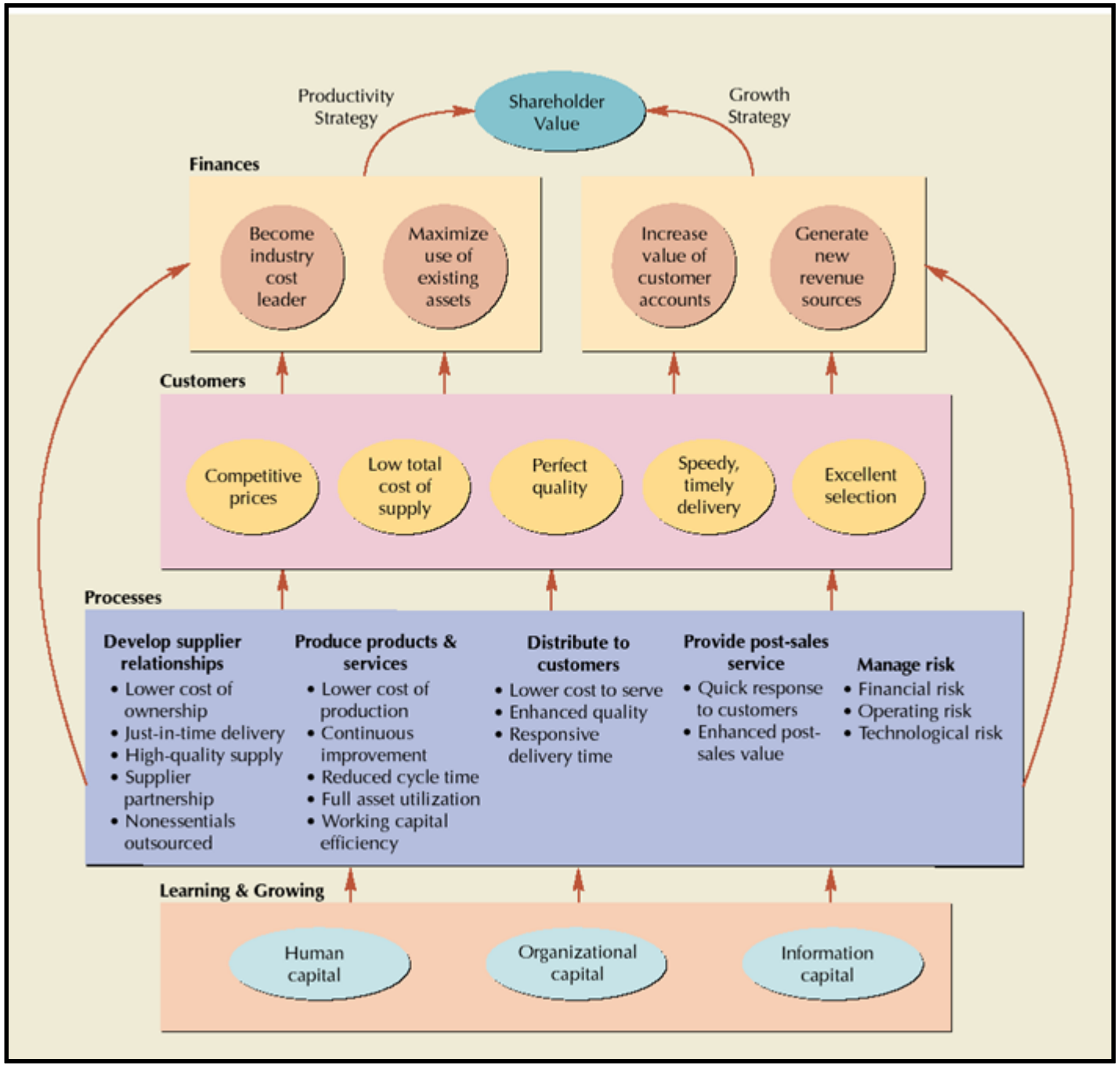
- By early 1980s, Johnson and Kaplan highlighted the shortfalls of financial performance measures to reflect changes in the competitive environment and strategies of organisations
- The 1990s saw a "performance measurement revolution" (Eccles, 1991; Neely, 1999) and a proliferation of frameworks that integrate wider criteria:

  - Balanced Scorecard (Kaplan and Norton, 1992)
  - Performance Measurement Matrix (Keegan et al, 1989)
  - SMART Pyramid (Lynch and Cross, 1991)
  - Baldrige Criteria for Performance Excellence
  - Performance Prism (Kennerley and Neely, 2000)
  - European Foundation for Quality Management (EFQM) Excellence Model
  - Six Sigma

