Techno-economic Analysis and Feasibility Appraisal of Energy Projects

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What does techno-economic appraisal provide?

- ***It (almost) insures business success, preventing failure.***
- ***It recognizes, from the beginning, the level of business risk.***
- ***It prevents the formation of stillborn situations.***

Business Objectives

Why set up in business?

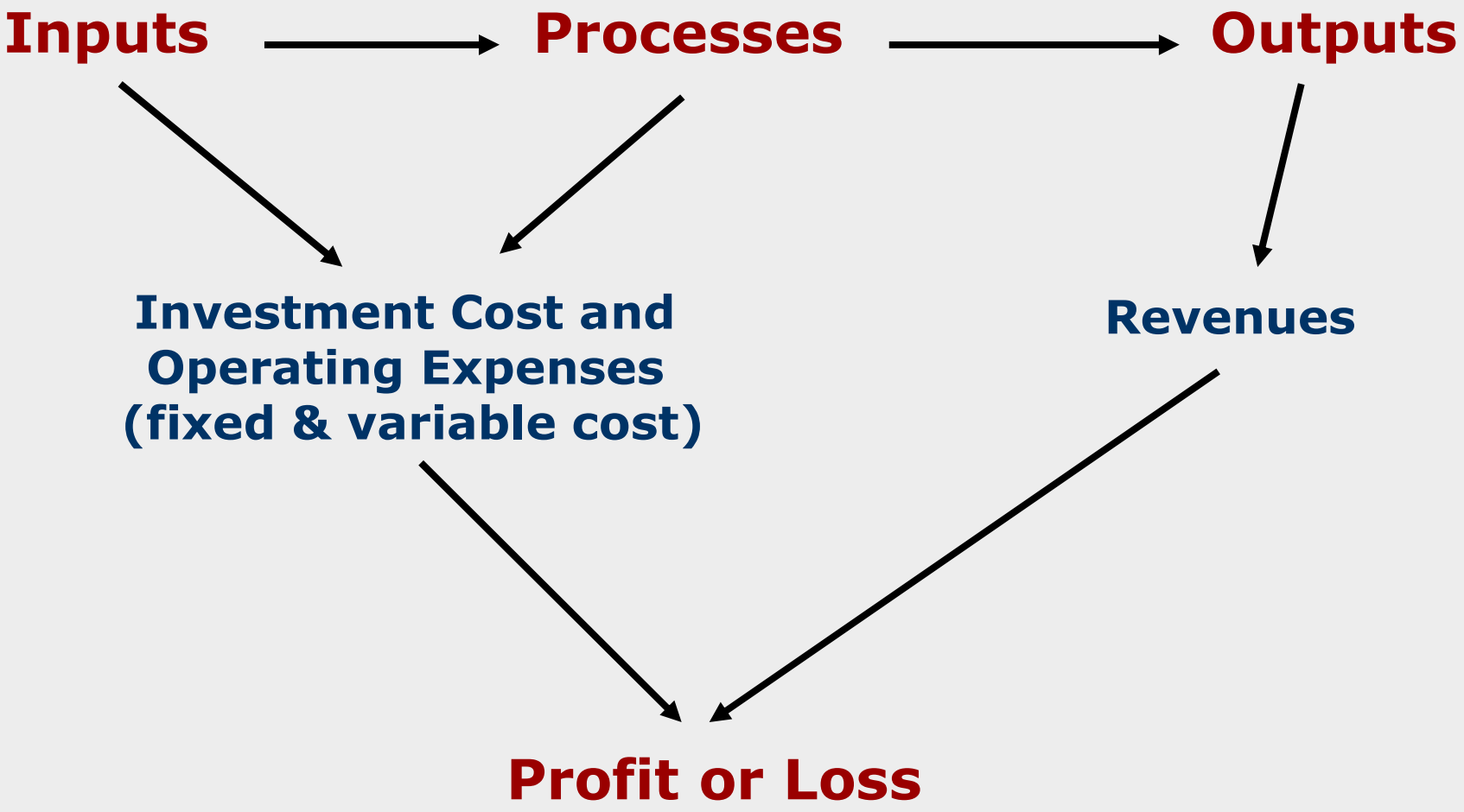
There can be many different motivations for people to set up in business

- Fed up with working for someone else
- Quality of life
- Buzz of success
- Feel in control
- "I could do better than that!"

⇨ **Financial reward**

i.e. ***PROFIT***

The Business Model



Business Objectives

- Businesses exist to provide goods or services
- Whether or not they have to make a profit, businesses have to satisfy customers' wants or needs

Key Point

Whatever the motivation, a business is set up solely to provide customer satisfaction

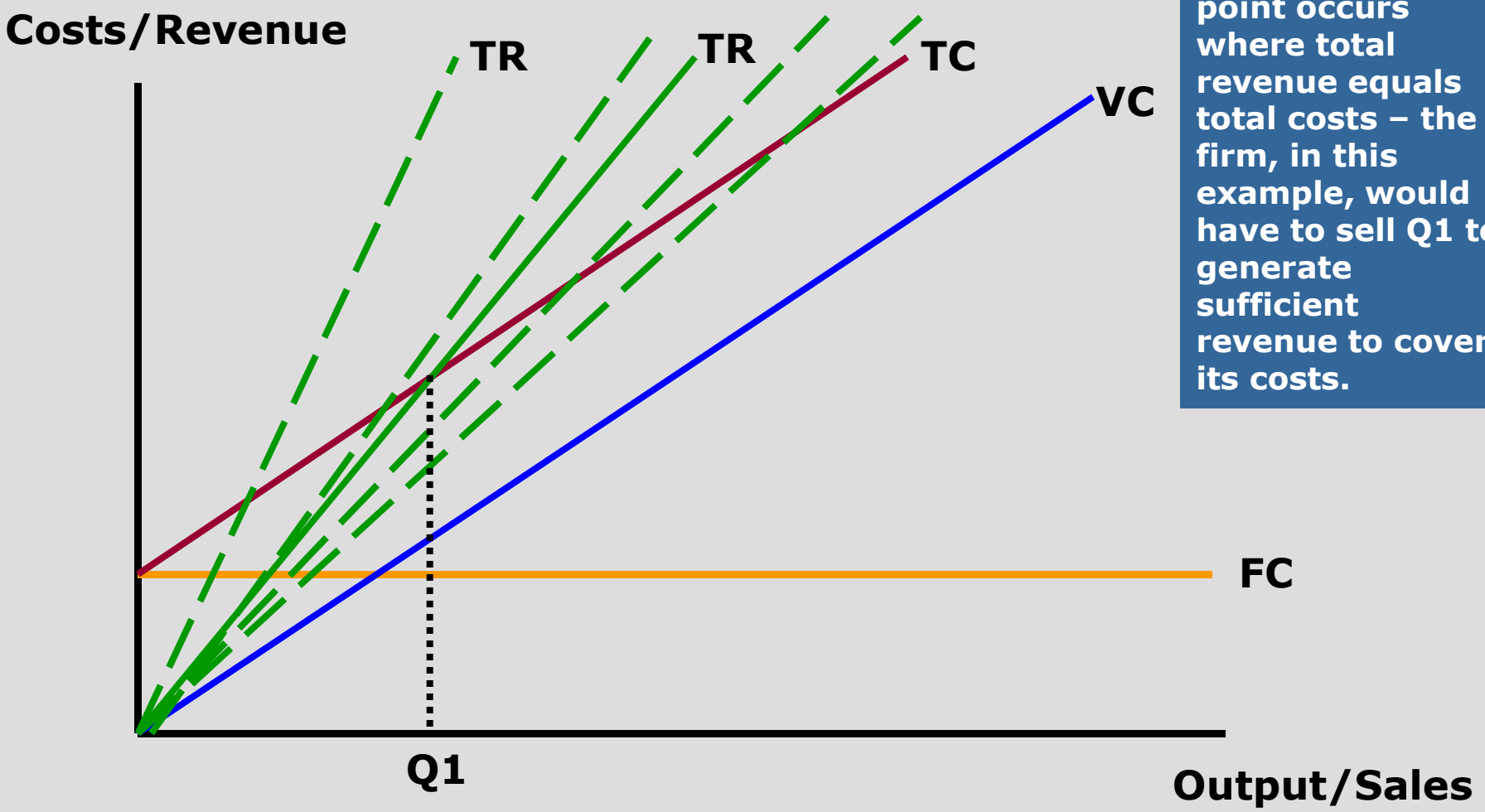
Costs

- Anything incurred during the production of the good or service to get the output into the hands of the customer.
- The customer could be the public (the final consumer) or another business.
- Controlling costs is essential to business success.
- Not always easy to pin down where costs are arising!

Revenues

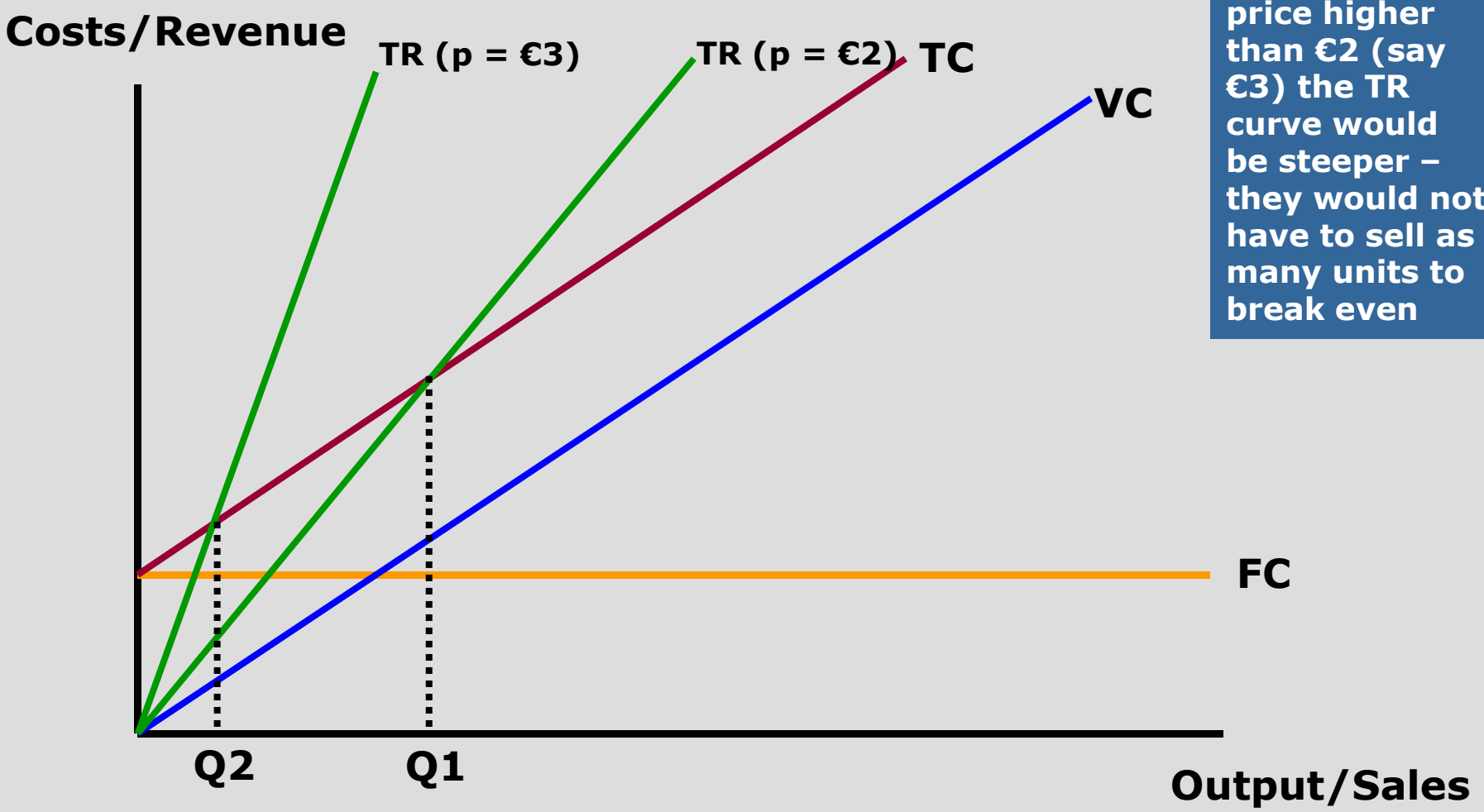
- **Total Revenue = Price x Quantity Sold**
- **Price** can be raised or lowered to change revenue – price elasticity of demand important here.
- **Quantity Sold** can be influenced by amending the elements of the marketing mix.

Break Even Analysis



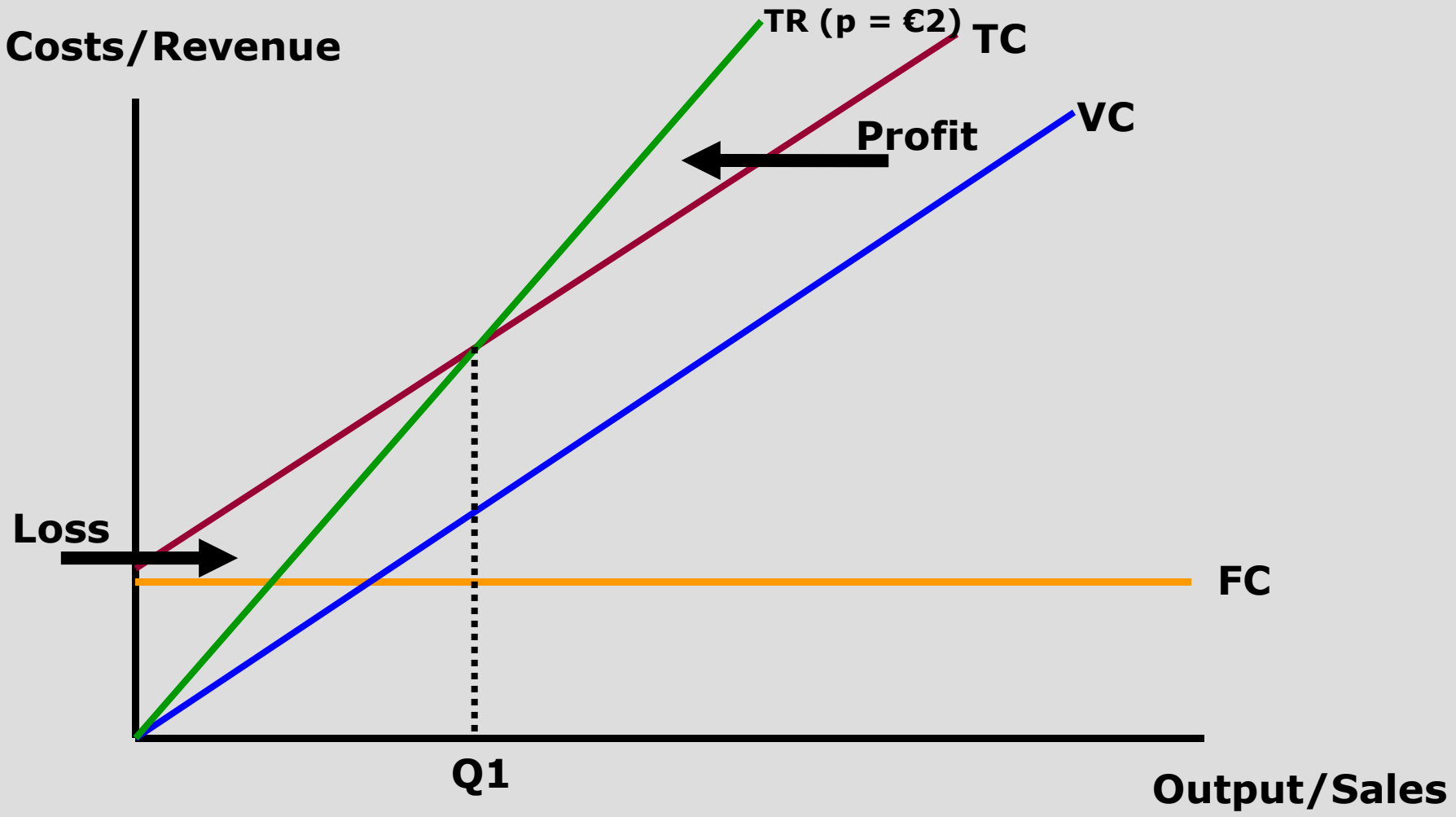
The break even point occurs where total revenue equals total costs – the firm, in this example, would have to sell Q1 to generate sufficient revenue to cover its costs.

