Skillshort

Self-Study Preparation Pack

CMA INTERMEDIATE

Paper 9: Operations Management and Strategic Management (OMSM)

# Chapter-wise Detailed Notes

For the December 2026 term (Fri 11 Dec 2026, 2–5 pm) and June 2027 · ICMAI Syllabus 2022 · Section A Operations Management 60% · Section B Strategic Management 40% · Worked examples verified in Python

100 marks · 3 hours | Q1: 15 MCQs × 2 = 30 | Any 5 of Q2–Q8 × 14 = 70 | OM numericals + SM theory and cases

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## This subject pack has 6 parts

1 Chapter-wise notes

2 Important topics & weightage

3 Past papers: trends & links

4 Mock tests + solutions

5 Chapter practice questions

6 Last-week plan & strategy

Prepared by Skillshort for self-study. Original explanations and questions; not an official ICAI/ICMAI/ICSI publication. Items marked VERIFY should be checked against the latest official material.

# How to use these notes

These notes follow the **ICMAI Syllabus 2022 module order** – Section A Operations Management (Chapters 1–7, 60%) and Section B Strategic Management (Chapters 8–11, 40%). Each chapter gives the concepts examined as theory, every formula, worked examples verified in Python and the traps that cost marks.

## Paper at a glance

| Item | Detail |
|---|---|
| Marks / time | 100 marks, 3 hours, 2:00–5:00 pm |
| Section A | Q1 – **15 MCQs × 2 marks = 30** (about 9 OM including 3–4 short numericals, 6 SM) |
| Section B | **Any 5 of Q2–Q8**, 14 marks each = 70 |
| Typical Section B order | Q2 OM theory · Q3 OM theory or replacement + regression · Q4 assignment + simulation · Q5 replacement/LPP + PERT · Q6–Q8 SM theory (two 7-mark parts each) |
| ICMAI weightage | M1 Introduction 5% · M2 Operations planning 5% · M3 Designing operational systems 5% · M4 PPC 20% · M5 Productivity and TQM 5% · M6 Project management 15% · M7 Maintenance and spares 5% · M8 Introduction to SM 10% · M9 Strategic analysis and planning 10% · M10 Formulation and implementation 10% · M11 Digital strategy 10% |

# Chapter 1: Introduction to Operations Management

**In this chapter:** Meaning, scope & objectives of OM · Production vs operations · Transformation process · Manufacturing vs services · Operations strategy & competitive priorities

## 1.1 Operations – transformation model

**Inputs** (men, materials, machines, money, information) → **Transformation** (conversion process) → **Outputs** (goods & services) → Feedback & control

- OM = design, operation & improvement of systems that create goods/services.
- Objectives: right **quality**, **quantity**, **time**, **cost**, flexibility & customer satisfaction.

## 1.2 Manufacturing vs services

| Basis | Manufacturing | Services |
|---|---|---|
| Output | Tangible, storable | Intangible, perishable |
| Customer contact | Low | High |
| Quality measure | Easy | Subjective |
| Location | Near resources | Near customers |
| Productivity | Easy to measure | Difficult |

## 1.3 Competitive priorities & types of production

- Priorities: **cost, quality, delivery (speed/reliability), flexibility, innovation**.
- **Job** (one-off, custom) → **batch** → **mass/line** → **continuous/process** (refinery) - volume ↑, variety ↓.
- **Operations strategy** aligns capacity, facilities, technology, workforce with business strategy (order winners vs order qualifiers).

## 1.4 Scope & decisions of OM

- **Strategic** (long-term): product design, process selection, capacity, location, layout, technology.
- **Tactical**: aggregate planning, workforce, inventory policy, quality systems.
- **Operational**: scheduling, dispatching, maintenance, inventory control.
- Interfaces: marketing (demand), finance (capex), HR (skills), purchasing (materials).

## 1.5 Productivity & operations objectives

- Efficiency (doing things right) vs effectiveness (doing right things).
- **Order qualifiers** (minimum to compete) vs **order winners** (beat competitors) - Terry Hill.
- Service operations: capacity can't be stored; queues & waiting-line management; service blueprinting.

**EXAM TIP** **FAQ – introduction**

- Production management (goods) is a subset of operations management (goods + services).
- Operations = largest cost & asset base - key to competitiveness.
- Mass customisation combines low cost with variety (modular design, postponement).

# Chapter 2: Operations Planning

**In this chapter:** Demand forecasting · Capacity planning · Facility location & layout · Aggregate planning · MRP & MRP II · Economic batch quantity

## 2.1 Demand forecasting

**Simple moving average =** $\Sigma$ last n periods ÷ n

**Weighted MA =** $\Sigma w_i D_i$ ($\Sigma w = 1$)

**Exponential smoothing =** $F_{t+1} = F_t + \alpha (D_t - F_t)$

**MAD =** $\Sigma|D - F| \div n$; Tracking signal := $\Sigma(D - F) \div$ MAD

- Qualitative: Delphi, market survey, sales-force composite, executive opinion; causal: regression.

## 2.2 Capacity planning

**Utilisation =** Actual output ÷ Design capacity

**Efficiency =** Actual output ÷ Effective capacity

**Break-even volume =** FC ÷ (SP − VC)

- **Design** (max) > **effective** (after allowances) > **actual** capacity.
- Strategies: **lead**, **lag**, **match** demand; capacity cushion.

## 2.3 Layout types

| Layout | Suits | Feature |
|---|---|---|
| Process (functional) | Job / batch | Similar machines grouped; flexible |
| Product (line) | Mass | Sequence of operations; low handling |
| Fixed position | Ships, aircraft | Product stays; resources move |
| Cellular / group tech | Families of parts | Mixed benefits |

## 2.4 Facility location

- Factors: market proximity, raw materials, labour, transport, utilities, taxes/incentives, community, environment.
- Methods: **factor rating** (weighted scores), **locational break-even** (cost-volume), **centre of gravity** ($Cx = \Sigma d_i x V_i \div \Sigma V_i$), transportation model.

## 2.5 Aggregate planning, MRP & MRP II

- **Aggregate planning** (3-18 months): match demand by varying workforce, overtime, inventory, subcontracting; **chase** vs **level** strategy.
- **MRP**: inputs - **MPS + BOM + inventory records** → planned order releases (net requirement = gross − on hand − scheduled receipts; lead-time offset).
- **MRP II**: adds capacity, finance, marketing → manufacturing resource planning → **ERP**.

## 2.6 Economic batch quantity

**EBQ =** $\sqrt{[2DS \div H(1 - d/p)]}$

- D annual demand, S set-up cost, H holding cost/unit, d usage rate, p production rate.
- Number of runs = D ÷ EBQ; maximum inventory = EBQ(1 − d/p).

**Note:** EOQ (purchase) ignores production rate; EBQ includes it.

**WORKED EXAMPLE** **Forecasting illustration**

| Month | Demand | 3-month MA | Exp. smoothing ($\alpha$ 0.3, $F_1$ 100) |
|---|---|---|---|
| 1 | 100 | - | 100 |
| 2 | 110 | - | 100 |
| 3 | 105 | - | 103 |
| 4 | 120 | 105 | 103.6 |
| 5 | - | 111.7 | **108.5** |

- $F_5$ (ES) = 103.6 + 0.3 × (120 − 103.6) = **108.5**.

**WORKED EXAMPLE** **Location factor rating**

| Factor | Weight | Site A | Site B |
|---|---|---|---|
| Labour | 0.4 | 80 | 70 |
| Market | 0.3 | 60 | 90 |
| Transport | 0.3 | 70 | 80 |
| **Score** | | **71** | **79** ✓ |

- Choose **Site B**; validate with locational break-even (FC + VC × volume).

**WORKED EXAMPLE** **MRP netting illustration**

- Product X needs 2 units of Y (BOM). MPS: 100 X in week 6. Y on hand 50; scheduled receipt 30 (week 4); lead time Y = 2 weeks.

**Gross requirement of Y =** 200 (week 6)

**Net requirement =** 200 − 50 − 30 = **120**

- Planned order release for Y: **120 units in week 4**.

**WORKED EXAMPLE** **EBQ illustration**

- D = 12,000 units p.a.; set-up ₹400; holding ₹4/unit p.a.; production 200/day; usage 50/day.

**EBQ =** √[2 × 12,000 × 400 ÷ (4 × (1 − 50/200))] = √(96,00,000 ÷ 3) = **1,789 units**

- Runs p.a. = 12,000 ÷ 1,789 ≈ 6.7; max inventory = 1,789 × 0.75 ≈ 1,342.