Link to the strategy- Policy Deployment







Key Performance Indicators

Source:
Robert Kaplan and David Norton, *Strategy Maps: Converting Intangible Assets into Tangible Outcomes* (Boston: Harvard Business School Press, 2004), Figure 3-2, p. 67

Balanced Scorecard

- Balanced scorecard
  - measuring more than financial performance
    - finances
    - customers
    - processes
    - learning and growing
- Key performance indicators
  - a set of measures that help managers evaluate performance in critical areas

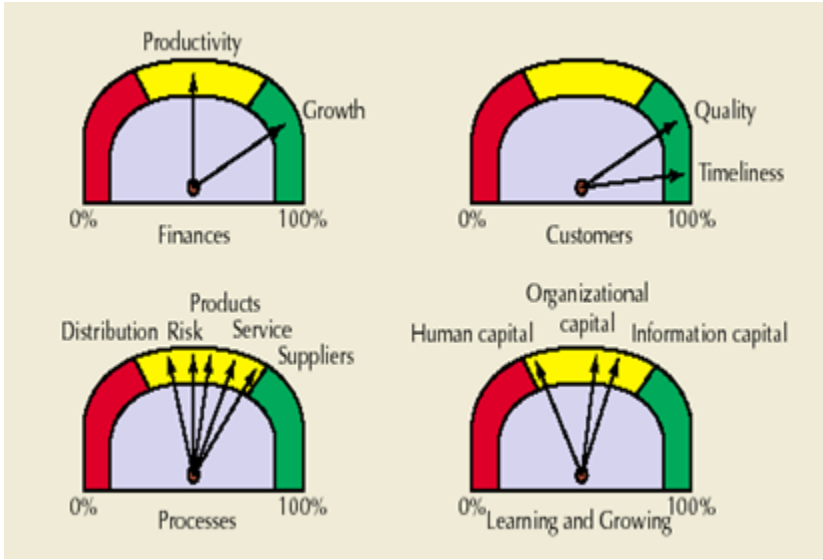
Balanced Scorecard

Balanced Scorecard Worksheet

Dimension		Objectives	Key Performance Indicator	Goal for 2008	KPI Results to Date	Score	Mean Performance
Finances	Productivity	Become industry cost leader	% reduction in cost per unit	20%	10%	50%	65%
	Growth	Increase market share	Market share	50%	40%	80%	
Customers	Quality	Zero defects	% good quality first pass	100%	80%	80%	87%
	Timeliness	On-time delivery	% of on-time deliveries	95%	90%	95%	
Processes	Suppliers	Integrate into production	% orders delivered to assembly	50%	40%	80%	73%
		Reduce inspections	% suppliers ISO 9000 certified	90%	60%	67%	
	Products	Reduce time to produce	Cycle time	10 mins.	12 mins.	83%	52%
		Improve quality	# warranty claims	200	1000	20%	
	Distribution	Reduce transportation costs	% FTL shipments	75%	30%	40%	40%
	Post-sales Service	Improve response to customer inquiries	% queries satisfied on first pass	90%	60%	67%	67%
	Risk	Reduce Inventory obsolescence	Inventory turnover	12	6	50%	50%
		Reduce customer backlog	% order backlogged	10%	20%	50%	
Learning & Growing	Human capital	Develop quality improvement skills	# of six sigma Black Belts	25	2	8%	35%
			% trained in SPC	80%	50%	63%	
	Information capital	Provide technology to improve processes	% customers who can track orders	100%	60%	60%	61%
			% suppliers who use EDI	80%	50%	63%	
	Organizational capital	Create innovative culture	# of employee suggestions	100	60	60%	55%
			% of products new this year	20%	10%	50%	