Break Even Analysis

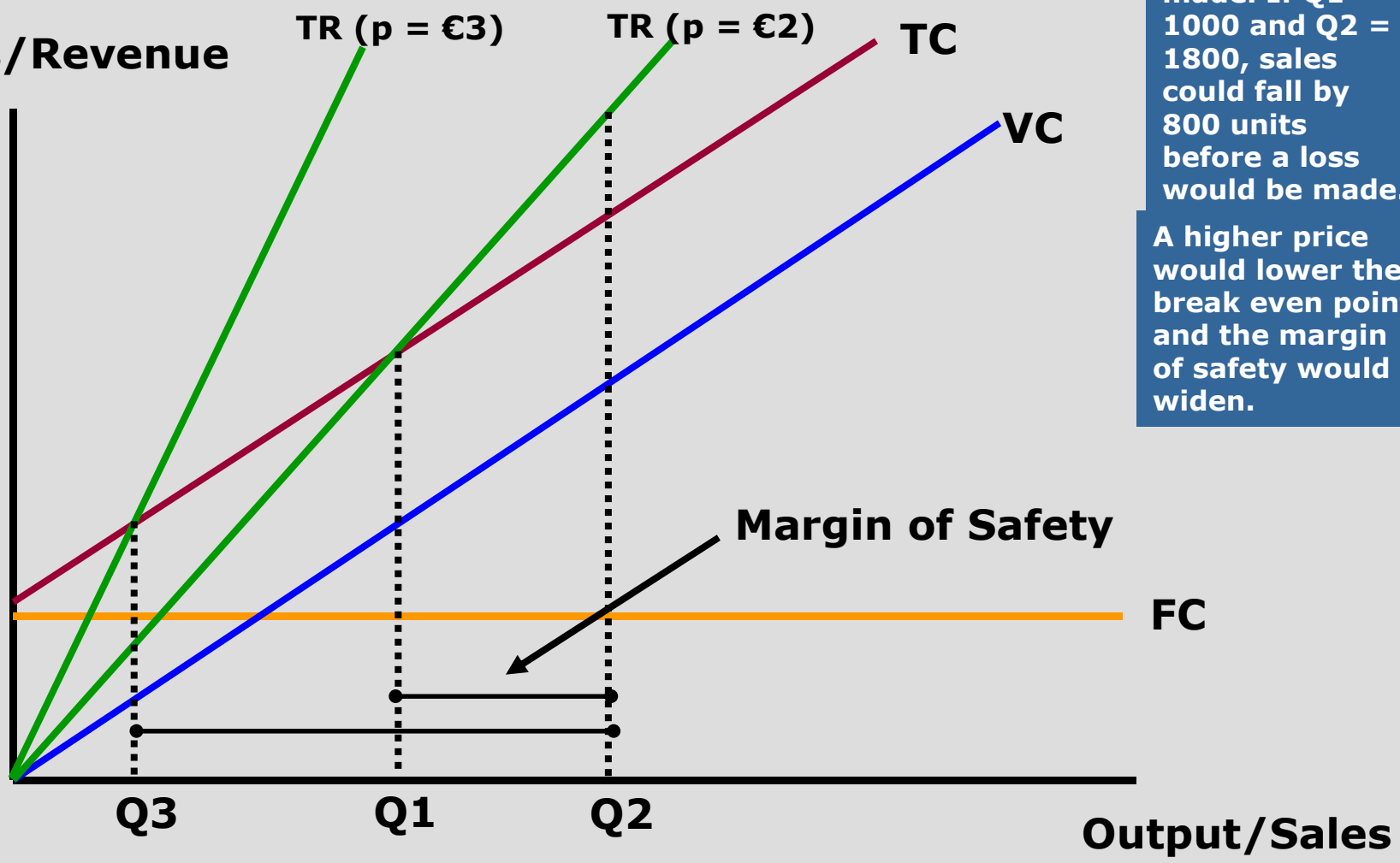


If the firm chose to set price higher than €2 (say €3) the TR curve would be steeper – they would not have to sell as many units to break even

Break Even Analysis



Break Even Analysis



Margin of safety shows how far sales can fall before losses made. If Q1 = 1000 and Q2 = 1800, sales could fall by 800 units before a loss would be made.

A higher price would lower the break even point and the margin of safety would widen.

Project Feasibility Appraisal: The Framework

i. Market Analysis and Marketing Concept

ii. Raw Materials and Supplies

iii. Engineering and Technology

iv. Organization and Overhead Costs

v. Human Resources

vi. Location, site and Environment

vii. Implementation Planning and Scheduling

viii. Financial Analysis and Investment Appraisal

Techno-economic Analysis

Define and quantify investment benefits and costs

In other words, we try to quantify:

Revenues

Expenses (repeated, generally estimated annually)

Investment Cost (once, generally at the beginning)

In order to be possible the calculation of:

Profit = Revenues – Total Expenses

So that, we could compare:

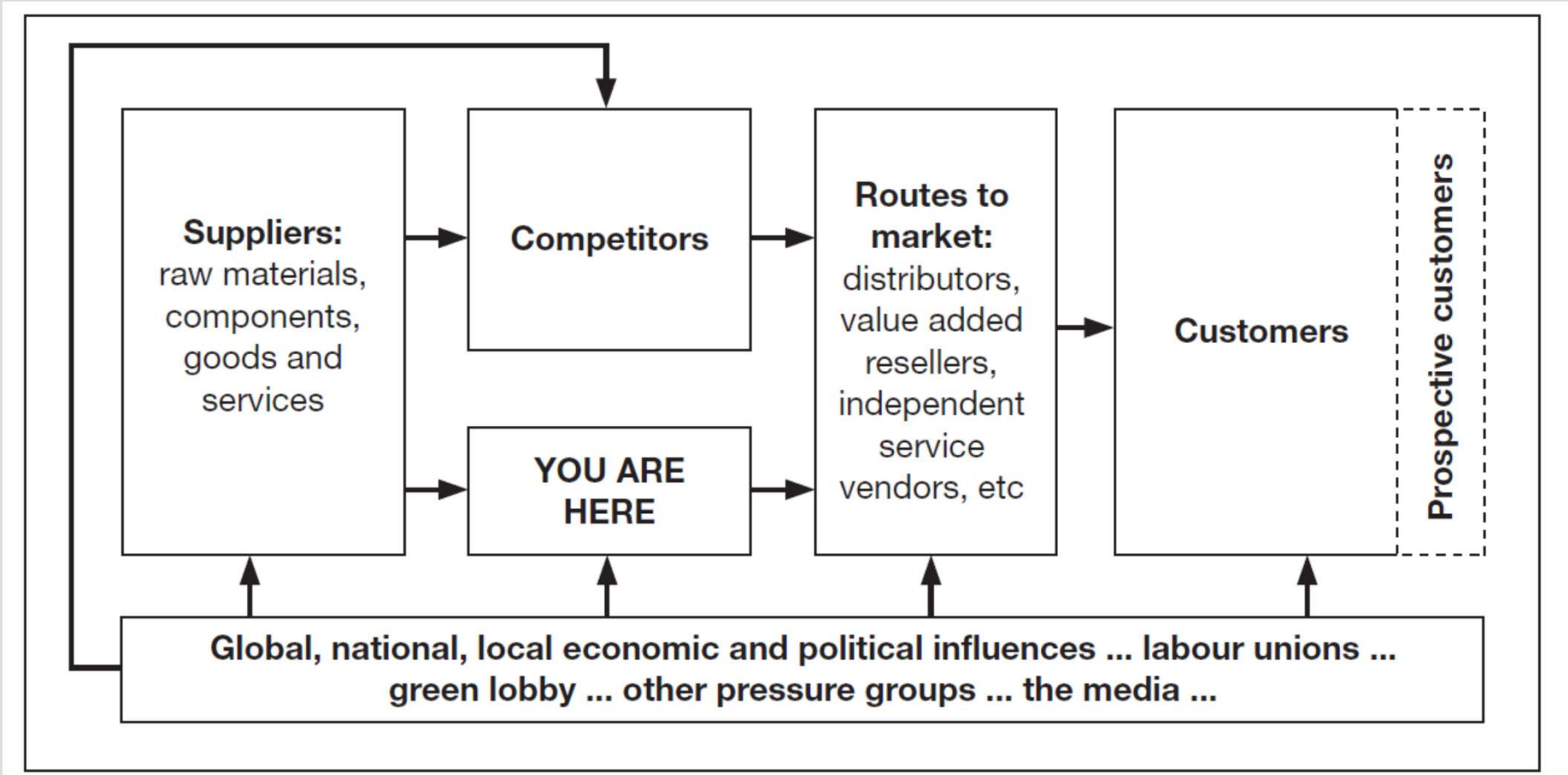
Profit over Investment Cost

⇨ Investment Appraisal

I. Market Analysis & Marketing Concept

Market:

Buyers - consumers, sellers - suppliers, rivals and all kinds of technical, political and legal restrictions.


Suppliers:
raw materials,
components,
goods and
services
Competitors
YOU ARE
HERE
Routes to
market:
distributors,
value added
resellers,
independent
service
vendors, etc
Customers
Prospective customers
Global, national, local economic and political influences ... labour unions ...
green lobby ... other pressure groups ... the media ...

Market Analysis

Quantitative data

- Market volume
- Position in the market life cycle
- Saturation of the market
- Growth rates (absolute values and percentage per annum)
- Stability of demand

Qualitative data

- Structure of customer needs
- Purchasing motives
- Purchasing process, attitudes in relation to information
- Intensity and strength of competition

Analysis of the competitors

- General information about the competitors
- Competitors' position
- Total sales and Sales in most important segments
- Total market share and Market shares in most important segments
- Total marketing expenditures
- What are the aims of the competitors?
- How do the competitors behave?
- How do the competitors assess their own situation?
- What are the strengths and weaknesses of the competitors?

I. Marketing analysis and the marketing concept (outline)

Analysis of the socio-economic environment

- PEST Analysis
- Porter’s Five Forces Analysis
- SWOT Analysis

PEST Analysis

- **Political:** local, national and international political developments – how will they affect the organisation and in what way/s?
- **Economic:** what are the main economic issues – both nationally and internationally – that might affect the organisation?
- **Social:** what are the developing social trends that may impact on how the organisation operates and what will they mean for future planning?
- **Technological:** changing technology can impact on competitive advantage very quickly!

PEST Analysis

Politics and law

- General policy trends
- General risks of local or international conflicts
- Trends in the relationship between political parties in the country concerned
- Trends in economic policies
- Trends in social legislation and labour laws

Economy

- Trends in revenue development in the project country
- Development of international trade
- Exchange of goods
- Economic integration
- Protectionism
- Trends in the development of the balance of payments and the foreign exchange rate
- Inflation
- Development of the capital market
- Development of the employment situation
- Expected investments trends
- Fluctuations in the economic development cycles
- Development of the economic sector concerned with the project

PEST Analysis

Social development

- Demographic development in the project country
- Development of important population groups
- Migrations
- Cultural, socio-psychological aspects
- Attitudes towards work
- Leisure-time behaviour
- Attitudes towards the economy
- Attitudes towards automation
- Attitudes towards materials utilized
- Attitudes towards products offered

Technology

- Production technology
- Trends in technology development
- Innovation potential
- Automation and process control
- Innovations in production materials
- Technology substitution
- Cost development
- Recycling technology

PEST Analysis

Examples:

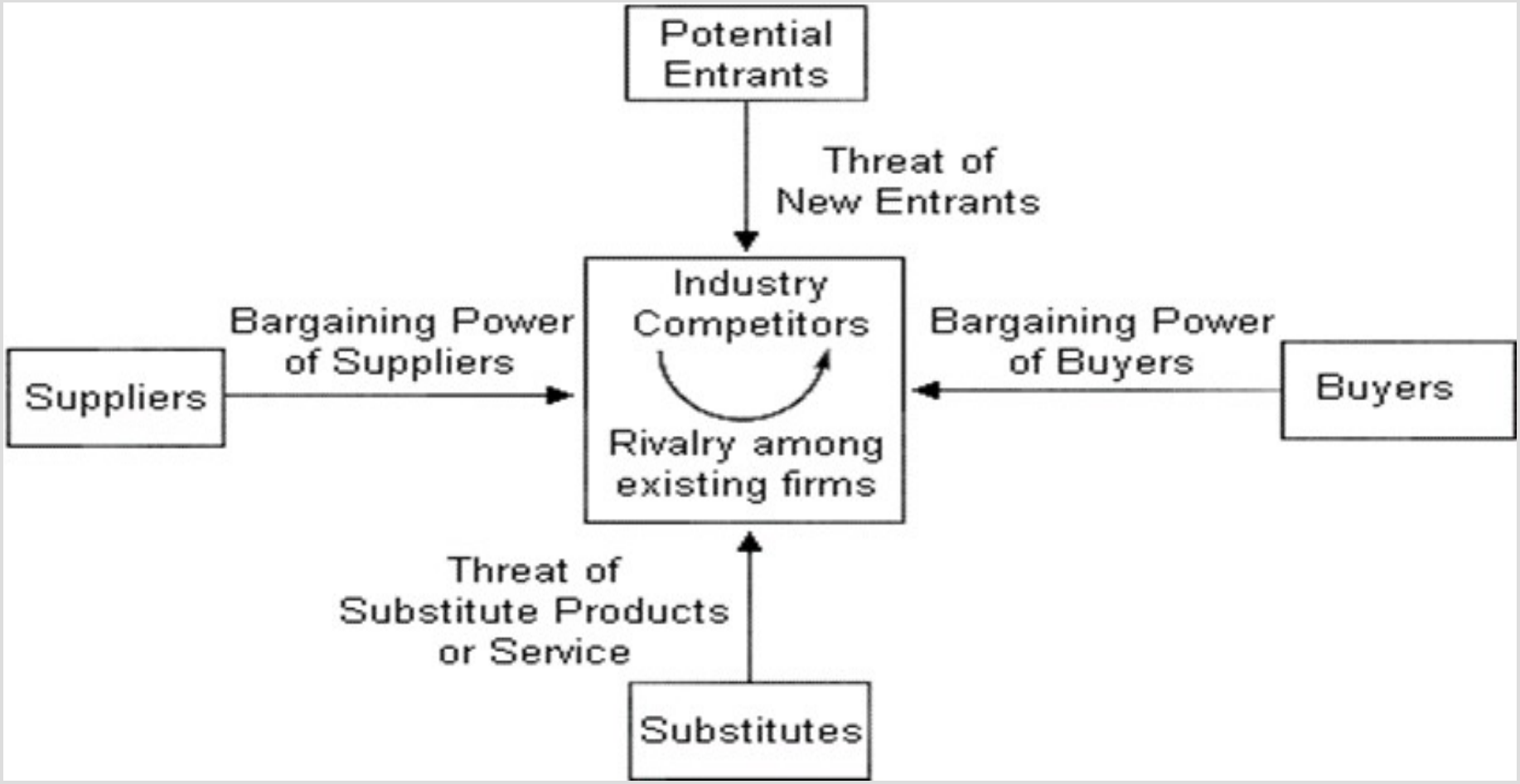
- Growth of China and India as manufacturing centres
- Concern over treatment of workers and the environment in less developed countries who may be suppliers
- The future direction of the interest rate, consumer spending, etc.
- The changing age structure of the population
- The move towards greater political regulation of business
- The effect of more bureaucracy in the labour market

Porter's Five Forces Analysis

Developed by Michael Porter: forces that shape and influence the industry or market the organisation operates in.