## 2.7 Chase vs level aggregate strategy

| Basis | Chase | Level |
|---|---|---|
| Output | Follows demand | Constant |
| Inventory | Low | High (builds in low season) |
| Workforce | Hire/fire, overtime | Stable |
| Suits | Services, perishables | Manufacturing with storable goods |

## 2.8 Regression for forecasting – worked example

**WORKED EXAMPLE** **Least-squares regression (asked in three of the last four papers)**

Advertising (X, ₹ lakh): 1, 2, 3, 4, 5. Sales (Y, ₹ lakh): 12, 15, 21, 24, 28. Fit Y on X and estimate sales at X = 6.

| X | Y | x = X − 3 | y = Y − 20 | xy | $x^2$ | $y^2$ |
|---|---|---|---|---|---|---|
| 1 | 12 | −2 | −8 | 16 | 4 | 64 |
| 2 | 15 | −1 | −5 | 5 | 1 | 25 |
| 3 | 21 | 0 | 1 | 0 | 0 | 1 |
| 4 | 24 | 1 | 4 | 4 | 1 | 16 |
| 5 | 28 | 2 | 8 | 16 | 4 | 64 |
| **Σ 15** | **Σ 100** | | | **41** | **10** | **170** |

**b(yx) =** $\Sigma xy \div \Sigma x^2 = 41 \div 10 =$ **4.1**

**a =** $\bar{Y} - b\,\bar{X} = 20 - 4.1 \times 3 =$ **7.7**

Regression line **Y = 7.7 + 4.1X**; at X = 6, Y = 7.7 + 24.6 = **₹32.3 lakh**.

For X on Y (to estimate X from a target Y), b(xy) = $\Sigma xy \div \Sigma y^2 = 41 \div 170 = 0.241$; X − 3 = 0.241 (Y − 20). Correlation r = $41 \div \sqrt{(10 \times 170)} =$ **0.994**.

## 2.9 Capacity requirement – number of workstations

**WORKED EXAMPLE** **Workstations needed**

Next year's demand 1,20,000 units; standard time 6 minutes per unit; the plant works 2 shifts × 8 hours × 250 days; efficiency 80%.

Hours needed = 1,20,000 × 6 ÷ 60 = **12,000 hours**. Effective hours per workstation = 2 × 8 × 250 × 80% = **3,200 hours**.

Workstations = 12,000 ÷ 3,200 = 3.75 → **4 workstations** (always round up). If 3 exist, 1 more is needed.

# Chapter 3: Designing of Operational Systems & Control

**In this chapter:** Product design & development · Process design · Product life cycle · Design thinking · Value analysis & standardisation

## 3.1 New product development

Idea generation → Screening → Concept testing → Business analysis → Product development (prototype) → Test marketing → Commercialisation

- Design tools: **CAD/CAM**, concurrent engineering, **QFD (house of quality)**, DFM/DFA, modular design, robust design.

## 3.2 PLC & operations focus

| Stage | Operations focus |
|---|---|
| Introduction | Design changes, short runs, high cost |
| Growth | Capacity expansion, reliability |
| Maturity | Cost reduction, standardisation |
| Decline | Rationalise, cut capacity |

## 3.3 Design thinking & process design

- **Design thinking** (5 stages): **Empathise → Define → Ideate → Prototype → Test** - user-centred, iterative.
- Process selection by volume-variety: project, job shop, batch, line, continuous.
- **Value analysis/engineering**: same function at lower cost; **standardisation/simplification** - fewer varieties.

## 3.4 Principles of plant layout

An ideal layout (Muther) follows these principles: (1) **integration** of men, materials, machines and support services; (2) **minimum movement** and shortest distance; (3) **smooth, continuous flow** without back-tracking; (4) **cubic space utilisation** (height as well as floor); (5) **safety and worker satisfaction**; (6) **flexibility** for future changes; (7) **visibility** and easy supervision; (8) **minimum handling** of materials; (9) **accessibility** for maintenance and service.

# Chapter 4: Production Planning & Control and Operations Research

**In this chapter:** PPC functions · Time & motion study, method study, work measurement · Linear programming · Transportation · Assignment · Scheduling & queuing · Simulation & line balancing · Lean & JIT

## 4.1 PPC functions

**Routing** (path) → **Loading** (assign work to machines) → **Scheduling** (timing) → **Dispatching** (release orders) → **Expediting / follow-up** → Inspection & corrective action

- Planning = routing, estimating, scheduling; control = dispatching, follow-up, inspection.

## 4.2 Work study

- **Method study** (how): Select → Record (charts: outline, flow process, two-handed, string diagram) → Examine (questioning) → Develop → Install → Maintain (**SREDIM**).
- **Work measurement** (how long): time study, work sampling, PMTS, synthesis.

**Normal time =** Observed time × Rating ÷ 100

**Standard time =** Normal time × (1 + allowances %)

## 4.3 Linear programming

- Formulate: decision variables, objective (max Z / min C), constraints, non-negativity.
- **Graphical** (2 variables): plot constraints → feasible region → evaluate **corner points**.
- Special cases: **unbounded**, **infeasible**, **multiple optima**, redundant constraint.
- Simplex: slack (≤), surplus & artificial (≥, =); Big-M / two-phase VERIFY.

## 4.4 Transportation problem

- Balanced? Σ supply = Σ demand (else dummy row/column at zero cost).
- Initial solution: **NWCR**, **least cost**, **VAM** (penalty = difference of two lowest costs - best start).
- Optimality: **MODI** ($u_i + v_j = c_{ij}$ for occupied; $\Delta_{ij} = c_{ij} - u_i - v_j \geq 0$ → optimal).
- Non-degenerate if occupied cells = **m + n – 1**.

## 4.5 Assignment problem

- **Hungarian method**: row reduction → column reduction → cover zeros with min lines → if lines = n optimal; else subtract smallest uncovered, add at intersections.
- Maximisation: subtract from largest; unbalanced: dummy; restricted cell: big M.
- Travelling salesman = assignment + no sub-tour.

## 4.6 Scheduling - Johnson's rule

- n jobs, 2 machines (same order): pick **smallest time**; if on M1 → schedule **first**, if on M2 → **last**; repeat.
- Priority rules: **FCFS, SPT** (minimises avg flow time), **EDD** (minimises lateness), critical ratio = time to due ÷ work remaining.

## 4.7 Queuing (M/M/1)

**ρ (utilisation) =** $\lambda \div \mu$

**Lq =** $\lambda^2 \div [\mu(\mu - \lambda)]$; L := $\lambda \div (\mu - \lambda)$

**Wq =** $\lambda \div [\mu(\mu - \lambda)]$; W := $1 \div (\mu - \lambda)$

**P(0) idle =** $1 - \lambda/\mu$

- λ arrival rate, μ service rate (λ < μ for steady state); Poisson arrivals, exponential service, FCFS, infinite queue.

## 4.8 Line balancing

**Cycle time =** Available time ÷ Required output

**Min no. of stations =** Σ task times ÷ Cycle time (round up)

**Efficiency =** Σ task times ÷ (Stations × Cycle time)

- Assign tasks respecting **precedence**, largest-time-first or most-followers heuristic.
- **Simulation**: Monte Carlo - random numbers mapped to cumulative probabilities.

## 4.9 Lean & JIT

- **Lean**: eliminate **7 wastes** (TIMWOOD: Transport, Inventory, Motion, Waiting, Over-production, Over-processing, Defects).
- **JIT**: produce exactly what is needed when needed; pull system, **Kanban**, small lots, SMED quick changeovers, supplier partnership, zero defects.
- Tools: 5S, kaizen, poka-yoke, value-stream mapping, TPM, heijunka.

### WORKED EXAMPLE Queuing illustration

- λ = 8 customers/hr; μ = 10/hr.

**ρ =** 0.8 → server busy 80%; idle 20%

**L =** 8 ÷ 2 = **4 customers** in system; Lq := 64 ÷ 20 = **3.2**

**W =** 1 ÷ 2 hr = **30 min**; Wq := 8 ÷ 20 = 0.4 hr = **24 min**

### WORKED EXAMPLE Johnson's rule illustration

| Job | A | B | C | D | E |
|---|---|---|---|---|---|
| M1 (hrs) | 5 | 1 | 9 | 3 | 10 |
| M2 (hrs) | 2 | 6 | 7 | 8 | 4 |

- Smallest 1 (B, M1) → first; 2 (A, M2) → last; 3 (D, M1) → 2nd; 4 (E, M2) → 4th; C → 3rd.
- Sequence **B - D - C - E - A**.

### WORKED EXAMPLE Line balancing illustration

- Required 400 units in 8-hr shift (480 min) → cycle time **1.2 min (72 sec)**.
- Σ task times 300 sec → min stations = 300 ÷ 72 = 4.17 → **5 stations**.

**Efficiency =** 300 ÷ (5 × 72) = **83.3%**; balance delay 16.7%

### WORKED EXAMPLE LPP graphical illustration

- Max Z = 30x + 40y; s.t. 2x + y ≤ 40; x + 2y ≤ 50; x, y ≥ 0.
- Corner points: (0,0) → 0; (20,0) → 600; (0,25) → 1,000; intersection (10, 20) → 300 + 800 = **1,100** ✓ optimal.