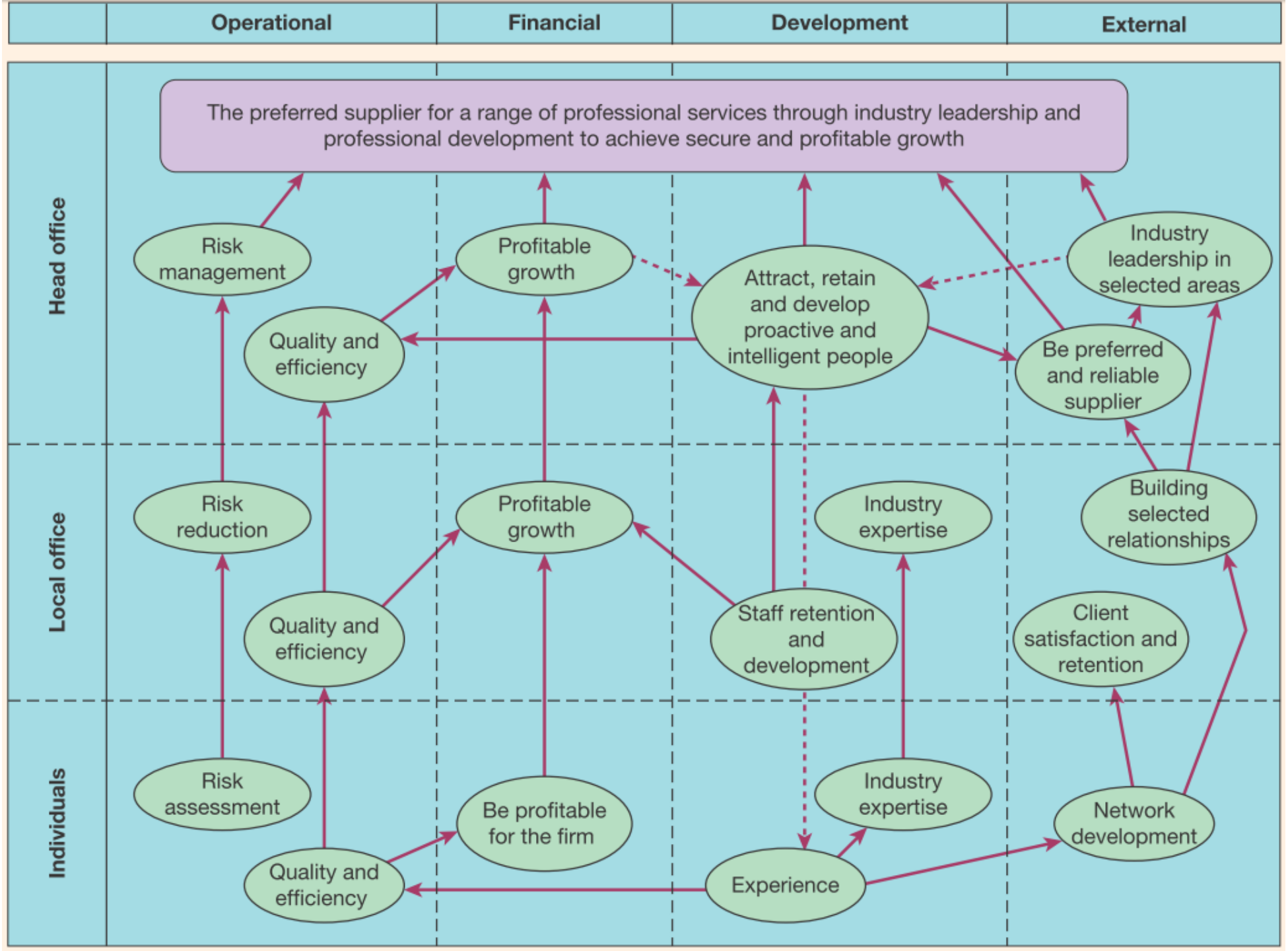
Balanced Scorecard

Radar Chart



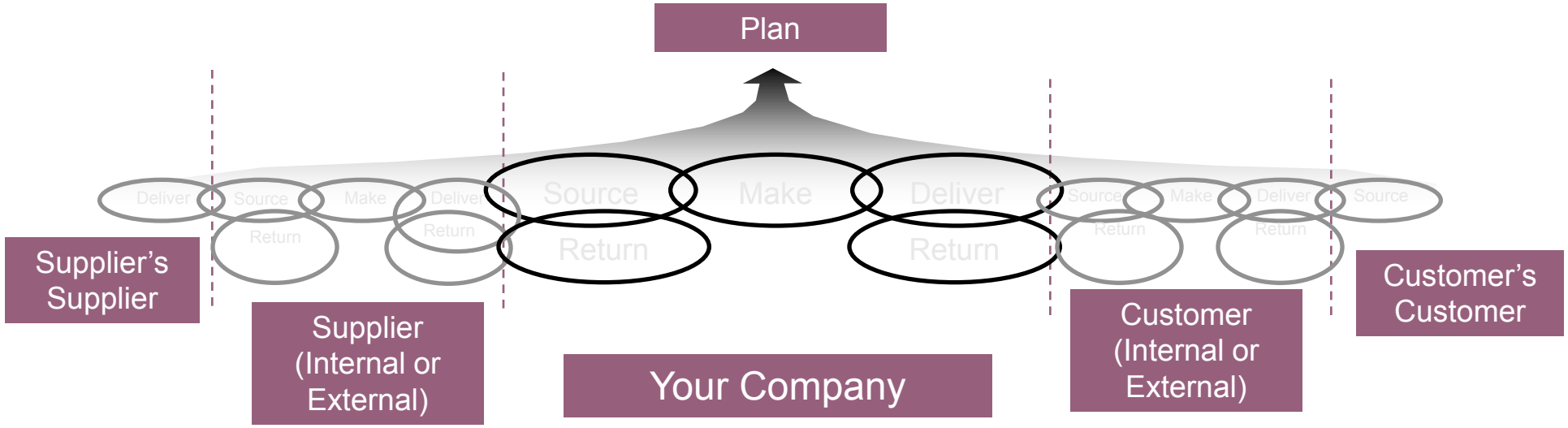
Dashboard

strategic linkage models



Supply Chain Operations Reference Model (SCOR):Basic Management Processes

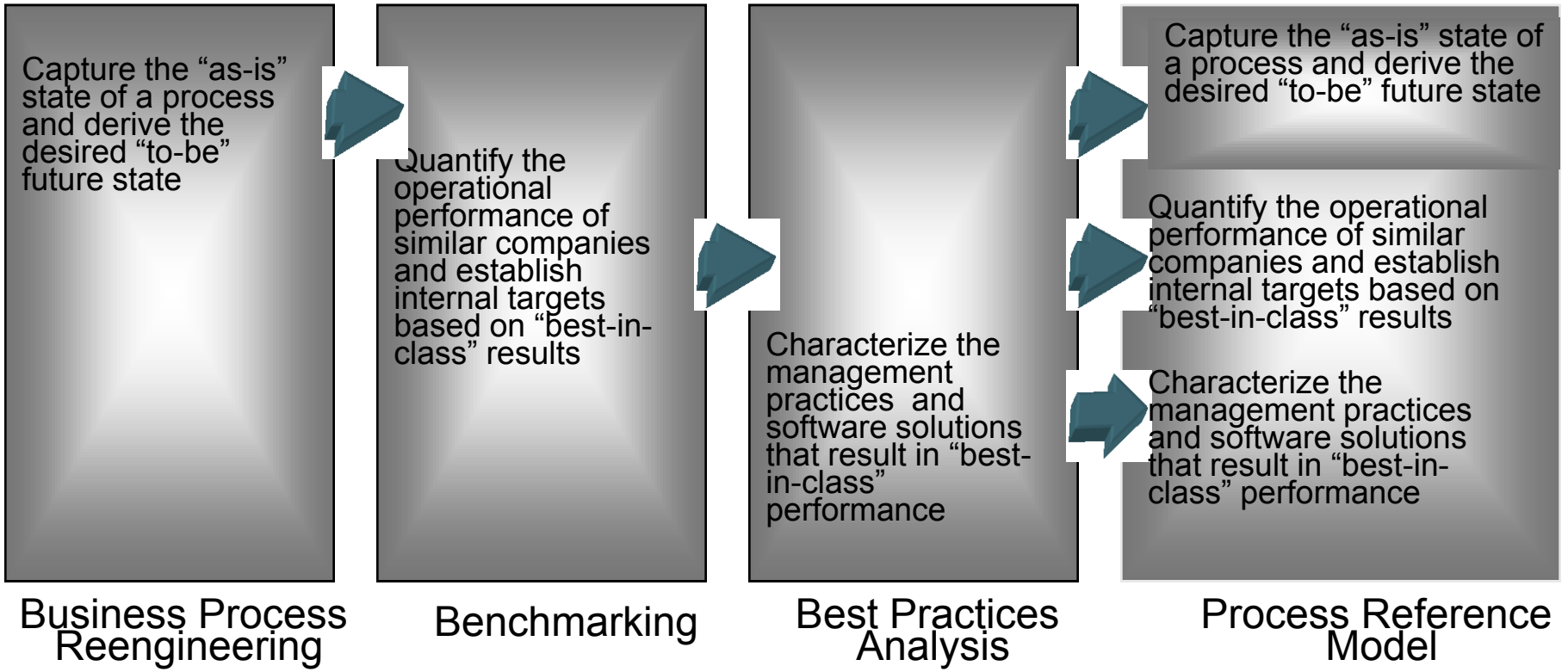
Plan-Source-Make-Deliver-Return



Plan-Source-Make-Deliver-Return provide the organizational structure of the SCOR-model

Supply Chain Operations Reference Model (SCOR)

- SCOR:
  - Integrates Business Process Reengineering, Benchmarking, and Process Measurement into a cross-functional framework.