- Strength of Barriers to Entry - how easy is it for new rivals to enter the industry?
- Extent of rivalry between firms – how competitive is the existing market?
- Supplier power – the greater the power, the less control the organisation has on the supply of its inputs.
- Buyer power – how much power do customers in the industry have?
- Threat from substitutes – what alternative products and services are there and what is the extent of the threat they pose?

Porter's Five Forces Analysis



SWOT Analysis

- **Strengths** – identifying existing organisational strengths
- **Weaknesses** – identifying existing organisational weaknesses
- **Opportunities** – what market opportunities might there be for the organisation to exploit?
- **Threats** – where might the threats to the future success come from?

Ten places to look for strengths and weaknesses

Area of your business	Strengths	Weaknesses
Processes	High productivity	Slow time to market
Management	Good at acquisitions	Poor staff management
Marketing and sales	Good at direct sales	Poor market research
Other skills	Excellent R&D	Poor maintenance
Experiences	Success overseas	Fingers burnt somewhere
Intellectual property	Branding, trade secrets	Expiring patent
Premises	Excellent location	Unwanted lease
Plant, machinery	Specialist equipment	Worn out plant
Information technology	Good management information	Poor automation
Finance	Good cash flow	Burden of debts

Ten areas where opportunities and threats can arise

Area	Opportunity	Threat
Market	Your market is growing rapidly	Your market is reaching maturity
Industry	Competition is fragmented	Competitors have strong R&D
Industry association	Compliance with standards strengthens your product	Meeting new standards increases costs
Labour market	Locally available skills	Disruptive strikes
Financial markets	Low-cost funds	Higher borrowing costs will reduce customer spending power
Exchange rates	Cheaper imported raw materials	Cheaper competing products
Green (environmental) lobby	Opportunity to sell, say, water saving devices	Cost of anti-pollution legislation
Economic trends	Economic expansion will boost demand	Growing unemployment will reduce demand
Government policies	Tax holiday	Incentives for rival company
Natural disasters	Sell specialized equipment or relief supplies	Loss of production or data

I. Marketing analysis and the marketing concept (outline)

Business Strategy

- Corporate culture
- Vision
- Mission
- Strategic planning

Marketing

- Marketing strategy (STP)
- Marketing mix (4Ps)
- Marketing measures
- Cost of marketing

Sales planning and total revenues

Market Analysis

- Actual Market Volume: current sales in a certain market or market segment and the market potential, or maximum possible demand of the total market.
- Actual Consumption: actual market volume.
- Apparent Consumption: current production plus total imports minus total exports plus the stock difference (initial minus final stock).

Market Analysis

Apparent Consumption =

Production

+ Imports - Exports

+ Initial Stock – Final Stock

Most common factors affecting demand

General economic indicators relating to product demand

- population level,
- population growth rate,
- per capita income,
- per capita consumption,
- gross domestic product per capita,
- gross domestic product annual growth rate, and
- income distribution

Most common factors affecting demand

Government policies

- practices and legislation related to consumption, production, imports and exports of the products in question,
- standards,
- restrictions,
- duties, taxes,
- subsidies or incentives,
- credit control, and
- foreign exchange regulations

Marketing Data Projection

- Quantitative data

  - All figures produced with statistical methods about

    - Volumes
    - Prices

      (per product, geographical area, type of consumer etc.)

- Qualitative data

  - Data about marketing and supply chain
  - Consumers' behaviour
  - Legislations and regulations about the product

Data Collection

Primary data

Makes use of all the statistical data collected by the firm and by other firms/organisations to help inform decision making

- Market research
- Surveys
- Past sales data
- Market growth data
- Specialist analyst data
- Time-series analysis

Secondary data

Time-Series Analysis

- Used to analyse movements of a variable over a time period – usually years, quarters, months, etc.

- Importance of assessing the:
  - Trend
  - Seasonality
  - Key moments

Demand Forecasting

- Data from several years can give accurate guides to future performance
- Statistical techniques can make the data informative and useful
- All depends on the quality of the data and the accuracy of the techniques used to analyse the data

Demand Forecasting

The following techniques may be used for demand forecasting:

- The trend (extrapolation) method
- The consumption-level method
- The end-use (consumption coefficient) method
- Regression models
- The leading indicator method

Demand Forecasting

The trend (extrapolation) method

The trend method, a quite common technique is based on the extrapolation of past data, and involves the determination of a trend and the identification of its parameters.
Two of the alternative trend curves for forecasting are indicated below:

Arithmetic (linear) trend. The equation is:

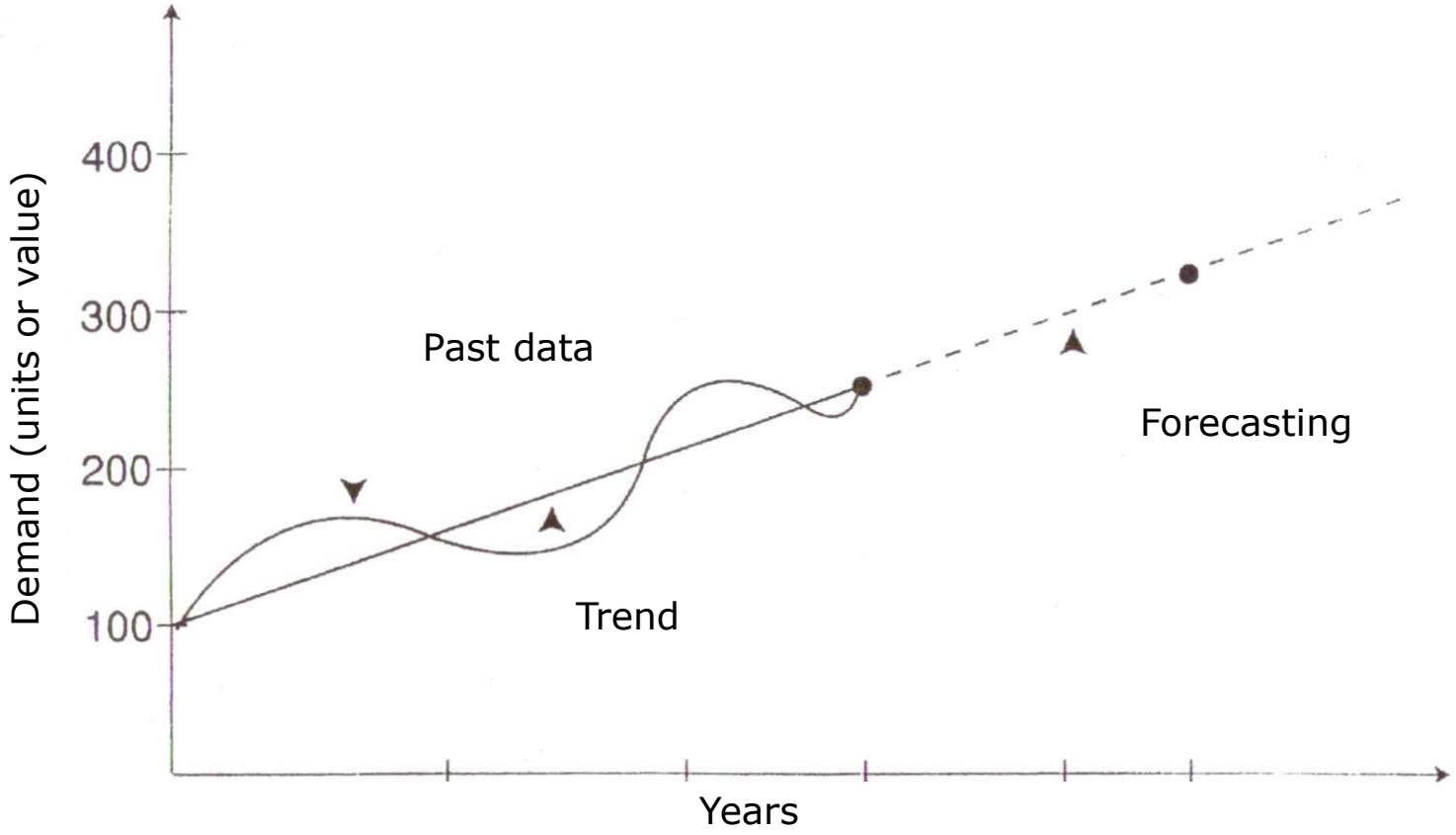
$Y=a + bT$
where Y is the variable being forecast, and T is to be estimated.

Exponential (semi-log) trend. The equation is:

$Y = a \, . \, e^{bT}$

or $lnY= lna+ bT$

This trend assumes a constant growth rate b within each period.


Demand (units or value)
400
300
200
100
Past data
Trend
Forecasting
Years

Demand Forecasting

The consumption-level method

The consumption-level method considers the level of consumption, using standard and defined coefficients, and can be usefully adopted for consumer products.

A major determinant of consumption levels is consumer income, influencing, *inter alia,* the household budget allocations which consumers are willing to make for a given product.

With few exceptions, product consumption levels demonstrate a high degree of positive correlation with the income levels of consumers.

For instance, the demand for cars can be estimated by determining the coefficients of car ownership among identified income levels.

Demand Forecasting

The end-use (consumption coefficient) method

The end-use or consumption coefficient method is particularly suitable for assessing intermediate products. It involves the following:

- All possible uses of a product are identified, including, for example, input to other industries, direct consumption demand, imports and exports;

- The input-output coefficient of the product and the industries using the product are obtained or estimated. It is then possible to derive the demand for a product, that is, for consumption plus its exports and net of imports, from the projected output levels of the consuming industries.

The end-use (consumption coefficient) method

Vehicle	*Annual petrol consumption per vehicle (thousand litres)*
Private cars	3.20
Taxis	8.60
Commercial vehicles using petrol	11.20
Scooters, motor cycles, three-wheelers	0.12
Other uses (10 per cent of figure for private cars)	0.32

The end-use (consumption coefficient) method

Forecast of petrol consumption

Vehicle	*2018*		*2019*		*2020*	
	Thousand cars	*Million litres*	*Thousand cars*	*Million litres*	*Thousand cars*	*Million litres*
Private cars	110	352	150	480	210	672
Taxis	40	344	60	546	90	774
Commercial vehicles	80	996	110	1 232	140	1 568
Two-wheeled vehicles (scooters etc.)	280	37	410	49	700	84
Others	..	35	..	48	..	67
Total	510	1 764	730	2 355	1 140	3 165

Demand Forecasting

Regression models

In the regression technique, forecasts are made on the basis of a relationship estimated between the forecast (or dependent variable and the explanatory (or independent) variables.

Different combinations of independent variables can be tested with data, until an accurate forecasting equation is derived.

Unfortunately, projection of the independent variables is difficult.

For instance:

$$Q_X = a + b.P_X + c.I + d.P_Y + e.P_S + f.A + \ldots$$

Demand Forecasting

The leading indicator method

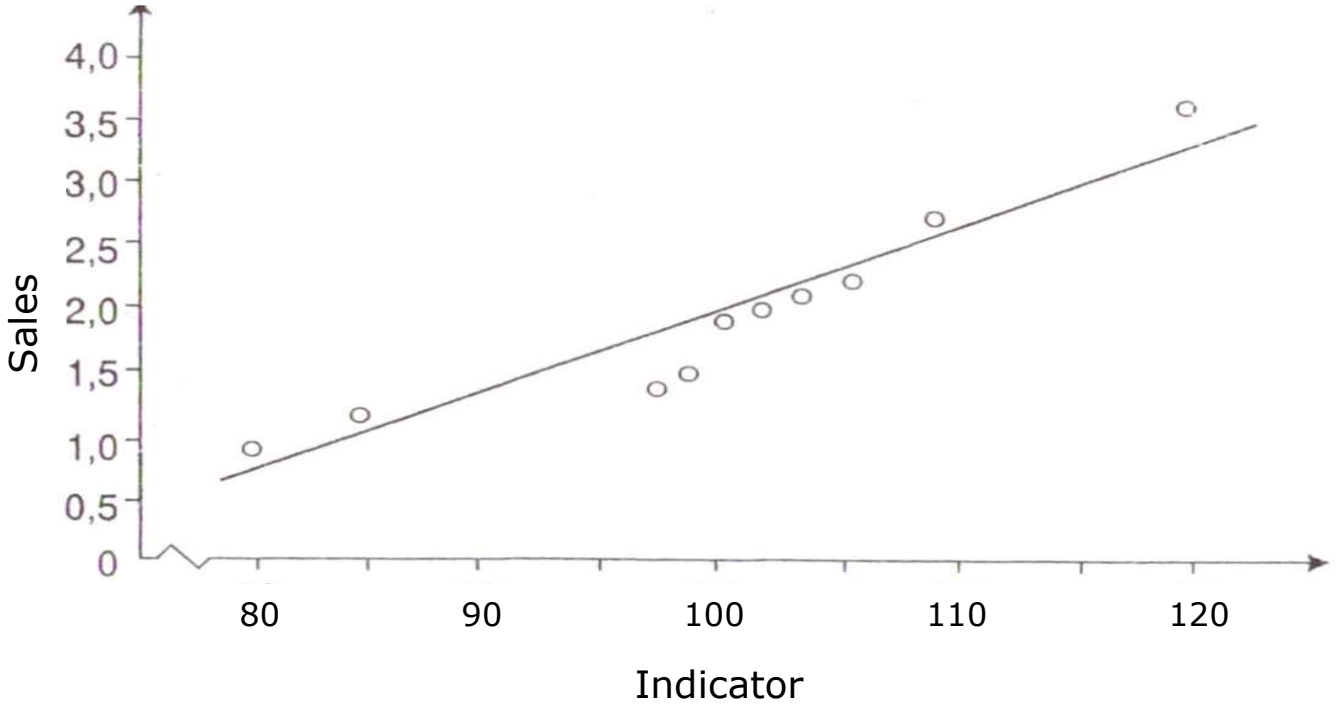
The leading indicator method is a variant of the consumption-coefficient and regression methods. Leading indicators are variables that react to change before, and which can be used to predict, other variables.

For instance, the demand for electric fans might be found to lag, for instance, two years behind the housing investment of various agencies.