**COMMON MISTAKE** **OR traps**

- Unbalanced transportation - forgetting dummy row/column.
- Degeneracy (occupied < m + n − 1) - add ε to an independent cell.
- Assignment maximisation solved as minimisation without converting - ×.
- Queue formulas need **λ < μ**; units of λ & μ must match.

**WORKED EXAMPLE** **Transportation - VAM start**

| From \ To | D1 | D2 | D3 | Supply |
|---|---|---|---|---|
| F1 | 4 | 6 | 8 | 50 |
| F2 | 6 | 8 | 6 | 70 |
| F3 | 5 | 7 | 6 | 30 |
| Demand | 60 | 40 | 50 | 150 |

- Penalties (row) F1 2, F2 0, F3 1; (col) D1 1, D2 1, D3 0 → allocate F1-D1 **50**; continue → test with MODI.
- Occupied cells must = 3 + 3 − 1 = **5**.

**WORKED EXAMPLE** **Assignment illustration**

| Job \ Man | A | B | C |
|---|---|---|---|
| 1 | 9 | 26 | 15 |
| 2 | 13 | 27 | 6 |
| 3 | 35 | 20 | 15 |

- Row reduce: (0,17,6) (7,21,0) (20,5,0); column reduce B by 5: (0,12,6) (7,16,0) (20,0,0).
- Assign **1-A, 2-C, 3-B**: cost 9 + 6 + 20 = **35**.

**WORKED EXAMPLE** **Time study illustration**

- Observed time 2.0 min; rating 110%; allowances 15%.

**Normal time** = 2.0 × 1.10 = 2.2 min

**Standard time** = 2.2 × 1.15 = **2.53 min**

- Output per 8-hr day = 480 ÷ 2.53 ≈ **190 units**.

**WORKED EXAMPLE** **Monte Carlo simulation**

| Demand | Prob. | Cum. | Random nos. |
|---|---|---|---|
| 10 | 0.2 | 0.2 | 00-19 |
| 11 | 0.5 | 0.7 | 20-69 |
| 12 | 0.3 | 1.0 | 70-99 |

- Random numbers 45, 83, 12 → demand 11, 12, 10 → average **11**.

## 4.10 Scheduling & loading tools

- **Gantt load chart** & progress chart; **index method** for loading; **forward** vs **backward** scheduling.
- **Kanban**: number of kanbans = D × L × (1 + safety) ÷ container size.
- Bottleneck management: **Theory of constraints** - drum-buffer-rope.

**EXAM TIP OR FAQ**

- LPP assumptions: linearity, certainty, divisibility, additivity, non-negativity.
- Shadow price = increase in Z per unit increase in a scarce resource.
- Queue discipline: FCFS, LCFS, priority, SIRO.
- Simulation used where analytical models are too complex.

## 4.11 Objectives of PPC and types of production control

**Points PPC focuses on:** routing (path of work); loading (assigning work to machines); scheduling (time-tables); dispatching (release of orders); expediting/follow-up; inspection; evaluation of performance; material control; tool control; co-ordination of departments; maintaining adequate inventory; ensuring delivery dates.

| Type of production control | Where used |
|---|---|
| **Block control** | Textiles, book and magazine printing – production in blocks of a given size |
| **Flow control** | Continuous/mass production – rate of flow controlled |
| **Order control** | Job production – each customer order controlled separately |
| **Batch control** | Batch production – batches of similar items |
| **Load control** | Where a bottleneck machine decides output – load on key machines |
| **Special project control** | One-off large projects – network techniques (PERT/CPM) |

## 4.12 LPP and maximisation assignment – worked examples

**WORKED EXAMPLE Graphical LPP with three constraints**

Max Z = 50x + 40y subject to 2x + y ≤ 100 (machine hours), x + y ≤ 80 (labour hours), x ≤ 40 (market), x, y ≥ 0.

| Corner point | Z = 50x + 40y |
|---|---|
| (0, 0) | 0 |
| (40, 0) | 2,000 |
| (40, 20) – x = 40 meets 2x + y = 100 | 2,800 |
| (20, 60) – 2x + y = 100 meets x + y = 80 | **3,400** |
| (0, 80) | 3,200 |

Optimum: **x = 20, y = 60, Z = ₹3,400**. Machine and labour hours are fully used; the market limit for x has slack of 20.

**WORKED EXAMPLE Assignment – maximisation (profit matrix, ₹ '000)**

| Worker \ Job | J1 | J2 | J3 | J4 |
|---|---|---|---|---|
| W1 | 62 | 78 | 50 | 111 |
| W2 | 71 | 84 | 61 | 73 |
| W3 | 87 | 92 | 111 | 71 |
| W4 | 48 | 64 | 87 | 77 |

Convert to a **regret (loss) matrix** by subtracting every entry from the largest (111), then apply the Hungarian method (row reduction, column reduction, cover zeros with the minimum lines; if lines < 4, subtract the smallest uncovered value from uncovered cells and add it at intersections).

Optimal assignment: **W1–J4 (111), W2–J2 (84), W3–J1 (87), W4–J3 (87)** – total profit **₹369 thousand** (checked against all 24 possible assignments).

**EXAM TIP** **Assignment checklist**

- Unbalanced matrix → add a **dummy** row/column of zeros.
- Prohibited assignment → put a very large cost (M).
- The number of covering lines must equal the order of the matrix before you assign.

# Chapter 5: Productivity Management & Total Quality Management

**In this chapter:** Productivity - concept, index, measurement · Five aspects of productivity · Productivity improvement · TQM - tools & techniques · ISO standards

## 5.1 Productivity measures

**Productivity =** Output ÷ Input

**Partial productivity =** Output ÷ single input (labour, capital, material)

**Total factor productivity =** Output ÷ (Labour + Capital)

**Productivity index =** Current productivity ÷ Base productivity × 100

- Five aspects (study material): **technology, workforce, materials, management, environment** VERIFY.

## 5.2 TQM tools

- **7 QC tools**: check sheet, histogram, Pareto chart (80/20), cause & effect (fishbone/Ishikawa), scatter diagram, control charts, flowchart/stratification.
- **PDCA** (Deming cycle), **Six Sigma** (DMAIC; 3.4 DPMO), **quality circles**, **kaizen**, **benchmarking**, poka-yoke.
- **Cost of quality**: prevention, appraisal, internal failure, external failure.

## 5.3 ISO standards

| Standard | Area |
|---|---|
| ISO 9001:2015 | Quality management system |
| ISO 14001:2015 | Environment management |
| ISO 45001:2018 | Occupational health & safety |
| ISO 27001:2022 | Information security |
| ISO 22000:2018 | Food safety |

- Certification: gap analysis → documentation → implementation → internal audit → certification audit → surveillance.

**MEMORY TRICK Deming's PDCA**

**PDCA** – P Plan (identify problem & plan change); D Do (small-scale test); C Check (study results); A Act (standardise or retry)

**EXAM TIP FAQ**

- Control charts: **$\bar{x}$ & R** (variables), **p, np** (defectives), **c** (defects).
- Juran trilogy: quality planning, control, improvement; Crosby: zero defects, "quality is free".
- Productivity vs production: production is output volume; productivity is output per unit input.

**WORKED EXAMPLE** **Productivity index illustration**

| Item | Base year | Current year |
|---|---|---|
| Output (units) | 10,000 | 12,000 |
| Labour hours | 5,000 | 5,500 |
| Labour productivity | 2.0 | 2.18 |

- Index = 2.18 ÷ 2.0 × 100 = **109** → 9% improvement.
- Multi-factor: output ÷ (labour cost + material cost + overhead) in constant prices.

## 5.4 Control chart limits

**$\bar{x}$ chart =** $\bar{\bar{x}} \pm A_2 \bar{R}$

**R chart =** UCL $D_4 \bar{R}$; LCL $D_3 \bar{R}$

**p chart =** $\bar{p} \pm 3\sqrt{[\bar{p}(1 - \bar{p}) \div n]}$

**c chart =** $\bar{c} \pm 3\sqrt{\bar{c}}$

- Point outside limits → **assignable cause** - investigate.

## 5.5 Six Sigma & quality gurus

- **DMAIC**: Define, Measure, Analyse, Improve, Control; belts (green, black, master black).
- **Deming 14 points**, **Juran** (fitness for use, trilogy), **Crosby** (zero defects), **Ishikawa** (fishbone, QC circles), **Taguchi** (loss function).
- Quality awards: Deming Prize, Malcolm Baldrige, RBNQA (India).