Supply Chain Operations Reference Model (SCOR)

- The Primary Use of SCOR:
  - To describe, measure and evaluate supply chain configurations.
- SCOR contains:
  - Standard descriptions of management processes
  - A framework of relationships among the standard processes
  - Standard metrics to measure process performance
  - Management practices that produce best-in-class performance
- Enables the companies to:
  - Evaluate and compare their performances with other companies effectively
  - Identify and pursue specific competitive advantages
  - Identify software tools best suited to their specific process requirements

Scopes of Basic Management Processes

Plan (Processes that balance aggregate demand and supply to develop a course of action which best meets sourcing, production and delivery requirements)

- Balance resources with requirements
- Establish/communicate plans for the whole supply chain

Source (Processes that procure goods and services to meet planned or

actual demand)

- Schedule deliveries (receive, verify, transfer)

Make (Processes that transform product to a finished state to meet planned or actual demand)

- Schedule production

Deliver (Processes that provide finished goods and services to meet planned or actual demand, typically including order management, transportation management, and distribution management)

- Warehouse management from receiving and picking product to load and ship product.

Return (Processes associated with returning or receiving returned products)

- Manage Return business rules

SCOR Model: Process D1.3 Metrics

Process Element: Reserve Inventory and Determine Delivery Date	Process Element Number: D1.3
Process Element Definition	
Inventory (both on hand and scheduled) is identified and reserved for specific orders and a delivery date is committed and scheduled.	
Performance Attributes	**Metric**
Supply Chain Reliability	Delivery Performance to Customer Commit Date Fill Rate % of Orders Delivered in Full
Supply Chain Responsiveness	Reserve Inventory and Determine Delivery Date Cycle Time Order Fulfillment Dwell Time
Supply Chain Agility	None Identified
Supply Chain Costs	Cost to Reserve Resources Determine Delivery Date
Supply Chain Asset Management	None Identified

Source: Adapted from Supply Chain Council 2011

Assess Costs and Benefi ts of Quality Initiatives

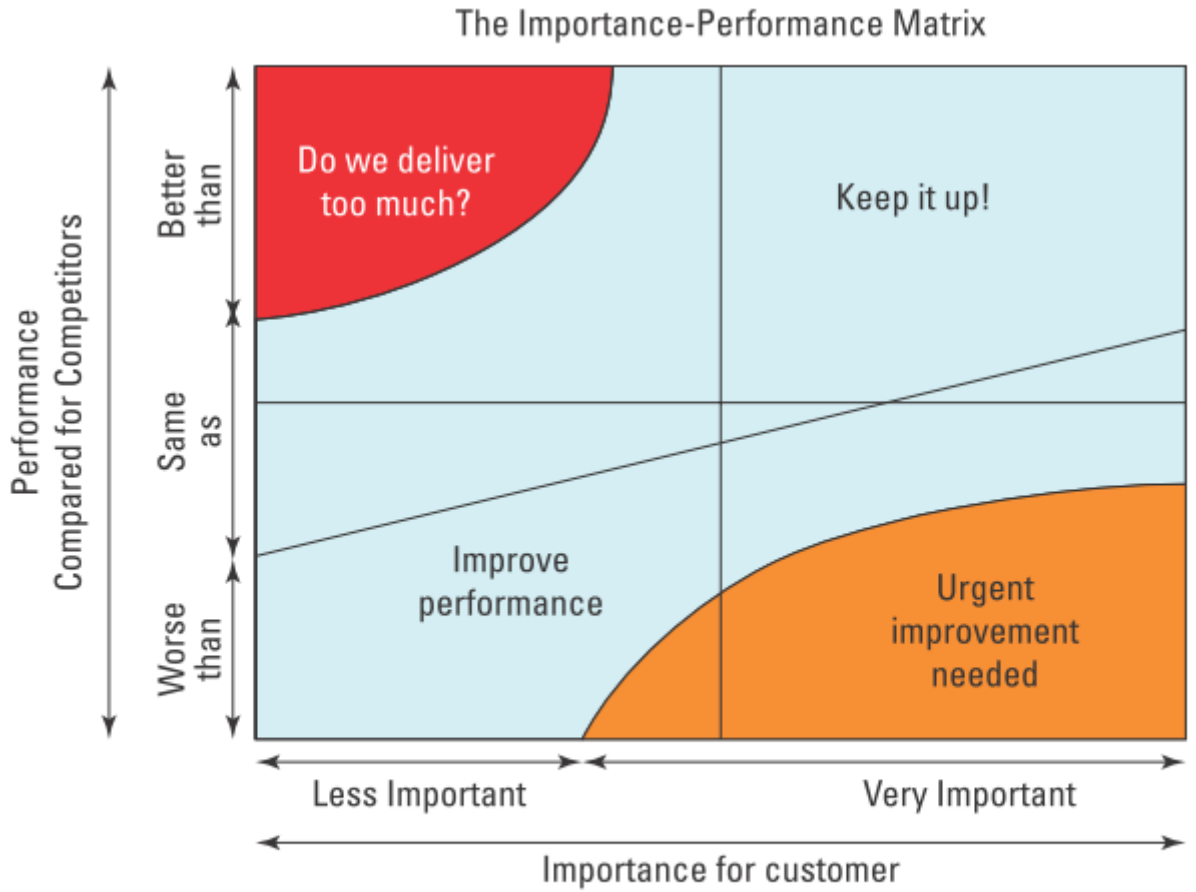
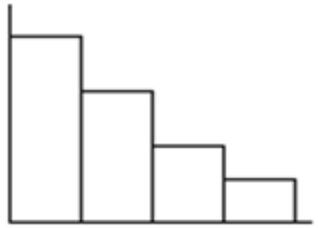