To use these indicators for forecasting purposes, at first the appropriate leading indicators would have to be identified, and then the relationship between them and the variable being forecast is determined.

The leading indicator method

Year	Sales (10.000 units)	Indicator
1	2,1	104
2	1,9	101
3	2,3	106
4	1,5	99
5	1,2	95
6	2,7	109
7	3,6	120
8	1,4	98
9	0,9	90
10	2,0	103



The leading indicator method

Business Strategy

- Corporate culture

  The beliefs and values shared by people who work in an organisation

  - How people behave with each other
  - How people behave with customers/clients
  - How people view their relationship with stakeholders
  - People's responses to energy use, community involvement, absence, work ethic, etc.
  - How the organisation behaves to its employees – training, professional development, etc.

  - Vision – where the organisation wants to go in the future
  - Mission Statement – summary of the beliefs of the organisation and where it is now

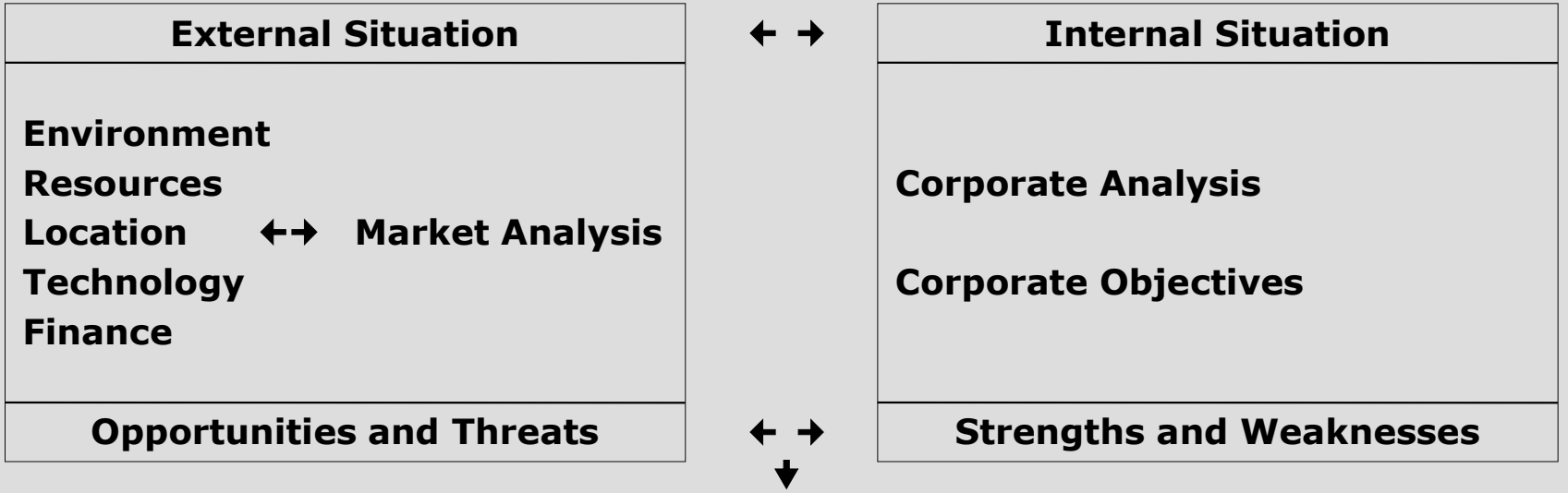
- Strategic planning

Ten common central objectives

1. Maximizing shareholder value.
2. Maximizing profitability (watch for managers with profit-related bonuses).
3. Maximizing dividend pay-outs (there goes the working capital).
4. Maximizing market share (common in Japan).
5. Maximizing total assets.
6. Minimizing excitement and risks – perhaps so that the chief executive has an easy ride during his or her final few years in charge.
7. Positioning the company as a takeover target – so that the owner(s) can make a quick capital gain.
8. Building an empire measured by the number of employees, the range of international subsidiaries or some other ego-inflating statistic.
9. Prudence – financial companies often pursue stability and growth.
10. Maximizing some altruistic vision – such as social welfare.

Outline of the project strategy and the marketing concept

ASSESSING THE PROJECT SITUATION - ANALYSING THE INITIAL POSITION

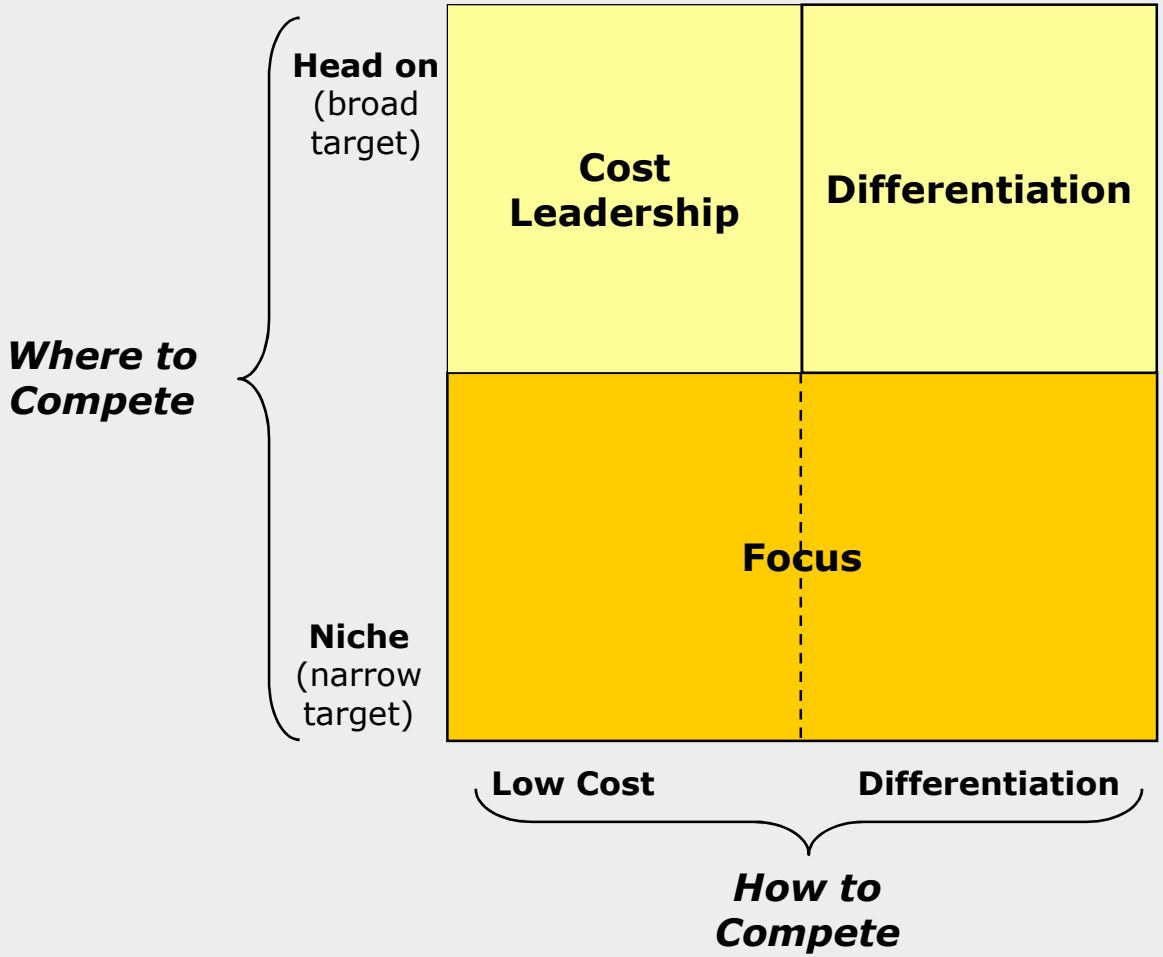


Determination of the project strategy

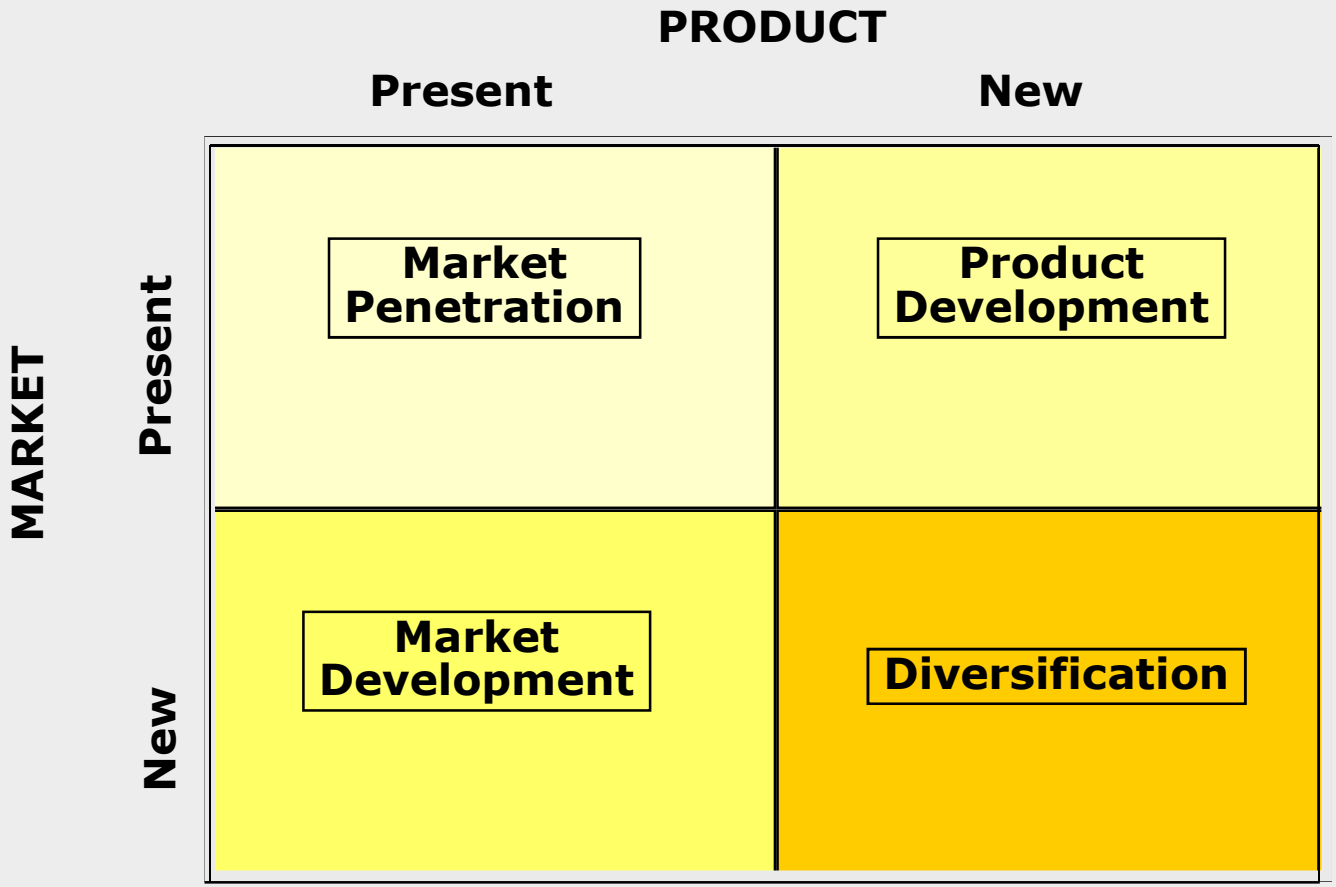
The following problems should be addressed:

- **Geographical area**
- **Basic strategy (Porter Matrix)**
- **Market share**
- **Product-market relation (Ansoff Matrix)**

Porter Matrix



Ansoff Matrix



Strategy of cost leadership

Assets usually required for a cost leadership strategy:

- High investment capacity, that is, access to capital
- Process innovations and improvements
- Thorough supervision of labour force
- Products designed for easy manufacturing
- Low-cost distribution system

Differentiation strategy

Assets usually required for a differentiation strategy:

- Powerful marketing potential
- Strengths in research and development
- Customer groups with higher purchasing power
- Parts of the product line
- Tradition in the industry
- Cooperation with supply and distribution channels.

Strategic Planning

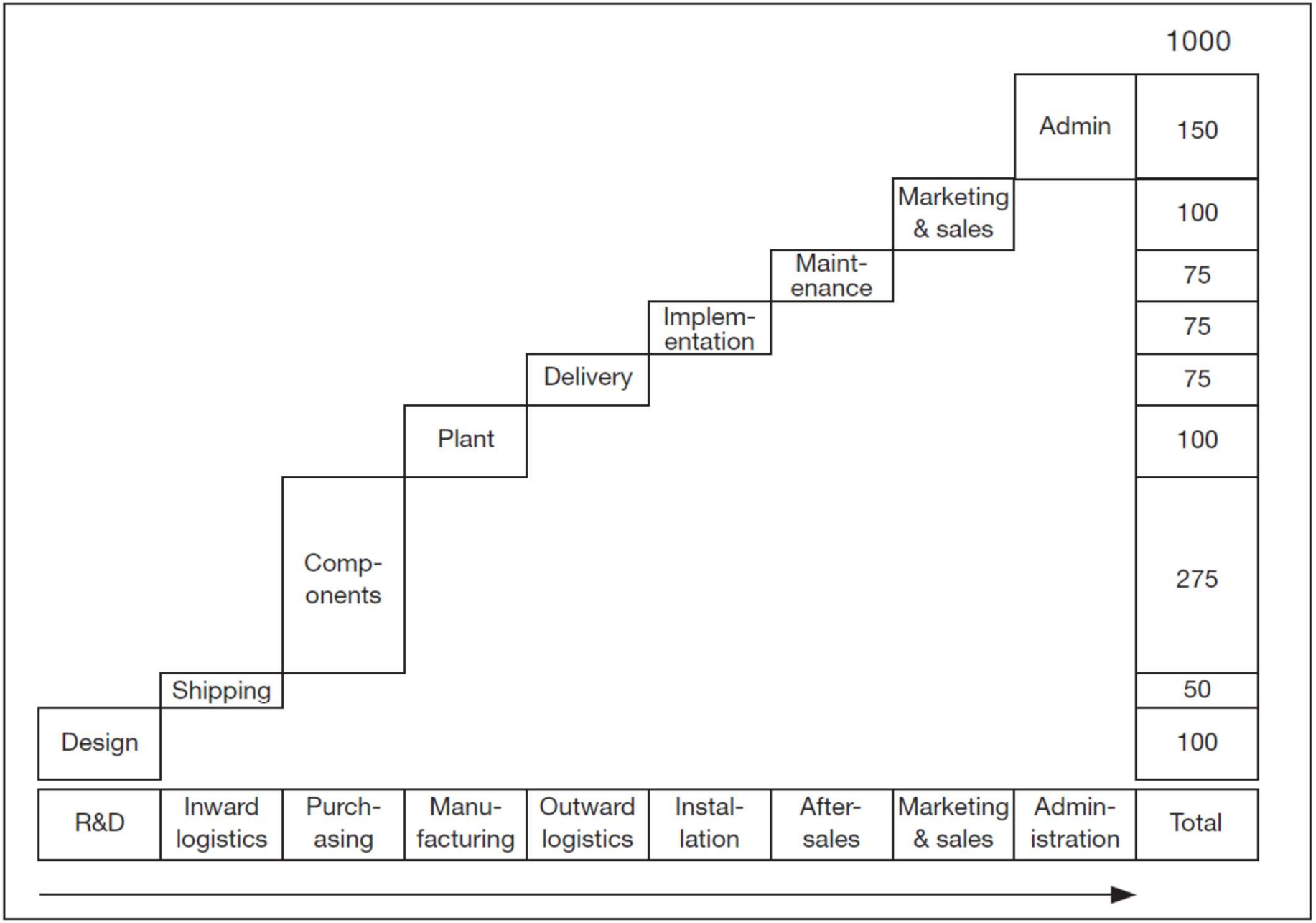
Adding Value – looking at ways to add value

Competitive Advantage –seeking to identify sources of competitive advantage

Core competencies – What is the business good at and recognised for?