# Chapter 6: Project Management

**In this chapter:** Project planning & life cycle · Gantt chart · Network analysis - PERT & CPM · Crashing · Resource levelling · Introduction to MS Project

## 6.1 Project life cycle

**Initiation** (feasibility, charter) → **Planning** (WBS, schedule, budget) → **Execution** → **Monitoring & control** → **Closure**

- **Gantt chart**: bar chart of activities vs time - simple, but doesn't show dependencies clearly.
- **WBS**: hierarchical breakdown of deliverables into work packages.

## 6.2 CPM & PERT

**PERT expected time $t_e$ =** $(a + 4m + b) \div 6$

**Variance =** $[(b - a) \div 6]^2$

**Z =** (Due date − Expected project time) ÷ σ (critical path)

**Total float =** LST − EST = LFT − EFT

**Free float =** EST of successor − EFT of activity

- **Critical path** = longest path; activities with **zero total float**.

## 6.3 PERT vs CPM

| Basis | PERT | CPM |
|---|---|---|
| Time | Probabilistic (3 estimates) | Deterministic |
| Focus | Event-oriented | Activity-oriented |
| Use | R&D, new projects | Construction, repetitive |
| Crashing | Not usual | Time-cost trade-off |

**WORKED EXAMPLE PERT illustration**

| Activity | a | m | b | $t_e$ | Var |
|---|---|---|---|---|---|
| 1-2 | 2 | 4 | 6 | 4 | 0.44 |
| 2-3 | 3 | 5 | 13 | 6 | 2.78 |
| 3-4 | 1 | 2 | 3 | 2 | 0.11 |

- Critical path 1-2-3-4 = **12 days**; σ = √3.33 = 1.83.

**P(complete in 14 days) =** Z = (14 − 12) ÷ 1.83 = 1.09 → **≈ 86%**

## 6.4 Crashing (time-cost trade-off)

**Cost slope =** (Crash cost − Normal cost) ÷ (Normal time − Crash time)

- Crash the **critical activity with the lowest cost slope** first; watch for new critical paths.
- Stop when indirect cost saved < direct crash cost, or no further crashing possible (optimum duration).

## 6.5 Resources & MS Project

- **Resource levelling**: shift non-critical activities within float to smooth resource usage; **resource allocation** under limits.
- **MS Project**: tasks, durations, dependencies (FS, SS, FF, SF), resources, baseline, Gantt & network views, tracking % complete.

- Dummy activity: shows dependency only - zero time.

**WORKED EXAMPLE** **Network & float illustration**

| Activity | Duration | EST | EFT | LST | LFT | TF |
|---|---|---|---|---|---|---|
| A (1-2) | 4 | 0 | 4 | 0 | 4 | 0 |
| B (1-3) | 3 | 0 | 3 | 3 | 6 | 3 |
| C (2-4) | 6 | 4 | 10 | 4 | 10 | 0 |
| D (3-4) | 4 | 3 | 7 | 6 | 10 | 3 |

- Critical path **A - C (10 days)**; B & D have 3 days float.

**WORKED EXAMPLE** **Crashing illustration**

| Activity | Normal (days, ₹) | Crash (days, ₹) | Slope |
|---|---|---|---|
| A | 4, 8,000 | 3, 10,000 | 2,000 |
| C | 6, 12,000 | 4, 15,000 | 1,500 |

- Crash C first (lowest slope) by 2 days → 8 days; cost +3,000. Then path B-D (7 days) becomes near-critical.
- If indirect cost ₹2,500/day: crashing C saves 5,000 − 3,000 = **₹2,000** net.

**EXAM TIP** **Network rules & FAQ**

- Each activity represented by one arrow; no loops; single start & end node; dummies for logic.
- Fulkerson's rule for numbering events (i < j).
- Slack (event) = L − E; float (activity) - total, free, independent.
- PERT assumes **beta distribution** for activity time; project time approx. **normal**.

## 6.6 Network with total, free and independent float – worked example

**WORKED EXAMPLE** **Floats (asked with PERT in every paper)**

Activities (days): A 1-2 (4), B 1-3 (6), C 2-3 (3), D 2-4 (8), E 3-4 (5), F 3-5 (7), G 4-5 (4).

Event times – earliest E: 1 = 0, 2 = 4, 3 = max(0 + 6, 4 + 3) = 7, 4 = max(4 + 8, 7 + 5) = 12, 5 = max(7 + 7, 12 + 4) = **16**. Latest L: 5 = 16, 4 = 12, 3 = min(12 − 5, 16 − 7) = 7, 2 = min(7 − 3, 12 − 8) = 4, 1 = 0.

| Activity | t | ES | EF | LS | LF | Total float | Free float | Independent float |
|---|---|---|---|---|---|---|---|---|
| A 1-2 | 4 | 0 | 4 | 0 | 4 | 0 | 0 | 0 |
| B 1-3 | 6 | 0 | 6 | 1 | 7 | **1** | 1 | 1 |
| C 2-3 | 3 | 4 | 7 | 4 | 7 | 0 | 0 | 0 |
| D 2-4 | 8 | 4 | 12 | 4 | 12 | 0 | 0 | 0 |
| E 3-4 | 5 | 7 | 12 | 7 | 12 | 0 | 0 | 0 |
| F 3-5 | 7 | 7 | 14 | 9 | 16 | **2** | 2 | 2 |
| G 4-5 | 4 | 12 | 16 | 12 | 16 | 0 | 0 | 0 |

**Total float =** LFj − ESi − t

**Free float =** Ej − Ei − t

**Independent float =** Ej − Li − t (negative → 0)

Two critical paths: **A–C–E–G** and **A–D–G**, both **16 days**.

# Chapter 7: Economics of Maintenance & Spares Management

**In this chapter:** Breakdown maintenance · Preventive & routine maintenance · Replacement of machines · Spare parts management

## 7.1 Maintenance types

| Type | Feature |
|---|---|
| Breakdown | Repair after failure; high downtime cost |
| Preventive | Scheduled inspection & servicing |
| Routine | Daily lubrication, cleaning |
| Predictive / condition-based | Monitoring (vibration, temperature) |
| TPM | Operators own maintenance; OEE |

- Optimum maintenance: minimise **preventive cost + breakdown cost**.

## 7.2 Replacement theory

- Items that deteriorate: replace when **average annual cost** (capital cost − scrap + cumulative running cost) ÷ n is **minimum**, i.e., when next year's running cost > current average cost.
- Items that fail suddenly (bulbs): compare **individual vs group replacement** cost.

**OEE =** Availability × Performance × Quality

## 7.3 Spare parts management

- Classification: **ABC** (value), **VED** (vital, essential, desirable), **FSN** (fast, slow, non-moving), insurance spares.
- Decide stock levels by criticality & lead time; standardisation & interchangeability reduce spares.

**WORKED EXAMPLE** **Replacement illustration**

| Year | Running cost | Cumulative | Total (6,000 + cum.) | Average |
|---|---|---|---|---|
| 1 | 1,000 | 1,000 | 7,000 | 7,000 |
| 2 | 1,200 | 2,200 | 8,200 | 4,100 |
| 3 | 1,400 | 3,600 | 9,600 | 3,200 |
| 4 | 1,800 | 5,400 | 11,400 | 2,850 |
| 5 | 2,300 | 7,700 | 13,700 | **2,740** |
| 6 | 2,900 | 10,600 | 16,600 | 2,767 |

- Machine cost ₹6,000, scrap nil → replace at end of **year 5** (minimum average; year-6 running cost 2,900 > 2,740).

**EXAM TIP** **FAQ**

- MTBF = operating time ÷ failures; MTTR = repair time ÷ failures.
- Breakdown maintenance suits cheap, non-critical equipment with standby.
- Spares under VED - vital items need higher safety stock.

**WORKED EXAMPLE** **Group vs individual replacement**

- 1,000 bulbs; individual replacement ₹10/bulb; group replacement ₹4/bulb; failure probabilities month 1-3: 0.1, 0.3, 0.6.
- Expected failures: m1 100; m2 310; m3 = 1,000×0.6 + 100×0.3 + 310×0.1 = **661**.
- Individual policy average cost/month = 1,000 × 10 ÷ mean life (2.5 months) = **₹4,000**.
- Group at end of month 1: (4,000 + 1,000) ÷ 1 = 5,000; month 2: (4,000 + 4,100) ÷ 2 = **₹4,050** → individual replacement cheaper here.

## 7.4 Maintenance cost trade-off

- As preventive effort ↑, preventive cost ↑ and breakdown cost ↓ → **total cost U-shaped**; optimum at minimum.
- Downtime cost includes lost contribution, idle labour, overtime, penalties.

| Item | Value |
|---|---|
| Breakdown only | 100 |
| Light preventive | 75 |
| Optimum | 60 |
| Heavy preventive | 80 |

**EXAM TIP** **Theory FAQ**

- Objectives of maintenance: maximum availability, safety, asset life, minimum cost.
- Preventive maintenance justified when breakdown cost > preventive cost & failures predictable.
- Insurance spares: costly, rarely used but critical - capitalised.