Figure 14.16 The importance-performance matrix compares a firm's service performance against competition and customer needs.

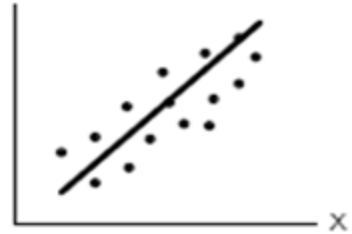
Tools for Root Cause Analysis

Brainstorming

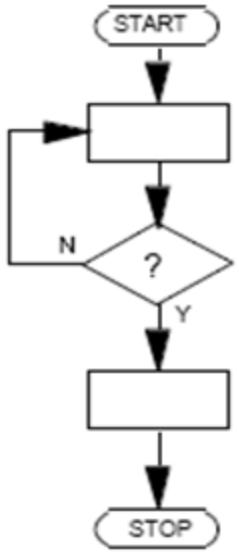


Pareto Chart

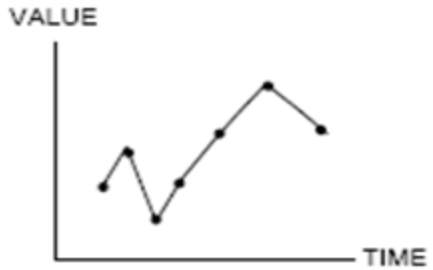
Fishbone Diagram



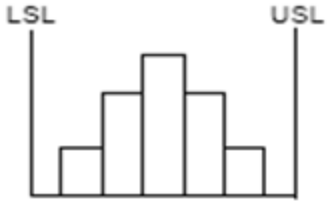
Scatter Diagram



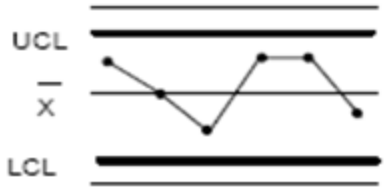
Flowchart



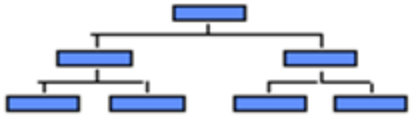
Run Chart



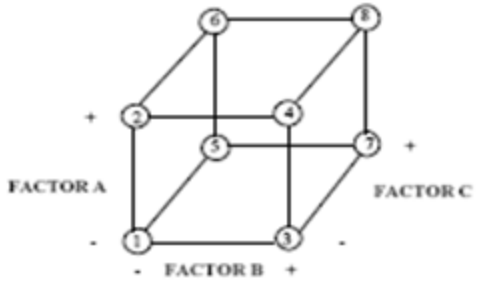
Histogram



Control Charts



Tree Diagram



Design of Experiments