Strategic intend – The long-term goal of the business

A sample value ladder



Competitive Advantage

Assess which strengths have potential to be sustainable competitive advantage

- Rare
- Valuable
- Durable
- Inimitable

} Competitive Advantage

} *Sustainable* Competitive Advantage

Resources are difficult (or impossible) to imitate when they are:

- Tacit
- Path dependent
- Socially complex
- Causally ambiguous

Choosing the Right Competitive Advantages

Criteria for Determining Which Differences to Promote:

- Important
- Distinctive
- Superior
- Communicable
- Pre-emptive
- Affordable (to company and consumer)
- Profitable

Moral: Avoid meaningless differentiation.

Twelve sources of competitive advantage

1. Strong research and development capabilities.
2. Access to intellectual property – trade names, trade secrets, patents, copyright, etc.
3. Exclusive re-selling or distribution rights.
4. Ownership of capital equipment (specialist machinery, exploration equipment, delivery fleets, surplus capacity).
5. Superior product and/or customer support.
6. Low cost (and perhaps high volume) production.
7. Other economies of scale.
8. Superior databases, management information, and data processing ability.
9. Marketing skills related to specific customer types (e.g., defence), market segments (teenagers), channels (retail, telesales), etc.
10. Access to working capital.
11. Other excellence in management, operations, administration, etc.
12. Barriers to entry.

Identifying Core Competencies

Core Competencies: A set of integrated and harmonized abilities that distinguish the firm in the marketplace.

- Competencies typically combine multiple kinds of abilities.
- Several core competencies may underlie a business unit.
- Several business units may draw from same competency.
- Core competencies should:
  - Be a significant source of competitive differentiation
  - Cover a range of businesses
  - Be hard for competitors to imitate

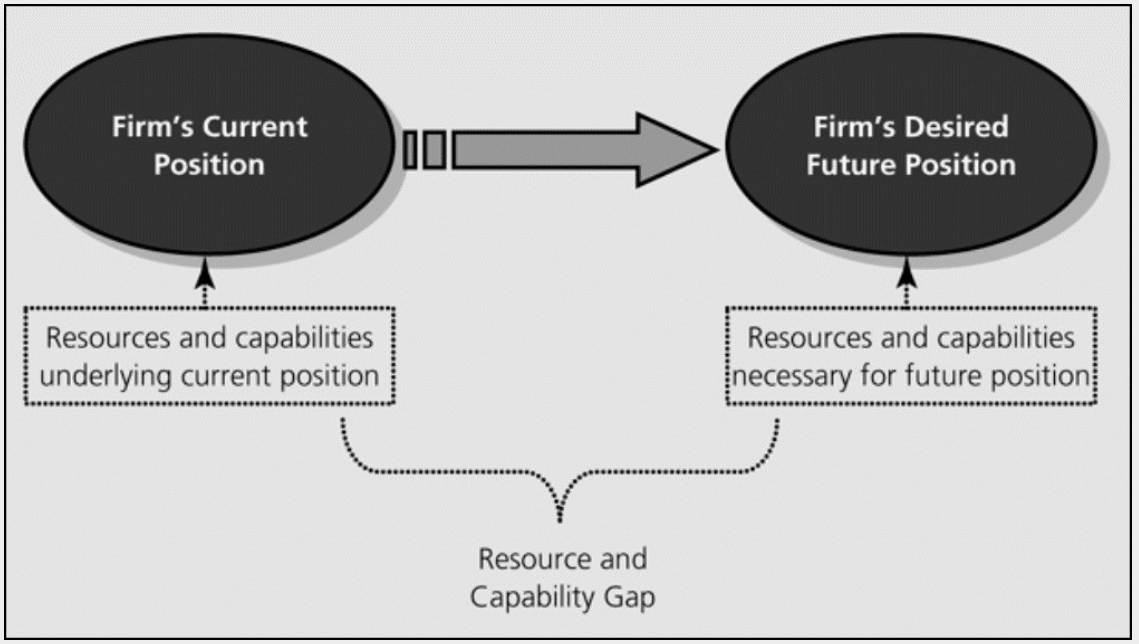
Fifteen areas where you might find competencies

1. R&D capability.
2. Product development.
3. Management of supplies/suppliers.
4. Production.
5. Capacity management.
6. Inventory control.
7. Branding.
8. Management of channels-to-market.
9. Market research/understanding.
10. Sales techniques/account management.
11. Information management.
12. Negotiating.
13. Corporate acquisitions.
14. International operations.
15. Specific areas of management expertise.

Strategic Intent

Strategic Intent: A long-term goal that is ambitious, builds upon and stretches firm's core competencies, and draws from all levels of the organization.

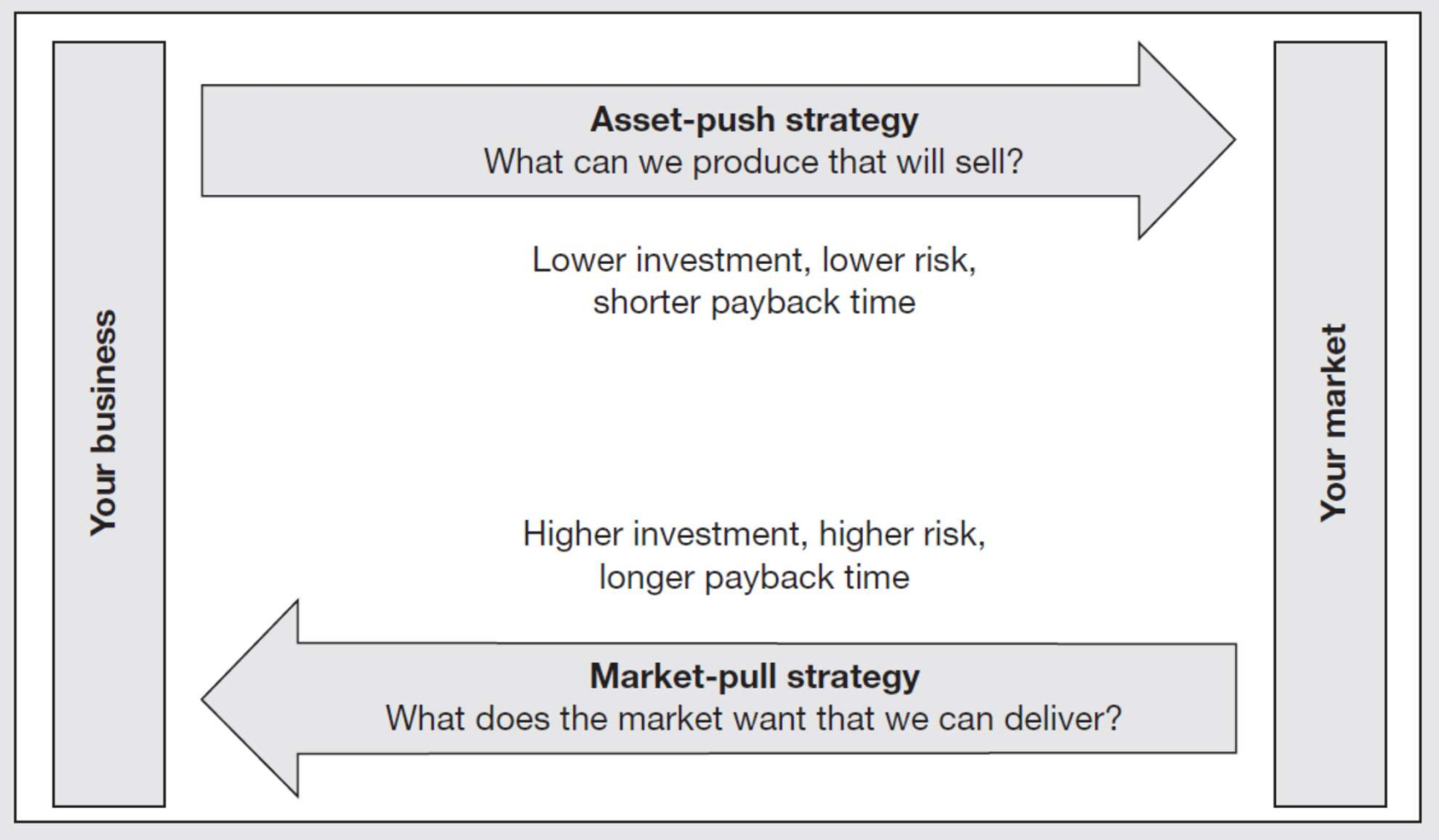
- Typically looks 10-20 years ahead, establishes clear milestones
- Firm should identify resources and capabilities needed to close gap between strategic intent and current position.



Marketing

There are two basic marketing concepts:

- Asset-Push Marketing
- Market-Pull Marketing



Asset-Push Marketing

- An asset-push business aims to use the core-competence of a business in developing new products and services
- Those assets may be human, physical or intangible assets, e.g.
- Physical Assets
  - Distribution
  - Manufacturing base
  - Global reach
- Intangible Assets
  - Brand name
  - Image
  - Personnel
- Core Competence – what the business sees itself as being 'good at'

Market-Pull Marketing

- A market–pull business has its focus purely on the needs of the customer
- The business is highly responsive to the needs of consumers – it has a focus on market research as a means of identifying those needs
- Basic principles:
  - The customer is king!
  - Customer service is paramount
  - Needs of consumers uppermost in new product development
  - Customer servility – being a 'slave' to the customer
  - Do not contemplate the cost of doing something to meet customer needs, contemplate the cost of ***not*** doing it!

Marketing Strategy Basics

STP
Segmentation
Targeting
Positioning

Segmentation, Targeting and Positioning

The idea is that (typically) we can’t be all things to all people

There is not one product/service that is ideal for all consumers

Segmentation

Market segment:

A group of customers who share a similar set of needs and wants

Segmentation

- Process of subdividing a total market into different subsets or groups.
- Where the marketer may select one or more segments.
- To be reached with an appropriate marketing mix.

Market Segmentation

Levels of Market Segmentation

- Mass Marketing *(no segmentation)*

  Same product to all consumers

- Segment Marketing *(some segmentation)*

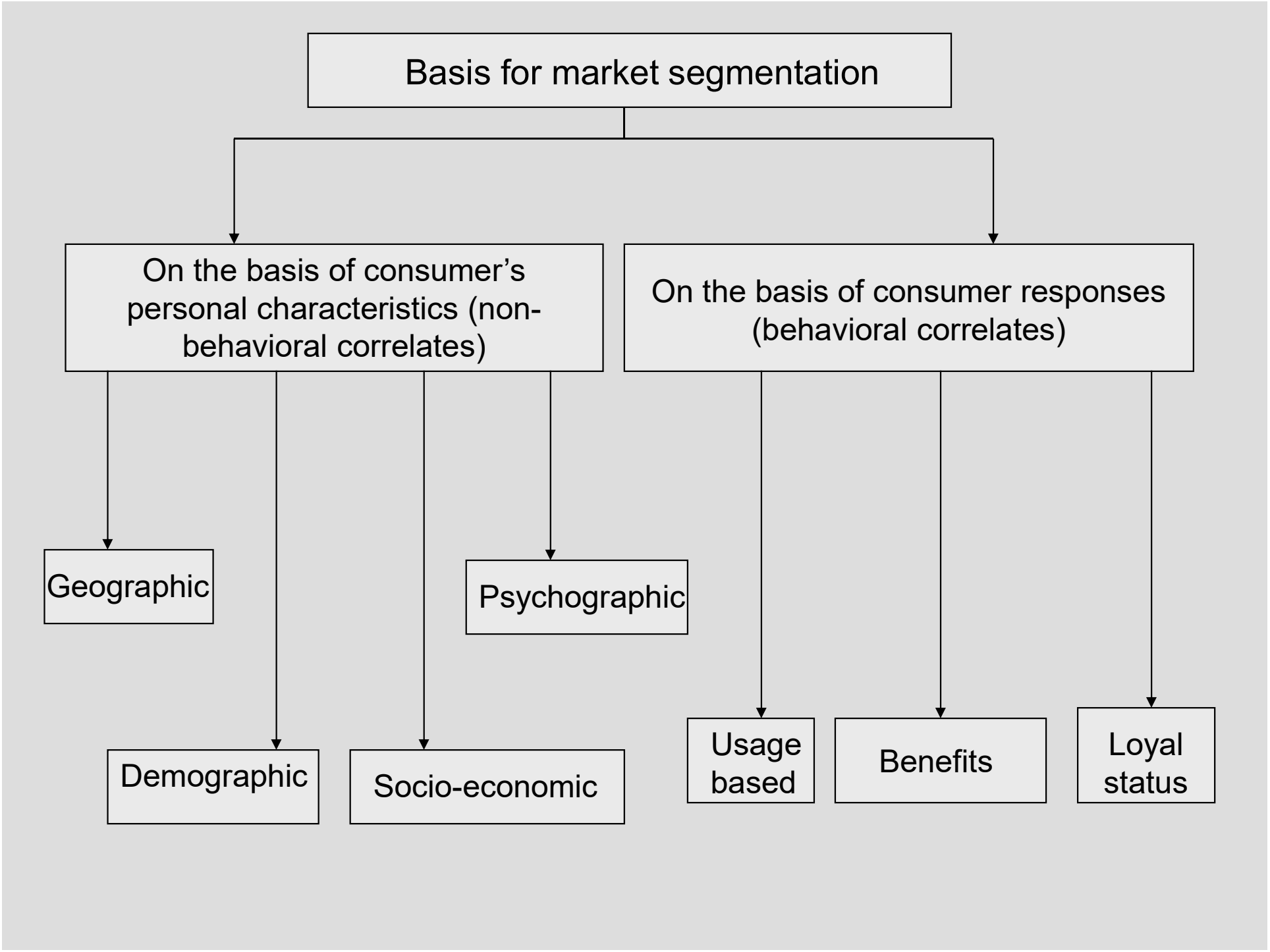
  Different products to one or more segments

- Niche Marketing *(more segmentation)*

  Different products to subgroups within segments

- Micromarketing *(complete segmentation)*

  Products to suit the tastes of individuals or locations


Basis for market segmentation
On the basis of consumer's personal characteristics (non-behavioral correlates)
On the basis of consumer responses (behavioral correlates)
Geographic
Demographic
Socio-economic
Psychographic
Usage based
Benefits
Loyal status

Geographic Segmentation

- Subdividing the whole market into different geographical units which can be further sub-divided into smaller units.
- Subdividing the market into different geographical units such as…

  Region of the world or country

  City or country size

  Climate.