## 7.5 Replacement – worked examples

**WORKED EXAMPLE** **Machine with falling resale value (asked Dec 2025 and June 2026)**

Cost including installation ₹1,00,000. Maintenance and resale value at the end of each year:

| Year | Maintenance | Cumulative maintenance | Resale value | Depreciation (C - S) | Total cost | Average annual cost |
|---|---|---|---|---|---|---|
| 1 | 8,000 | 8,000 | 70,000 | 30,000 | 38,000 | 38,000 |
| 2 | 10,000 | 18,000 | 55,000 | 45,000 | 63,000 | 31,500 |
| 3 | 14,000 | 32,000 | 45,000 | 55,000 | 87,000 | 29,000 |
| 4 | 19,000 | 51,000 | 37,000 | 63,000 | 1,14,000 | **28,500** |
| 5 | 25,000 | 76,000 | 30,000 | 70,000 | 1,46,000 | 29,200 |
| 6 | 32,000 | 1,08,000 | 25,000 | 75,000 | 1,83,000 | 30,500 |

Average annual cost is **minimum at year 4 (₹28,500)** → replace at the end of the 4th year. Check: year-5 maintenance (25,000) + fall in resale (7,000) = 32,000 > 28,500.

**WORKED EXAMPLE** **Group replacement – full table**

1,000 bulbs; failure probability by month 1–5: 0.10, 0.15, 0.25, 0.30, 0.20. Individual replacement ₹10 per bulb; group replacement ₹3 per bulb.

Failures: N1 = 100; N2 = 1,000 × 0.15 + 100 × 0.10 = 160; N3 = 250 + 15 + 16 = 281; N4 = 300 + 25 + 24 + 28.1 = 377.1; N5 = 349.9.

Mean life = 1(0.10) + 2(0.15) + 3(0.25) + 4(0.30) + 5(0.20) = **3.35 months** → individual policy cost = 1,000 × 10 ÷ 3.35 = **₹2,985 per month**.

| Group at end of month | Cumulative failures | Cost (3,000 + failures × 10) | Average per month |
|---|---|---|---|
| 1 | 100 | 4,000 | 4,000 |
| 2 | 260 | 5,600 | **2,800** |
| 3 | 541 | 8,410 | 2,803 |
| 4 | 918 | 12,181 | 3,045 |

Best policy: **group replacement every 2 months** (₹2,800) with individual replacement of failures in between – cheaper than pure individual replacement (₹2,985).

# Chapter 8: Introduction to Strategic Management

**In this chapter:** Concept of strategy · Vision, mission, culture & values · Objectives & goals · Organisational genomics · Individual vs organisational objectives · Strategic levels · Balanced scorecard · EVA-driven responsibility accounting

## 8.1 Strategy basics

- **Strategy**: long-term plan of action to achieve objectives & competitive advantage (Chandler: "determination of basic long-term goals...adoption of courses of action & allocation of resources").
- **Proactive** (planned) + **reactive** (adaptive) strategy - Mintzberg's **emergent** strategy.
- Strategic management = **analysis → formulation → implementation → evaluation & control**.
- Benefits: proactive, direction, competitive edge, resource allocation, survival; limitations: complex environment, time-consuming, costly, difficult to predict competition.

## 8.2 Strategic intent hierarchy

**Vision** - what we want to become (future, inspiring) → **Mission** - why we exist; business definition (who, what, how - Abell: customer groups, needs, technologies) → **Goals** - broad results → **Objectives** - specific, measurable, time-bound (SMART) → Strategies & plans

- Values & **business model**: how firm creates, delivers & captures value (value proposition, revenue model, cost structure).

## 8.3 Levels of strategy

| Level | Who | Question | Example |
|---|---|---|---|
| Corporate | Board, CEO | What businesses to be in? | Diversification, acquisitions |
| Business (SBU) | SBU heads | How to compete? | Cost leadership, differentiation |
| Functional | Dept heads | How to support business strategy? | Marketing mix, HR, finance |
| Operational | Supervisors | Day-to-day | Production schedules |

**MEMORY TRICK** **Good objectives - "SMART-C"**

**SMART** – S Specific; M Measurable; A Achievable; R Realistic; T Time-bound

**Note:** Also: consistent, challenging, understandable, hierarchical.

**EXAM TIP** **Case-answer hooks**

- A start-up founder only reacts to market changes → explain **reactive vs proactive** strategy & need for strategic planning.
- Conglomerate CEO deciding to exit cement business → **corporate-level** decision.
- Mission statement elements: purpose, products/markets, philosophy, self-concept, public image.

## 8.4 Strategic decision-making - characteristics

- **Long-term**, complex, involve **major resource commitment**, uncertain, affect whole organisation, top-management driven, future-oriented.
- Types: **routine vs non-routine**; programmed vs non-programmed (strategic = non-programmed).
- Rational decision process: problem → alternatives → evaluate → choose → implement → monitor.

## 8.5 Strategic management process

Vision, mission & objectives > Environmental & organisational analysis (SWOT) > Strategy formulation (alternatives & choice) > Strategy implementation > Strategic evaluation & control > Feedback / revise

- Strategic planning ≠ strategic thinking: planning = analysis & programmes; thinking = synthesis, intuition, creativity.

## 8.6 Business model & strategy

- **Business model** - how a firm creates, delivers & captures value: customer segments, value proposition, channels, customer relationships, revenue streams, key resources, key activities, partners, cost structure (canvas).
- **Strategic intent** (Hamel & Prahalad) - stretch ambition beyond current resources.
- **Strategic drift** - gradual mismatch between strategy & environment.

## 8.7 Vision vs Mission vs Objectives

| Element | Answers | Feature | Example |
|---|---|---|---|
| Vision | What do we want to become? | Aspirational, long-term | "Be India's most trusted mobility brand" |
| Mission | Why do we exist? Whom do we serve? | Purpose, scope (customer, need, technology) | "Affordable EV transport for every Indian city" |
| Goals | Broad results | Open-ended | Market leadership |
| Objectives | What, how much, by when? | SMART, measurable | 20% market share by FY 2028 |

**EXAM TIP More case hooks - SM Ch 1**

- Family business with ad-hoc decisions → need for **strategic management** - direction, proactivity, resource optimisation.
- Firm with great product but no revenue clarity → define **business model** (revenue streams, cost structure).
- Distinguish **corporate, business & functional** level - always identify level in case.
- Limitations of SM: environment highly dynamic, difficult to predict, time & cost, implementation gap.

## 8.8 Organisational genomics & culture

- **Organisational DNA** (Booz & Co.): four building blocks - **decision rights, information, motivators, structure** - shape execution.
- Culture & values: shared beliefs guide behaviour; strong culture aids strategy execution but may resist change.
- **Individual vs organisational objectives**: align via incentives, participation, communication - goal congruence.

## 8.9 Balanced scorecard

| Perspective | Question | KPIs |
|---|---|---|
| Financial | How do shareholders see us? | ROI, EVA, revenue growth |
| Customer | How do customers see us? | Share, satisfaction, retention |
| Internal process | What must we excel at? | Cycle time, quality, cost |
| Learning & growth | Can we improve & create value? | Training, innovation, staff retention |

- **Strategy map** links cause-effect across perspectives.

## 8.10 EVA-driven responsibility accounting

**EVA =** NOPAT – (WACC × Capital employed)

- Make each **investment centre** accountable for EVA, not just profit → managers consider cost of capital.
- Link bonus banks to EVA improvement; avoids ROI-driven under-investment.

## 8.11 Characteristics of effective objectives

Objectives should be: **specific** (clear about what is to be achieved); **measurable** (quantified – market share 15%, ROCE 18%); **attainable/realistic** yet **challenging**; **relevant** to the mission; **time-bound**; **understandable** to those

who must achieve them; **consistent** with one another and arranged in a **hierarchy** (corporate → business → functional); **flexible** enough to be revised when the environment changes; and preferably **written and communicated**. The SMART framework summarises the core five.

# Chapter 9: Strategic Analysis & Strategic Planning

**In this chapter:** Business environment - PESTEL · Industry & competitive analysis - Porter's five forces · Internal analysis - value chain · SWOTC · Portfolio analysis - BCG · Stages & alternatives in strategic planning

## 9.1 PESTLE

| Factor | Examples |
|---|---|
| **P**olitical | Govt stability, trade policy, subsidies |
| **E**conomic | GDP growth, inflation, interest, exchange rates |
| **S**ocial | Demographics, lifestyle, culture, education |
| **T**echnological | Innovation, automation, digital, AI |
| **L**egal | Labour law, consumer protection, competition law |
| **E**nvironmental | Climate, pollution norms, ESG, sustainability |

## 9.2 Porter's Five Forces

- **Threat of new entrants** - barriers: economies of scale, capital, brand, access to distribution, Govt policy, switching costs.
- **Bargaining power of buyers** - concentration, standardised products, low switching cost, backward integration threat.
- **Bargaining power of suppliers** - few suppliers, unique input, forward integration threat.
- **Threat of substitutes** - price-performance of substitutes, switching cost.
- **Rivalry among existing firms** - number & balance of competitors, slow growth, high fixed costs, exit barriers.

**Note:** Stronger forces → lower industry profitability.

## 9.3 Industry analysis toolkit

| Tool | Purpose |
|---|---|
| Dominant economic features | Market size, growth, scale, technology |
| **Driving forces** | Changes reshaping industry (internet, regulation, entry of big firms) |
| **Key success factors** | What every firm must do well (cost, distribution, brand) |
| **Strategic group mapping** | Cluster rivals with similar strategies on 2 variables (price/quality, geographic coverage) |
| Competitive intelligence | Rivals' likely moves |

**WORKED EXAMPLE Case application**

- **Indian EV-scooter maker**: entry threat high (start-ups with VC funds, Govt subsidies); buyer power moderate; supplier power **high** (battery cells imported); substitutes (petrol two-wheelers, public transport); rivalry intense → strategy: secure battery supply (backward integration), differentiate on service network.

**EXAM TIP FAQ**

- Micro environment: customers, suppliers, competitors, intermediaries, public; macro: PESTLE.
- Globalisation drivers: market, cost, Govt, competition; benefits & challenges for Indian firms.
- Opportunity vs threat identification feeds **SWOT** in internal analysis.

## 9.4 Industry & competitive analysis - 7 questions

Dominant economic features of industry? → Competitive forces & their strength (Porter)? → Drivers of change (driving forces)? → Which companies are in strongest/weakest positions (strategic groups)? → Likely strategic moves of rivals (competitive intelligence)? → Key success factors? → Is the industry attractive - prospects for above-average profit?

## 9.5 Driving forces - common examples

- Changes in long-term **industry growth rate**; changes in buyers/uses; **product & marketing innovation**; technological change; entry/exit of major firms; diffusion of know-how; changes in cost & efficiency; regulatory & govt policy changes; societal concerns & lifestyles; reduced uncertainty & risk; **globalisation**; internet & e-commerce.

## 9.6 Key success factors (KSF)

- KSFs are **industry-wide** competitive elements every firm must do well: technology-related (R&D, process), manufacturing (low cost, quality), distribution (network, dealers), marketing (brand, service), skills (talent), organisational capability (speed to market).
- Usually **3-5 KSFs** dominate; strategy built around them.

## 9.7 Micro vs macro environment

| Basis | Micro (task) | Macro (general) |
|---|---|---|
| Elements | Customers, competitors, suppliers, intermediaries, public | PESTLE forces, demography, global forces |
| Control/influence | Some influence | Uncontrollable |
| Impact | Direct, immediate | Indirect, long-term |
| Analysis tool | Five forces, customer & competitor analysis | PESTLE, scenario planning |

**EXAM TIP FAQ – External environment**

- Strategic group map: axes must be **not highly correlated** (e.g., price/quality vs geographic coverage); bubble size ∝ group sales.
- Competitive landscape steps: identify competitor → understand them → determine strengths & weaknesses → put information together.
- Customer analysis / segmentation bases: geographic, demographic, psychographic, behavioural VERIFY.

## 9.8 Core competence & VRIO

- **Core competence** tests (Prahalad & Hamel): provides access to **multiple markets**; significant contribution to **customer benefits**; **difficult to imitate**.
- **VRIO**: Valuable, Rare, costly to Imitate, Organised to exploit → sustained competitive advantage.
- Resources: tangible (physical, financial), intangible (brand, technology), human; capabilities = ability to deploy resources.

## 9.9 Porter's value chain

Inbound logistics > Operations > Outbound logistics > Marketing & sales > Service

- **Support activities**: firm infrastructure, HRM, technology development, procurement.
- Margin = value created – cost; identify cost & differentiation drivers.

## 9.10 Generic strategies

| Strategy | Scope | Source of advantage | Risk |
|---|---|---|---|
| Cost leadership | Broad | Lowest cost | Imitation, technology change |
| Differentiation | Broad | Unique features, brand | Premium not valued |
| Focus - cost | Narrow niche | Low cost in niche | Broad players enter |
| Focus - differentiation | Narrow niche | Unique for niche | Niche disappears |
| **Best-cost provider** | Broad/mid | Good quality at lower price | Squeezed both ways |

- "Stuck in the middle" - no clear advantage.

## 9.11 SWOT → TOWS

| Item | Opportunities | Threats |
|---|---|---|
| **Strengths** | **SO** - use strengths to exploit opportunities (maxi-maxi) | **ST** - use strengths to counter threats (maxi-mini) |
| **Weaknesses** | **WO** - overcome weaknesses via opportunities (mini-maxi) | **WT** - minimise weaknesses & avoid threats (mini-mini) |

- SWOT: internal (S, W) + external (O, T).

**WORKED EXAMPLE** **Case application**

- **Regional dairy brand**: S - farmer network, trusted brand; W - weak cold chain; O - rising demand for protein products; T - national brands, price wars.
- **SO**: launch high-protein curd using farmer network; **WT**: partner with logistics firm for cold chain.
- PLC: product in **growth** stage → invest in capacity & distribution.

### Product life cycle - sales & profit (illustrative)

| Stage | Intro | Growth | Maturity | Decline |
|---|---|---|---|---|
| Sales | 10 | 45 | 80 | 40 |
| Profit | -5 | 15 | 30 | 5 |

## 9.12 PLC stage strategies

| Stage | Features | Strategy |
|---|---|---|
| Introduction | Low sales, losses, few rivals | Build awareness, penetrate/skim |
| Growth | Rapid sales ↑, profits ↑, new entrants | Expand distribution, product improvement |
| Maturity | Sales peak, intense rivalry | Differentiate, cost control, defend share |
| Decline | Sales ↓ | Harvest, divest, rejuvenate |

## 9.13 Competitive advantage & resources

- **Competitive advantage** - superior value from lower cost or differentiation; sustained if resources are **VRIO**.
- **Resource-based view**: tangible (physical, financial), intangible (reputation, IP, culture), human; capabilities = coordinated use of resources.
- **Dynamic capabilities** - ability to reconfigure resources in changing environment.
- **Benchmarking & value chain** identify where advantage is created.

**MEMORY TRICK** **Core competence tests - "MCI"**

**MCI** – M Multiple markets access; C Customer benefit significant; I Inimitable (hard to copy)

**Note:** Example: Honda's engine expertise → cars, bikes, generators, lawn-mowers.

## 9.14 Porter's generic strategies - how to achieve

- **Cost leadership**: economies of scale, learning curve, process innovation, outsourcing, lean design, tight cost control.
- **Differentiation**: superior quality, features, brand image, technology, service, customer experience.
- **Focus**: serve narrow segment better than broad rivals - by cost (budget airlines regional) or uniqueness (luxury watches).

**EXAM TIP FAQ – Internal environment**

- SWOT limitations: static, subjective, no prioritisation → TOWS converts SWOT into strategies.
- Value chain: **primary** (inbound, operations, outbound, marketing & sales, service) vs **support** (infrastructure, HRM, technology, procurement).
- Best-cost provider: **more value for money** - quality features at lower price than differentiators.

## 9.15 SWOTC & strategic planning stages

- **SWOTC** = SWOT + **Challenges** (or Competition) - adds explicit view of key challenges/competitive moves VERIFY.

Environmental scanning → Setting vision, mission, objectives → Strategic analysis (internal & external) → Strategy formulation (alternatives & choice) → Implementation → Evaluation & control

- Alternatives: stability, expansion, retrenchment, combination.

**EXAM TIP FAQ – analysis**

- PESTEL vs Porter: macro vs industry; SWOT internal + external.
- Value chain: primary (inbound, operations, outbound, marketing & sales, service) + support (infrastructure, HRM, technology, procurement).

## 9.16 Formal strategic planning – five main steps

1. **Select the corporate mission and major goals** (vision, mission, values, objectives).
2. **Analyse the external competitive environment** to identify opportunities and threats (PESTEL, Porter's five forces).
3. **Analyse the internal operating environment** to identify strengths and weaknesses (resources, capabilities, value chain).
4. **Select strategies** that build on strengths and correct weaknesses to exploit opportunities and counter threats (SWOT/TOWS) – functional, business, global and corporate strategies.
5. **Implement the strategy** – organisational structure, control systems, culture; then feedback for the next cycle.