Demographic Segmentation

- Subdividing the market in terms of demographic features of a country or a region.
- Demographic data is essential for estimating the size of the target market.
- Variables that may be considered are age, gender, marital status, family size, family life cycle, household type, income/ expenditure patterns, occupation, education, socioeconomic status, religion, nationality/race/ethnic group etc.

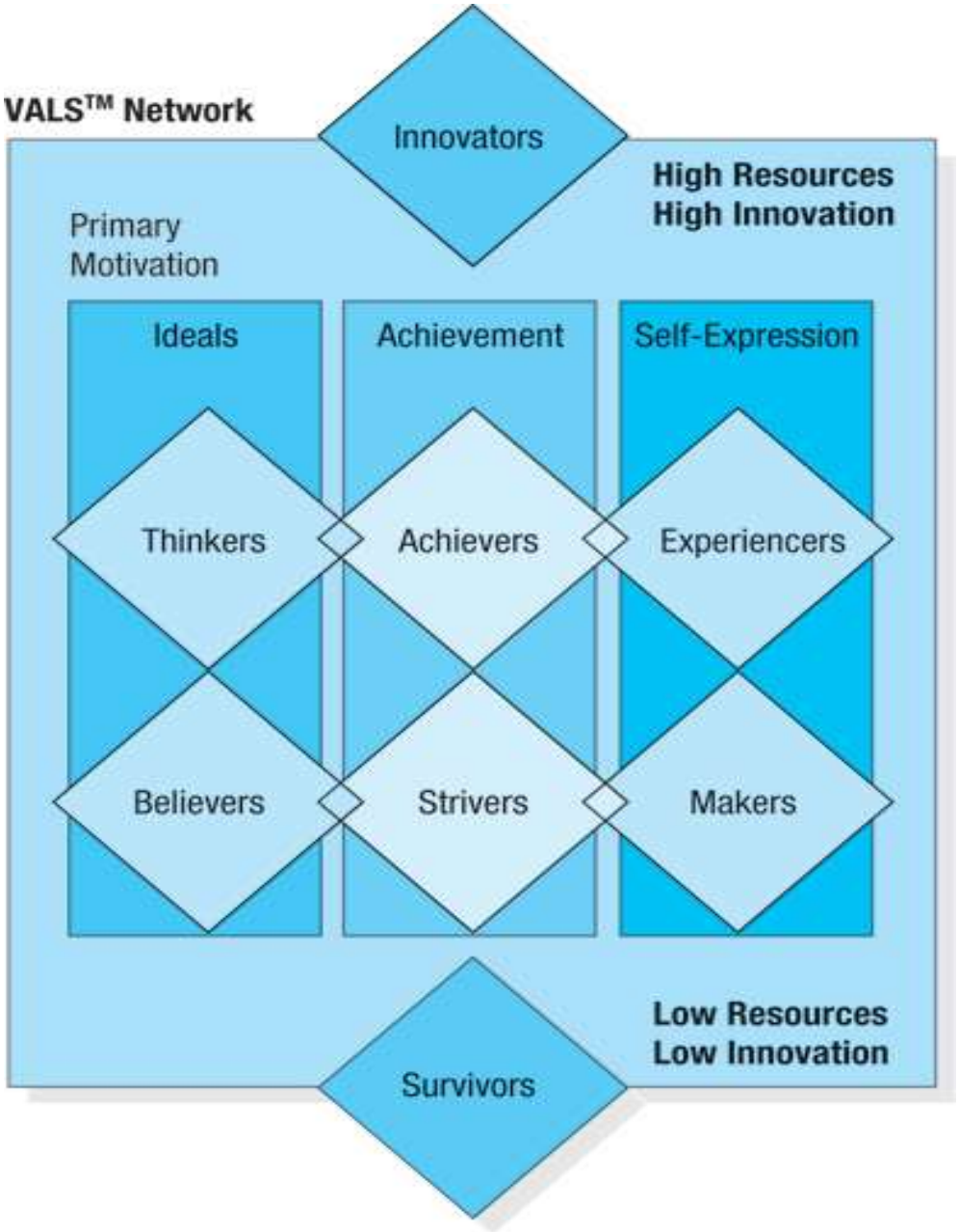
Socio-economic segmentation

- Variables that may considered for market segmentation are income, occupation, education, religion, social classes, etc.
- This segmentation is used for durable products such as automobiles, PCs, etc.

Psychographic segmentation

- Sub division of different groups on the basis of personality, life style and values.
- Marketers of cosmetics, textiles, fast food providers etc. must understand the life style of the target market.
- Automobile manufacturers must consider different personality traits in dividing the market.

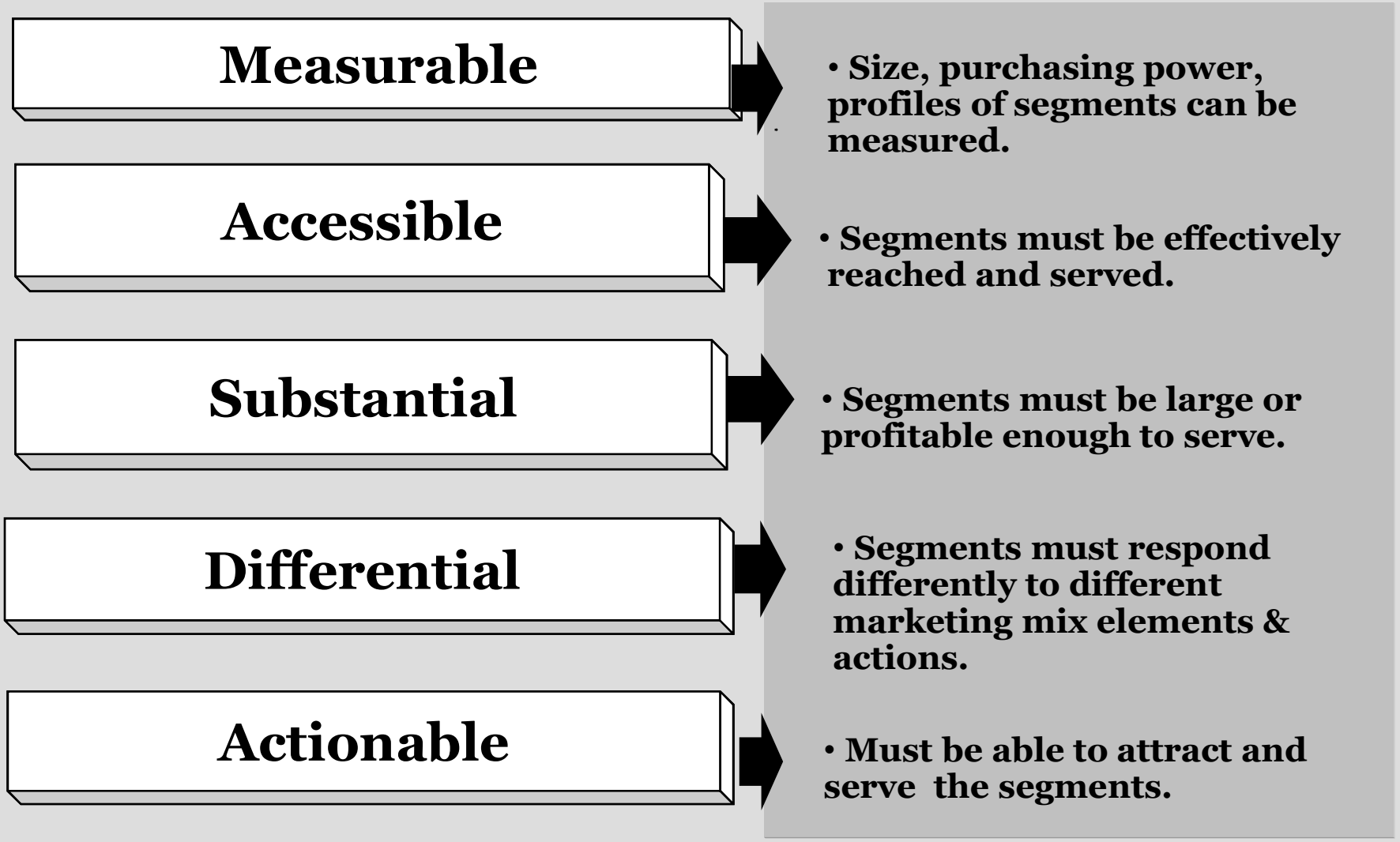
Psychographic segmentation



Behavioral Segmentation

- Occasion
  - Special promotions & labels for holidays.
  - Special products for special occasions.
- Benefits Sought
  - Different segments desire different benefits from the same products.
- Loyalty Status
  - Nonusers, ex-users, potential users, first-time users, regular users.
- Usage Rate
  - Light, medium, heavy.

Evaluation of segmentation



Ten examples of market segmentation

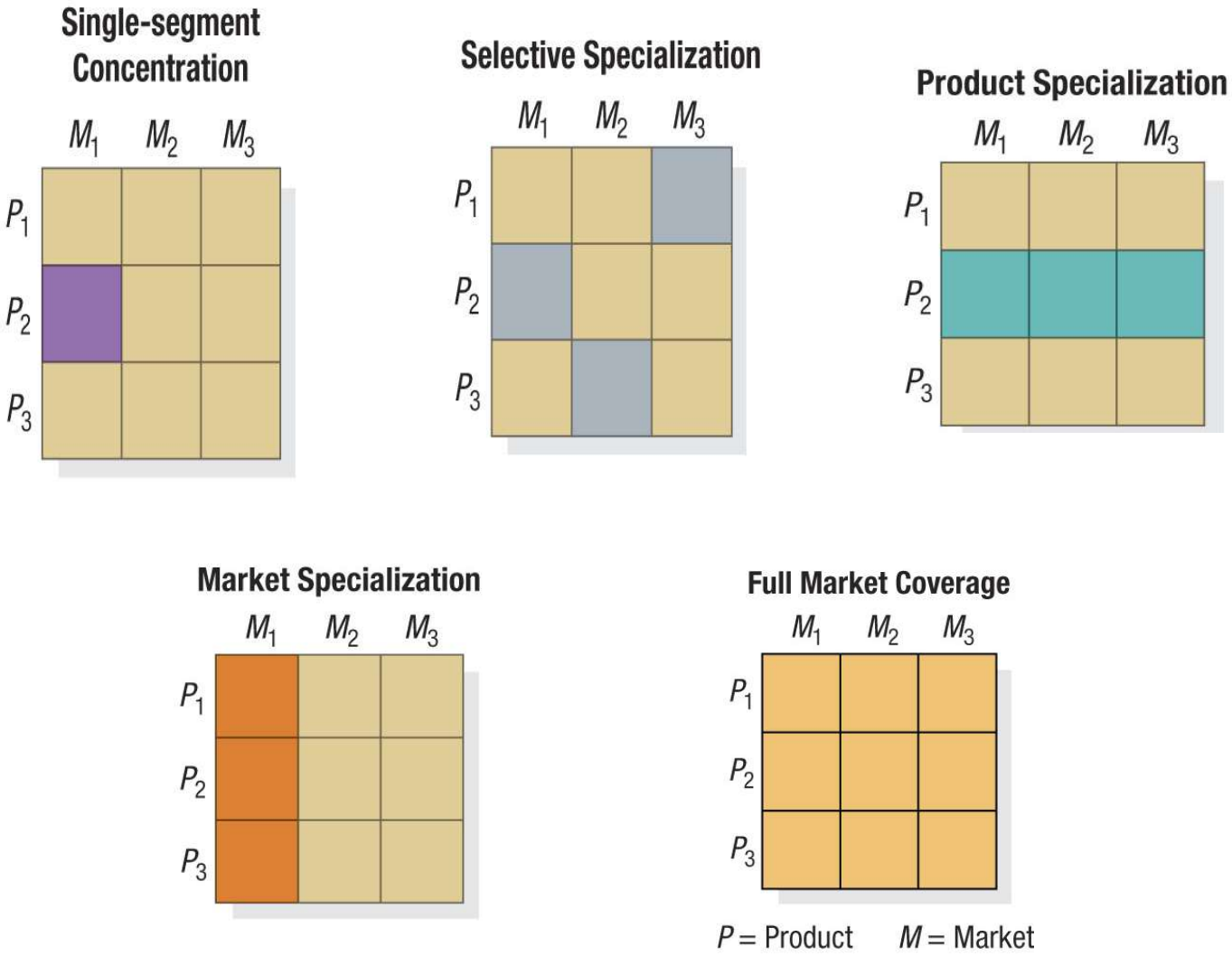
Variable	Consumer	Industrial
Business activity	by occupation	by industry sector
Size	family, house	employees, assets, turnover
Location	city, rural, region	region, country
Resources	income groups	assets, profits
Attitudes	supporter, neutral	risk averse, quality seeker
User benefits	saves money	increases efficiency
Relationship	existing buyer	existing customer
Buying practices	impulse, regular user	centralized, decentralized
Financing	hire purchase	leasing
Loyalty	frequent buyer	repeat orders

Targeting

- Once the firm has segmented the total market ,it should select the target market segment or segments for marketing.

- Investing in a particular segment should be sensible in terms of company's mission, objectives, skills and resources.

Patterns of Target Market Selection: Product x Market Matrices



Market Positioning

- Positioning of a product or service is creating an "image" in the consumers' mind.
- Consumers generally buy "images" rather than actual product.
- Marketers mostly use advertising as a tool to build up brand or corporate "image".

Positioning Example

To *(target segment and need)*

our *(brand)* is a *(concept)* that

(point-of-difference).

"To busy mobile professionals who need to always be in the loop, Blackberry is a wireless connectivity solution that allows you to stay connected to people and resources while on the go more easily and reliably than the competing technologies."