## 9.17 Rockart's four sources of critical success factors

| Source | Meaning | Example |
|---|---|---|
| **Structure of the industry** | CSFs common to every firm in the industry | Supermarkets – product mix, stock turnover |
| **Competitive strategy, industry position and geographic location** | CSFs from the firm's own position | A market leader's CSF is brand; a small player's is a niche |
| **Environmental factors** | Changes in economy, regulation, technology | Fuel prices for an airline |
| **Temporal factors** | Short-term internal situations | Replacing key managers after resignations |

## 9.18 Red ocean vs blue ocean strategy

| Red ocean | Blue ocean (Kim and Mauborgne) |
|---|---|
| Compete in existing market space | Create uncontested market space |
| Beat the competition | **Make the competition irrelevant** |
| Exploit existing demand | Create and capture new demand |
| Make the value–cost trade-off | **Break the value–cost trade-off** |
| Align the system with differentiation **or** low cost | Align the system with differentiation **and** low cost |

Tool: the **ERRC grid** – eliminate, reduce, raise, create.

# Chapter 10: Strategy Formulation & Implementation

**In this chapter:** Strategic choices & portfolio models · Functional strategies - production, supply chain, marketing, HR · Structuring - SBU, organisation structures · BPR · Management, operational & task control · Goal congruence

## 10.1 Ansoff product-market matrix

| Item | Existing products | New products |
|---|---|---|
| **Existing markets** | **Market penetration** (more share - pricing, promotion) | **Product development** |
| **New markets** | **Market development** (new geography/segments) | **Diversification** (highest risk) |

## 10.2 BCG growth-share matrix

| Quadrant | Market growth | Relative share | Strategy |
|---|---|---|---|
| **Star** | High | High | Build/hold - invest |
| **Cash cow** | Low | High | Hold/harvest - fund others |
| **Question mark** | High | Low | Build selectively or divest |
| **Dog** | Low | Low | Divest/harvest |

- GE nine-cell: **industry attractiveness × business strength** (invest/grow, selectivity, harvest/divest).
- ADL matrix: industry maturity × competitive position.

## 10.3 Corporate strategy options

| Strategy | When | Forms |
|---|---|---|
| **Stability** | Satisfactory performance, stable environment | No change, pause/proceed with caution, profit |
| **Expansion** | Growth opportunities | Intensification, diversification, integration, M&A, alliances, internationalisation |
| **Retrenchment** | Decline, losses | **Turnaround**, **divestment**, **liquidation** |
| **Combination** | Multi-business firm | Mix of above across SBUs |

## 10.4 Diversification types

| Type | Meaning | Example |
|---|---|---|
| Vertical - backward | Into supplier's business | Car maker making tyres |
| Vertical - forward | Towards customer | Manufacturer opening retail stores |
| Horizontal | Same stage, related product | Soap maker buys rival soap brand |
| Concentric (related) | Related technology/market | TV maker → ACs |
| Conglomerate (unrelated) | Unrelated business | Tobacco co. → hotels |

## 10.5 Turnaround & M&A

- **Turnaround** signals: persistent losses, declining share, high debt, uncompetitive products; action plan: assess → plan → implement (cost cut, asset reduction, revenue generation, change management) → return to normal.
- **Divestment**: sell part of business (non-core, persistent drain, mismatch).
- **Liquidation**: last resort - sell assets.
- **M&A**: horizontal, vertical, co-generic (concentric), conglomerate; motives - synergy, market power, tax, diversification.
- **Strategic alliance**: JV, equity alliance, non-equity alliance; advantages - access to resources/markets, risk sharing; disadvantages - control, culture clash.

**MEMORY TRICK** **Retrenchment – "TDL"**

**TDL** – T Turnaround (fix it); D Divest (sell part); L Liquidate (exit fully)

**Note:** Ansoff risk order: penetration < market development ≈ product development < diversification.

## 10.6 ADL matrix & BCG limitations

- **ADL (Arthur D. Little)**: industry maturity (embryonic, growth, mature, ageing) × competitive position (dominant, strong, favourable, tenable, weak).
- **BCG limitations**: only 2 variables, high share ≠ profitability always, ignores synergies, "dogs" may still generate cash.
- **Portfolio analysis** helps resource allocation among SBUs.

## 10.7 Functional strategies

| Function | Strategy elements |
|---|---|
| Marketing | 4Ps → 7Ps (people, process, physical evidence); social, augmented, direct, relationship, synchro-marketing |
| Financial | Capital acquisition, allocation, dividend, WC, reserves |
| Production / operations | Capacity, location, technology, quality, supply chain |
| HR | Recruitment, training, compensation, appraisal, retention |
| R&D | Basic vs applied, offensive vs defensive |
| Logistics / SCM | Inventory, transport, warehousing, JIT |

## 10.8 GE nine-cell matrix

| Business strength → / Industry attractiveness ↓ | Strong | Average | Weak |
|---|---|---|---|
| High | Invest / grow | Invest / grow | Selectivity |
| Medium | Invest / grow | Selectivity | Harvest / divest |
| Low | Selectivity | Harvest / divest | Harvest / divest |

- Green zone (top-left 3 cells) - grow; yellow (diagonal) - hold/selective; red (bottom-right) - harvest/divest.

## 10.9 Strategic alliances

- **Forms**: joint venture (new entity), equity strategic alliance, non-equity alliance (contract), global strategic alliance.
- **Benefits**: access to new markets & technology, shared risk & cost, economies of scale, learning.
- **Risks**: loss of control, culture clash, opportunistic partner, leakage of know-how.
- Success factors: clear objectives, mutual trust, complementary resources, exit clause.

## 10.10 Turnaround action plan

Assessment of current problems (diagnose root causes) > Analyse situation & develop strategic plan > Implement change: cost reduction, asset reduction, revenue generation, product repositioning > Restructure: people, processes, finance > Return to normal: profitability, growth

- Danger signs: persistent negative cash flow, uncompetitive products, declining market share, poor management, high employee attrition.

**EXAM TIP** **FAQ – Strategic choices**

- Stability ≠ no change - incremental improvement, focus on existing business.
- Divestment reasons: persistent losses, mismatch with core, need for funds, regulatory.
- Concentric vs conglomerate diversification - related vs unrelated technology/market.
- Merger types: horizontal, vertical, **co-generic** (related), conglomerate; acquisition can be friendly or hostile.

## 10.11 Formulation vs implementation

| Formulation | Implementation |
|---|---|
| Positioning forces before action | Managing forces during action |
| Effectiveness | Efficiency |
| Intellectual process | Operational process |
| Analytical skills | Motivational & leadership skills |
| Few people (top) | Many people |

## 10.12 Leadership, culture & change

- **Transformational** leader: vision, inspiration, change (turbulent environment); **transactional**: rewards/punishment, stability (mature firms).
- **Culture**: shared values; strong culture aids implementation but may resist change.
- **Lewin's change model**: **Unfreeze** → **Change** (move) → **Refreeze**.
- **McKinsey 7S**: Strategy, Structure, Systems (hard); Shared values, Style, Staff, Skills (soft).

## 10.13 Organisation structures

| Structure | Best for | Drawback |
|---|---|---|
| Simple | Small owner-managed | Overload on owner |
| Functional | Single business | Coordination across functions |
| Divisional (product/geography) | Diversified firms | Duplication |
| Matrix | Projects + functions (dual authority) | Conflict, two bosses |
| Network / virtual | Outsourcing-based | Control, dependency |
| SBU | Multi-business conglomerates | Extra layer |
| **Hourglass** | Middle management reduced by IT | Career paths limited |

## 10.14 Strategic control types

| Type | Checks | Timing |
|---|---|---|
| **Premise control** | Validity of assumptions (environment, industry) | Continuous |
| **Implementation control** | Progress of plans - milestones, special projects | During implementation |
| **Strategic surveillance** | Broad monitoring of events inside/outside | Unfocused, continuous |
| **Special alert control** | Sudden unexpected events (pandemic, disaster) | Rapid response |

- **Operational control** - short-term, budgets & standards; **management control** - resource use.

## 10.15 Process improvement tools

- **Benchmarking**: compare with best practices - internal, competitive, functional, generic; steps: identify need → plan → collect data → analyse → implement → monitor.
- **BPR** (Hammer & Champy): **fundamental rethinking & radical redesign** of business processes for dramatic improvement in cost, quality, service, speed.
- **Balanced scorecard**: financial, customer, internal process, learning & growth VERIFY.
- Strategic performance measures: market share, profitability, customer satisfaction, innovation.

**EXAM TIP** **Case-answer hooks**

- Company's growth strategy fails because staff resist → **change management** (Lewin) + leadership + culture.
- Project-based IT firm with dual reporting → **matrix structure**.
- Sudden pandemic shutting supply chain → **special alert control**.