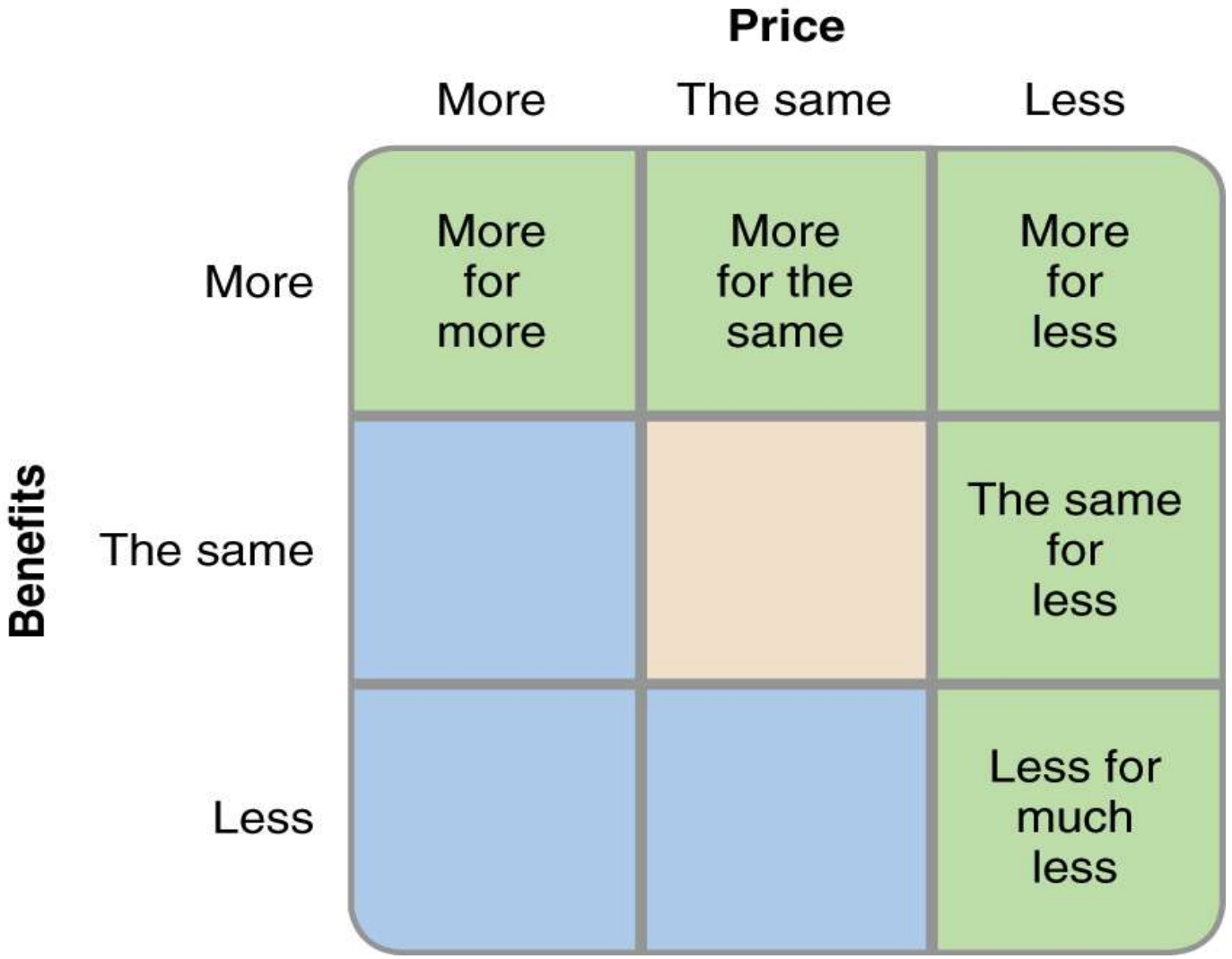
Positioning strategies

Sl. no.	Positioning strategies	Definition	Advertising claims
1.	Customer benefits	Associate a brand or product with customer benefits	Benefit(s)
2.	Price and quality	A product is highlighted in terms of service features or performance. Manufacturer charges high price	Value for money
3.	Application	Associating a product or service with a use or application	Use or application of a product or services.
4.	Product user	Associating a product or service with a user or class of users.	Cine stars or sports heroes using the product

Positioning strategies

Sl. no.	Positioning strategy	Definition	Advertising claims
5	Product class	Associating a product or service in a particular product class	World class products
6	Cultural symbols	Associating cultural symbols with a product or service to differentiate from competitors product	Royal
7	Competitors	Associating with competitor’s product or service by comparison	Compares with competitors brand

Generic Product Positions & Value Propositions



The Marketing Mix

The Marketing Mix

- The tools available to a business to gain the reaction it is seeking from its target market in relation to its marketing objectives
- 4Ps – Product, Promotion, Place, Price
- Traditional 4Ps extended 7Ps to encompass growth of service industry: Product, Promotion, Place, Price, People, Process, Physical Environment

The Marketing Mix

Blend of the mix depends upon:

- Marketing objectives
- Type of product
- Target market
- Market structure
- Rivals' behaviour
- Global issues – culture/religion, etc.
- Marketing position
- Product portfolio

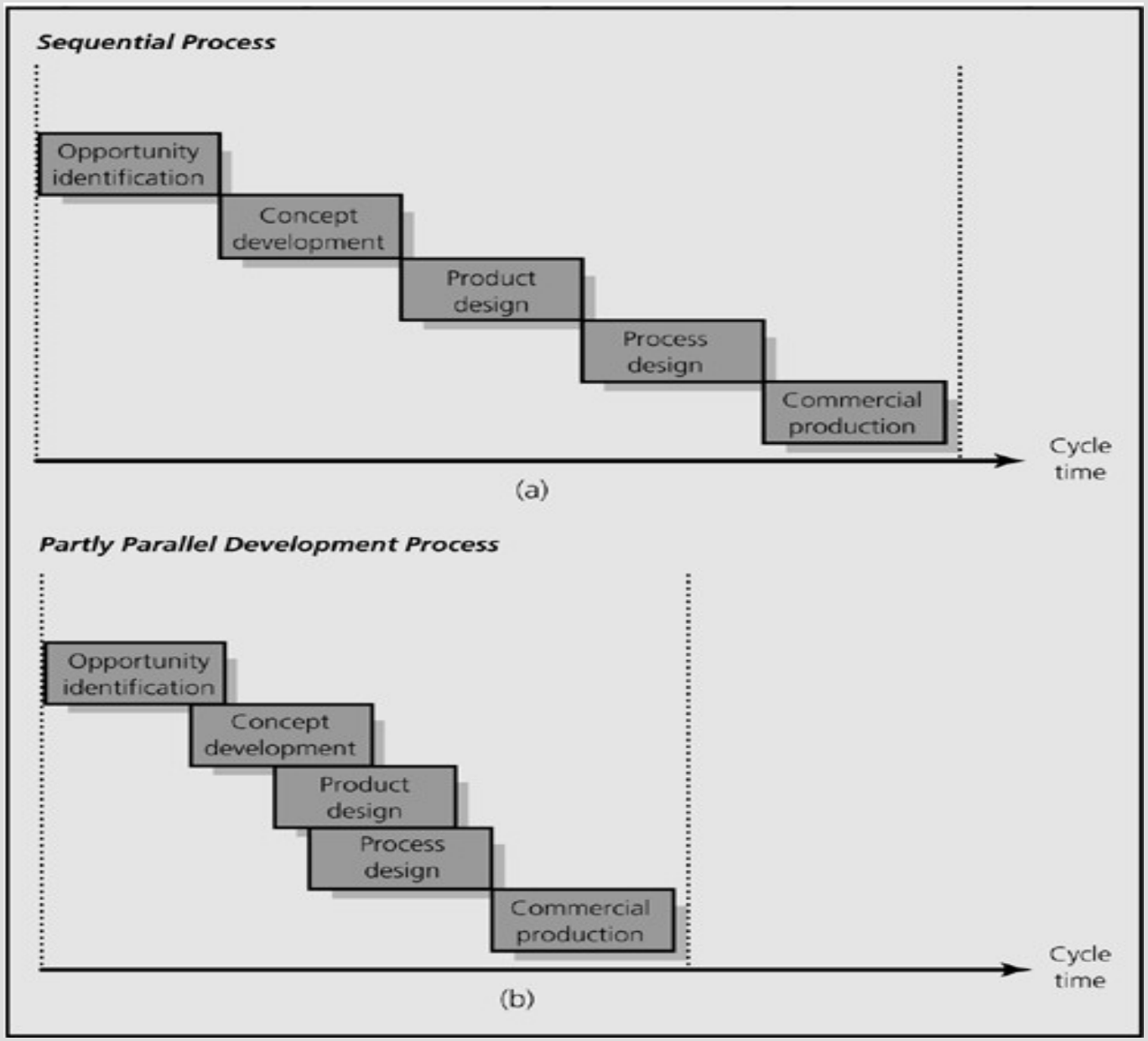
The New Product Development (NPD) Process

NPD Overview

Key objectives of the new product development process are:

- **maximizing fit with customer requirements,**
- **minimizing cycle time,** and
- **controlling development costs**.

Sequential versus Party Parallel Development Processes



Involving Customers and Suppliers in the Development Process

Involving **customers** and **suppliers** in the development process may ensure that products fulfill **customer performance/price requirements**, and help **control costs** while speeding up development.

Tools for Improving the New Product Development Process

Stage-Gate Processes

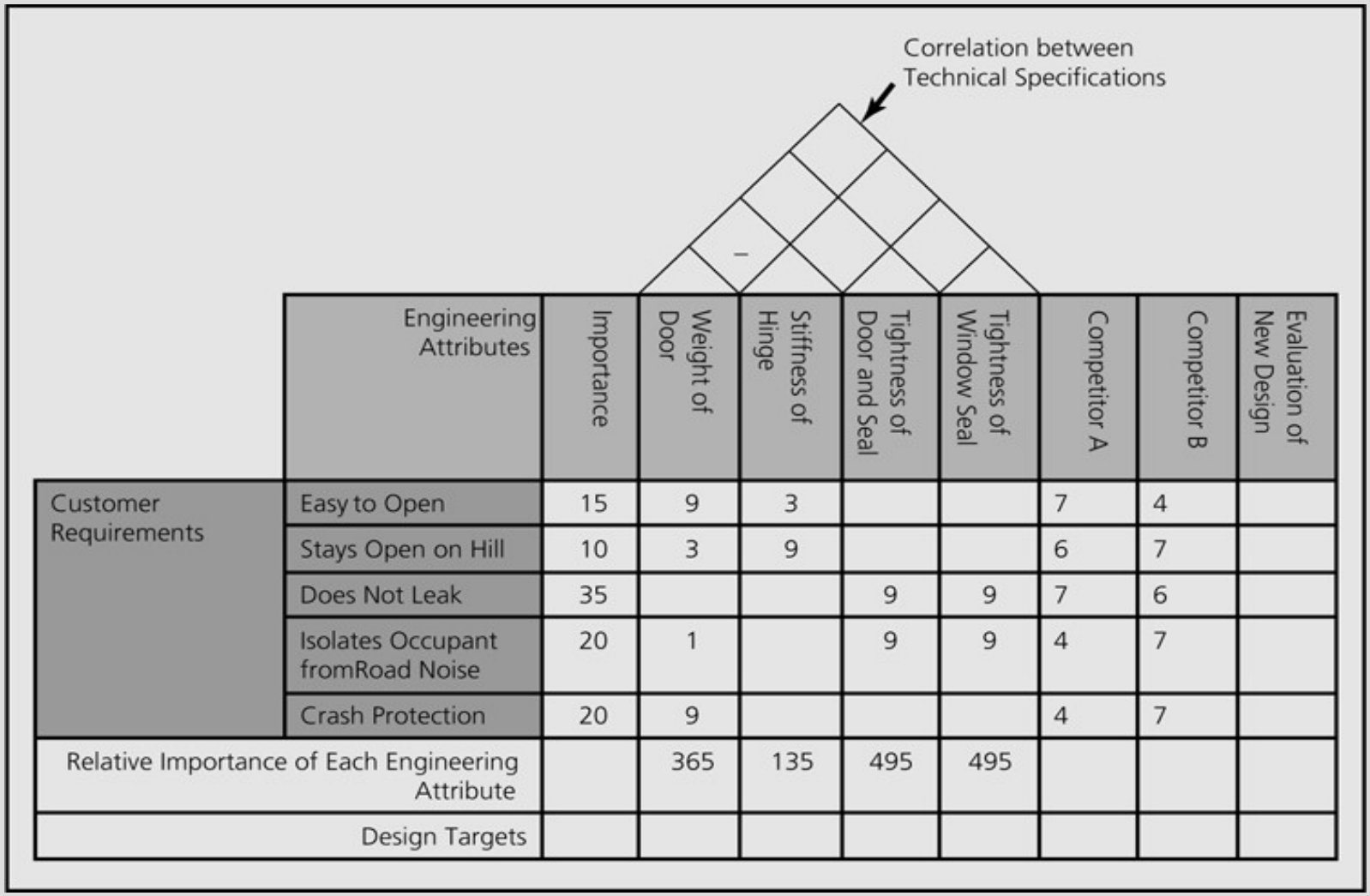
- The **Stage-Gate Processes** applies a **tough multi-functional review** at the end of each stage of the design process to ensure that only those projects demonstrating increasing certainty with regard to success move forward.
- Prior to moving to the next stage the project must clear a **Go/Kill gate** at which 3 components are reviewed: **deliverables** (i.e. results of the previous stage and inputs for the review), **criteria** (i.e. questions or metrics used to make Go/Kill decision) and **outputs** (i.e. results of the gate review process).
- This is important since risks and costs escalate as a project proceeds.

Tools for Improving the New Product Development Process

IDEA	SCOPING	BUILDING BUSINESS CASE	DEVELOPMENT	TESTING & VALIDATION	LAUNCH	POST-LAUNCH REVIEW
	GATE 1 Idea Screen Does the idea merit any work?	GATE 2 Second Screen Does the idea justify extensive investigation?	GATE 3 Decision to Develop Is the business case sound?	GATE 4 Decision to Test Should the project be moved to external testing?	GATE 5 Decision to Launch Is the product ready for commercial launch?	
	STAGE 1 • Preliminary market assessment • Preliminary technical assessment • Preliminary financial and business assessment • Action plan for Stage 2	STAGE 2 • User needs and wants study • Competitive analysis • Value proposition defined • Technical feasibility assessment • Operations assessment • Product definition • Financial analysis	STAGE 3 • Technical development work • Rapid prototypes • Initial customer feedback • Prototype development • In-house product testing • Operations process development • Full launch and operations plans	STAGE 4 • Extended in-house testing • Customer field trials • Acquisition of production equipment • Production trials • Test market/trial sell • Finalized launch and operations plans • Post launch and life cycle plans	STAGE 5 • Market launch and rollout • Full production • Selling begun • Results monitoring • Post launch and life cycle plans under way	How did we do vs. projections? What did we learn?

Quality Function Deployment – The House of Quality

QFD improves communication and coordination between engineering, marketing, and manufacturing.



	Engineering Attributes	Importance	Weight of Door	Stiffness of Hinge	Tightness of Door and Seal	Tightness of Window Seal	Competitor A	Competitor B	Evaluation of New Design
Customer Requirements	Easy to Open	15	9	3			7	4	
	Stays Open on Hill	10	3	9			6	7	
	Does Not Leak	35			9	9	7	6	
	Isolates Occupant fromRoad Noise	20	1		9	9	4	7	
	Crash Protection	20	9				4	7	
Relative Importance of Each Engineering Attribute			365	135	495	495			
Design Targets									

Quality Function Deployment - The House of Quality

Steps for QFD

1. Team identifies customer requirements.
2. Team weights requirements in terms of relative importance.
3. Team identifies engineering attributes that drive performance.
4. Team enters correlations between different engineering attributes.
5. Team indicates relationship between engineering attributes and customer requirements.
6. Team multiplies customer importance rating by relationship to engineering attribute and then sums for each attribute.
7. Team evaluates competition.
8. Using relative importance ratings for engineering attributes and scores for competing products, team determines design targets.
9. Team evaluates the new design based on the design targets.

Design for Manufacturing

- **Design for manufacturing** ensures that **issues of manufacturability** are considered **early in the design phase**. It is usually done by engineering and manufacturing **agreeing on a set of design rules**.

  When the rules are followed, products are easier to manufacture, development cycle time is shortened, costs are reduced and quality increases, all with a concurrent increase in customer satisfaction.

Promotion

Promotional measures will be required by the investment project,

- first, for entering the market with the new product, and
- secondly, to stay in the market and reach the long-term objectives of the project.

The feasibility study should identify the promotional measures required to reach the projected sales volume and estimate the costs of these measures.

Promotion

The following promotional tools can be distinguished:

- Advertising.
- Public relations.
- Personal sales or face-to-face selling.
- Sales promotion or merchandising is an instrument to support especially the retailers.
- Brand policy is an important instrument of the promotional mix.

Place

- The means by which products and services get from producer to consumer and where they can be accessed by the consumer.

- The more places to buy the product and the easier it is made to buy it, the better for the business (and the consumer?)