## 10.16 McKinsey 7S framework

| Hard S | Soft S |
|---|---|
| **Strategy** - plan to achieve advantage | **Shared values** - core beliefs (centre) |
| **Structure** - organisation chart, reporting | **Style** - leadership approach |
| **Systems** - processes, IT, procedures | **Staff** - people & development |
| | **Skills** - distinctive capabilities |

- All 7 must be **aligned** for successful implementation.

## 10.17 Strategy-structure link & leadership roles

- **Chandler**: "structure follows strategy" - growth strategy changes create administrative problems → new structure.
- Strategic leader's roles: manage human capital, effective culture, ethical practices, balanced controls, direction-setting.
- **Entrepreneurial vs intrapreneurial** culture; culture change through leadership, symbols, rewards.
- Network / virtual organisation, boundaryless organisation, modular structure VERIFY.

## 10.18 Strategy evaluation criteria (Rumelt)

- **Consistency** - no inconsistent goals & policies.
- **Consonance** - adaptive response to external environment.
- **Advantage** - creates/maintains competitive advantage.
- **Feasibility** - doesn't overtax resources.
- Evaluation steps: fix benchmarks → measure performance → analyse variance → corrective action.

## 10.19 Lewin's change model - detail

**Unfreezing** - create awareness of need, reduce resistance (communication, participation) > **Changing** - new behaviour via compliance, identification, internalisation > **Refreezing** - reinforce new behaviour through rewards, systems, culture

- Resistance causes: fear of unknown, loss of status, habit, insecurity; remedies: education, participation, facilitation, negotiation.

**EXAM TIP** **FAQ - Implementation & evaluation**

- Matrix structure suits **complex, multiple-project** environments; drawback = dual command.
- Hourglass structure: shrunk middle management due to IT; problem - limited promotion paths.
- BPR vs benchmarking: BPR = radical redesign; benchmarking = learn from best practices, incremental.
- Strategic control vs operational control: long-term direction vs short-term efficiency.

## 10.20 Functional strategies - CMA focus

- **Production**: capacity, technology, make/buy, quality, flexibility.
- **Supply chain**: sourcing, logistics, inventory, supplier relations, digital SCM, resilience (dual sourcing).
- **Marketing**: segmentation-targeting-positioning, 4Ps/7Ps, pricing & channel strategies.
- **HR**: recruitment, training, performance & reward, succession; HR as strategic partner.

## 10.21 Business process re-engineering

Identify process to re-engineer → Understand current process → Design new process (radical, IT-enabled) → Implement & monitor

- BPR (Hammer & Champy) = **fundamental rethinking & radical redesign** for dramatic improvement in cost, quality, service, speed.
- Contrast: TQM/kaizen = incremental.

## 10.22 Levels of control (Anthony)

| Level | Focus |
|---|---|
| Strategic planning | Goals, policies (top) |
| Management control | Ensure resources used effectively - budgets, KPIs |
| Operational / task control | Specific tasks done efficiently |

- **Goal congruence**: managers' actions in own interest also serve organisation.

## 10.23 International structures and the transnational structure

| Structure | Global efficiency | Local responsiveness | Feature |
|---|---|---|---|
| International | Low | Low | Core competences transferred from home; head office controls R&D |
| Multinational (multi-domestic) | Low | **High** | Autonomous country units adapting to local markets |
| Global | **High** | Low | Standard products, centralised production for scale |
| **Transnational** | **High** | **High** | Seeks the best of both extremes – a network of specialised, interdependent units sharing knowledge in all directions |

The transnational structure is hard to manage: it needs strong shared values, matrix-type co-ordination and heavy communication cost.

## 10.24 Human resource strategy

HR strategy aligns people with business strategy. Its elements: **workforce planning** (numbers and skills needed); **talent acquisition**; **training and development**; **performance management** linked to strategic goals (balanced scorecard); **compensation and rewards** that support goal congruence; **succession planning** and leadership development; **culture and engagement**; employee relations and compliance. A sound HR strategy builds capabilities that are hard to imitate (VRIO) and supports change programmes such as BPR.

## 10.25 Business process re-engineering – reasons and concerns

**Reasons to undertake BPR:** need for dramatic improvement in cost, quality, service and speed; customer focus; pressure from competition; new technology that makes old processes obsolete; crisis or falling performance; mergers and restructuring.

**Concerns in implementing BPR:** resistance from employees and managers; high cost and time; risk of failure if objectives are unclear; job losses and morale; over-dependence on IT; lack of top-management commitment; narrow focus on cost-cutting rather than process redesign.

# Chapter 11: Digital Strategy

**In this chapter:** Digital transformation & strategy · Innovations & disruptive business models · Trends in digital & social media marketing

## 11.1 Digital transformation

- Integration of digital technology into **all areas** of business - changes operations, value delivery & culture.
- Building blocks: **SMAC** (social, mobile, analytics, cloud), IoT, AI/ML, blockchain, RPA.
- Strategy steps: assess digital maturity → vision → customer-journey redesign → data & platform → talent & culture → measure (digital KPIs).

## 11.2 Disruptive innovation & business models

- **Christensen**: disruptors start at low-end or new market, improve until they displace incumbents (e.g., digital cameras, OTT, UPI).
- Models: **platform/marketplace** (two-sided), **subscription/SaaS**, **freemium**, **sharing economy**, **D2C**, **on-demand** (aggregators).
- Sustaining vs disruptive innovation.

## 11.3 Digital & social media marketing trends

- SEO/SEM, content & influencer marketing, social commerce, short video, programmatic ads, personalisation via analytics, chatbots, omnichannel.
- Metrics: CAC, CLV, conversion rate, engagement, ROAS.
- Risks: data privacy (DPDP Act 2023), misinformation, brand safety VERIFY.

## 11.4 Traditional vs digital strategy

| Basis | Traditional | Digital |
|---|---|---|
| Value chain | Linear pipeline | Platform / ecosystem |
| Customer | Segment-based | Individual, real-time |
| Decisions | Experience | Data-driven |
| Speed | Annual plans | Agile, iterative |

**EXAM TIP FAQ – digital**

- Digital transformation fails mostly due to **culture & leadership**, not technology.
- Platform businesses benefit from **network effects**.
- Industry 4.0 = cyber-physical systems, IoT, smart factories.

## 11.5 Big data, artificial intelligence and blockchain

**Big data** – data sets so large and fast-growing that ordinary tools cannot handle them.

| Type | Meaning | Example |
|---|---|---|
| Structured | Fixed format, rows and columns | Sales ledger, ERP tables |
| Unstructured | No predefined format | E-mails, videos, social media posts |
| Semi-structured | Tags or markers but not tabular | XML, JSON files |

**Characteristics (the Vs): Volume** (size), **Variety** (types and sources), **Velocity** (speed of generation and processing), **Variability** (inconsistency of flows); often also **veracity** (reliability) and **value**.

**Levels of AI: Narrow (weak) AI** – one task (weather forecasting, chess, voice assistants); **General AI** – human-level reasoning across tasks (not yet achieved); **Super AI** – surpassing human intelligence (hypothetical).

**Related concepts: machine learning** – systems learn patterns from data without explicit programming; **deep learning** – ML using multi-layer neural networks (image and speech recognition); **natural language processing** – understanding human language (chatbots); **computer vision**; **robotic process automation** – software bots doing rule-based tasks.

**Blockchain** – a shared, **immutable, distributed ledger** that records transactions and tracks assets in a business network. Features: decentralisation, consensus mechanism, cryptographic security, transparency, **smart contracts**. Types: public, private, consortium and hybrid. Uses: supply-chain traceability, trade finance, land records, payments.

# Last-Day Revision Sheet

**In this chapter:** OM formulas · SM frameworks · Answer checklist

## OM formula chips

$F_{t+1} = F_t + \alpha(D - F)$ · Utilisation = Actual/Design · EBQ = $\sqrt{[2DS/H(1-d/p)]}$ · Std time = NT × (1+allow.) · Transport m+n−1 · MODI $\Delta = c - u - v$ · Hungarian lines = n · Johnson min-time rule · $\rho = \lambda/\mu$ · $L = \lambda/(\mu-\lambda)$ · $W = 1/(\mu-\lambda)$ · Cycle time = time ÷ output · Stations = $\Sigma t \div CT$ · $t_e = (a+4m+b)/6$ · $\sigma^2 = ((b-a)/6)^2$ · Cost slope = $\Delta C/\Delta T$ · OEE = A × P × Q · Productivity index = current ÷ base × 100

## SM framework chips

Vision-Mission-Objectives · SMART · PESTEL · Porter 5 forces · Value chain · VRIO · SWOT/TOWS/SWOTC · BCG (star, cash cow, question mark, dog) · GE 9-cell · Ansoff · Generic strategies · McKinsey 7S · BSC 4 perspectives · EVA · BPR · Anthony's control levels · Disruptive innovation · Platform models · SMAC