Place

- Distribution through wholesalers to retailers, through retailers or directly to consumers (end-users) are the main distribution channels used by producers to reach the end-users.
- The main task of distribution is to get the products from the manufacturers to the consumers, that is, to the place where and at the time when the goods are needed.

Place

- The physical distribution, that is, the logistical aspects, therefore deserve special attention when determining the distribution mix.
- The most important elements of the marketing mix are the terms of delivery (delivery time, means of transport, optimization of transport routes, establishment of depots), the control of the stock and the protection of goods during transport.

Place

- The choice of a distribution channel has a significant impact on the profitability of the project.
- When determining ex-factory prices, it is important to identify the margins needed for the wholesalers and retailers to include the products in their sales programme.

Pricing Strategies

Penetration Pricing

- Price set to ‘penetrate the market’
- ‘Low’ price to secure high volumes
- Typical in mass market products – chocolate bars, food stuffs, household goods, etc.
- Suitable for products with long anticipated life cycles
- May be useful if launching into a new market

Market Skimming

- High price, Low volumes
- Skim the profit from the market
- Suitable for products that have short life cycles or which will face competition at some point in the future (e.g. after a patent runs out)
- Examples include: Play-station, jewellery, digital technology, new DVDs, etc.

Value Pricing

- Price set in accordance with customer perceptions about the value of the product/service
- Examples include status products/exclusive products

Loss Leader

- Goods/services deliberately sold below cost to encourage sales elsewhere

  Typical in supermarkets, e.g. at Eastern, selling the cheapest lambs in the hope that people will be attracted to the store and buy other things

- Purchases of other items more than covers 'loss' on item sold

  e.g. 'Free' mobile phone when taking on contract package

Psychological Pricing

- Used to play on consumer perceptions
- Classic example - € 9.99 instead of € 10.00!
- Links with value pricing – high value goods priced according to what consumers THINK should be the price

Going Rate (Price Leadership)

- In case of price leader, rivals have difficulty in competing on price – too high and they lose market share, too low and the price leader would match price and force smaller rival out of market.
- May follow pricing leads of rivals especially where those rivals have a clear dominance of market share.
- Where competition is limited, ‘going rate’ pricing may be applicable – banks, petrol, supermarkets, electrical goods – find very similar prices in all outlets.

Tender Pricing

- Many contracts awarded on a tender basis
- Firm (or firms) submit their price for carrying out the work
- Purchaser then chooses which represents best value
- Mostly done in secret

Price Discrimination

- Charging a different price for the same good/service in different markets
- Requires each market to be impenetrable
- Requires different price elasticity of demand in each market

Example: Hotel prices differ for the same room at different times of the year

Absorption/Full Cost Pricing

- Full Cost Pricing – attempting to set price to cover both fixed and variable costs
- Absorption Cost Pricing – Price set to 'absorb' some of the fixed costs of production

Marginal Cost Pricing

- Marginal cost – the cost of producing ONE extra or ONE fewer item of production
- MC pricing – allows flexibility
- Particularly relevant in transport where fixed costs may be relatively high
- For instance, on a flight from London to New York – providing the cost of the extra passenger is covered, the price could be varied a good deal to attract customers and fill the aircraft

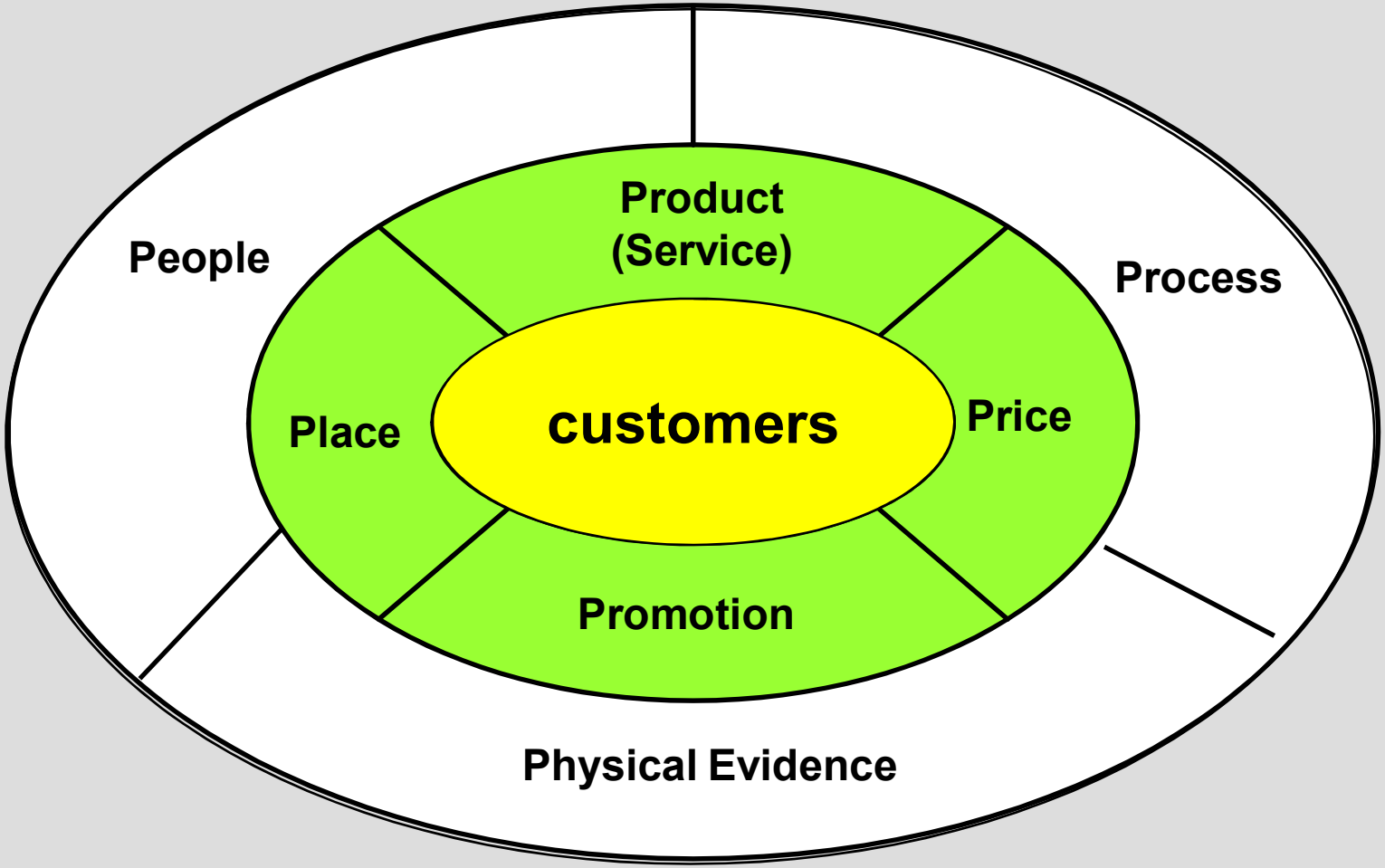
Target Pricing

- Setting price to ‘target’ a specified profit level
- Estimates of the cost and potential revenue at different prices, and thus the break-even have to be made, to determine the mark-up
- Mark-up = Profit/Cost x 100

Services Projects' Marketing Mix (7Ps)

Expanded Marketing Mix

for Services Projects

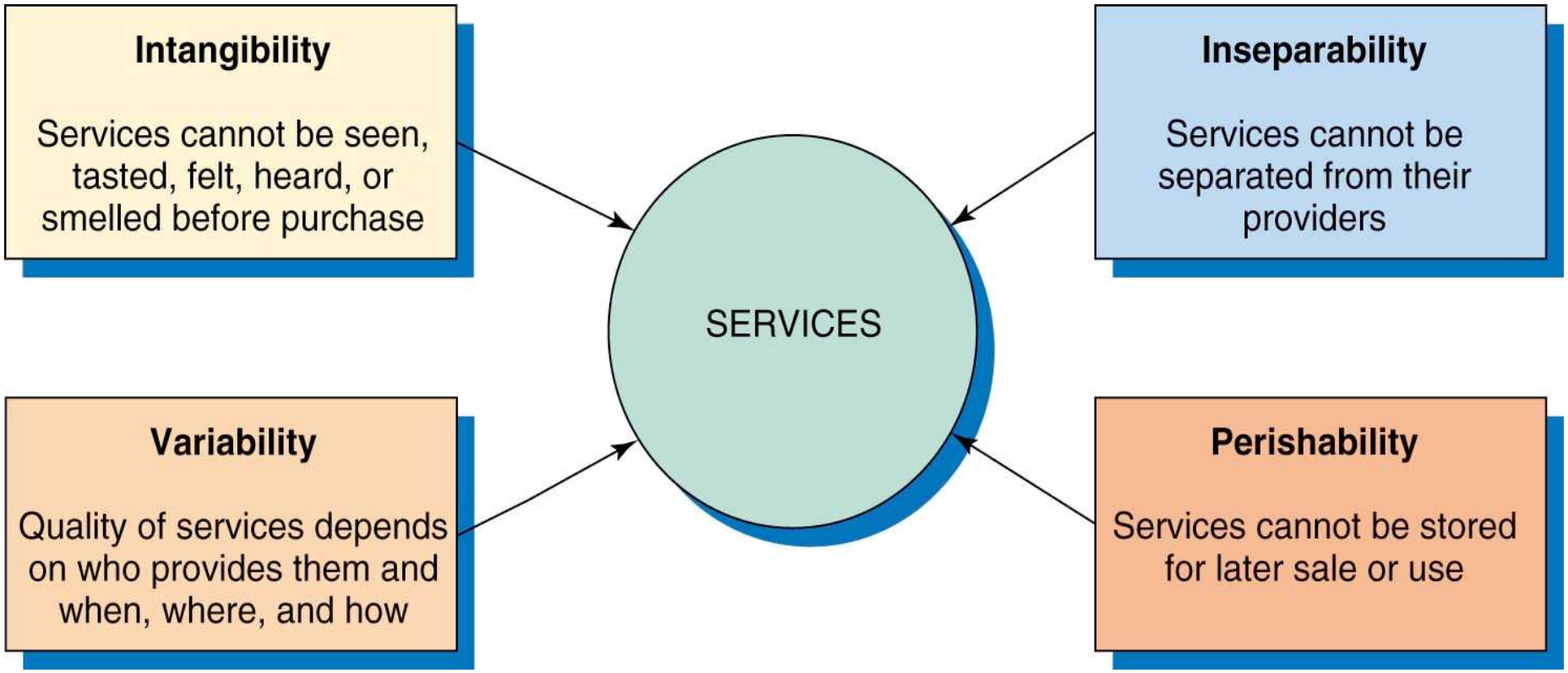


Expanded Marketing Mix for Services Projects

Product	Place	Promotion	Price
Physical good features	Channel type	Promotion blend	Flexibility
Quality level	Exposure	Salespeople	Price level
Accessories	Intermediaries	Selection	Terms
Packaging	Outlet locations	Training	Differentiation
Warranties	Transportation	Incentives	Discounts
Product lines	Storage	Advertising	Allowances
Branding	Managing channels	Media types	
		Types of ads	
		Sales promotion	
		Publicity	
		Internet/Web strategy	

People	Physical Evidence	Process
Employees	Facility design	Flow of activities
Recruiting	Equipment	Standardized
Training	Signage	Customized
Motivation	Employee dress	Number of steps
Rewards	Other tangibles	Simple
Teamwork	Reports	Complex
Customers	Business cards	Customer
Education	Statements	involvement
Training	Guarantees	

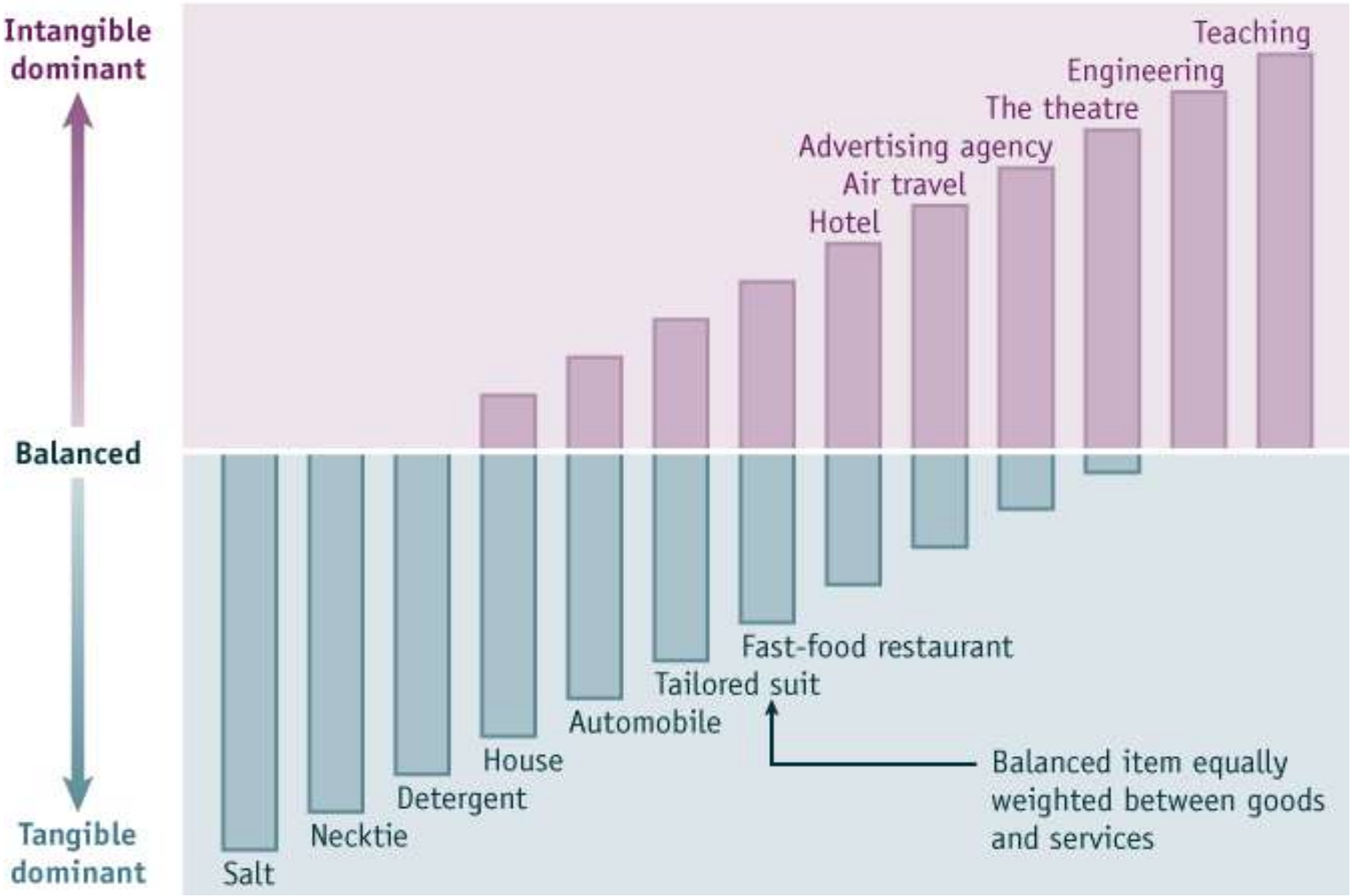
Services' Characteristics



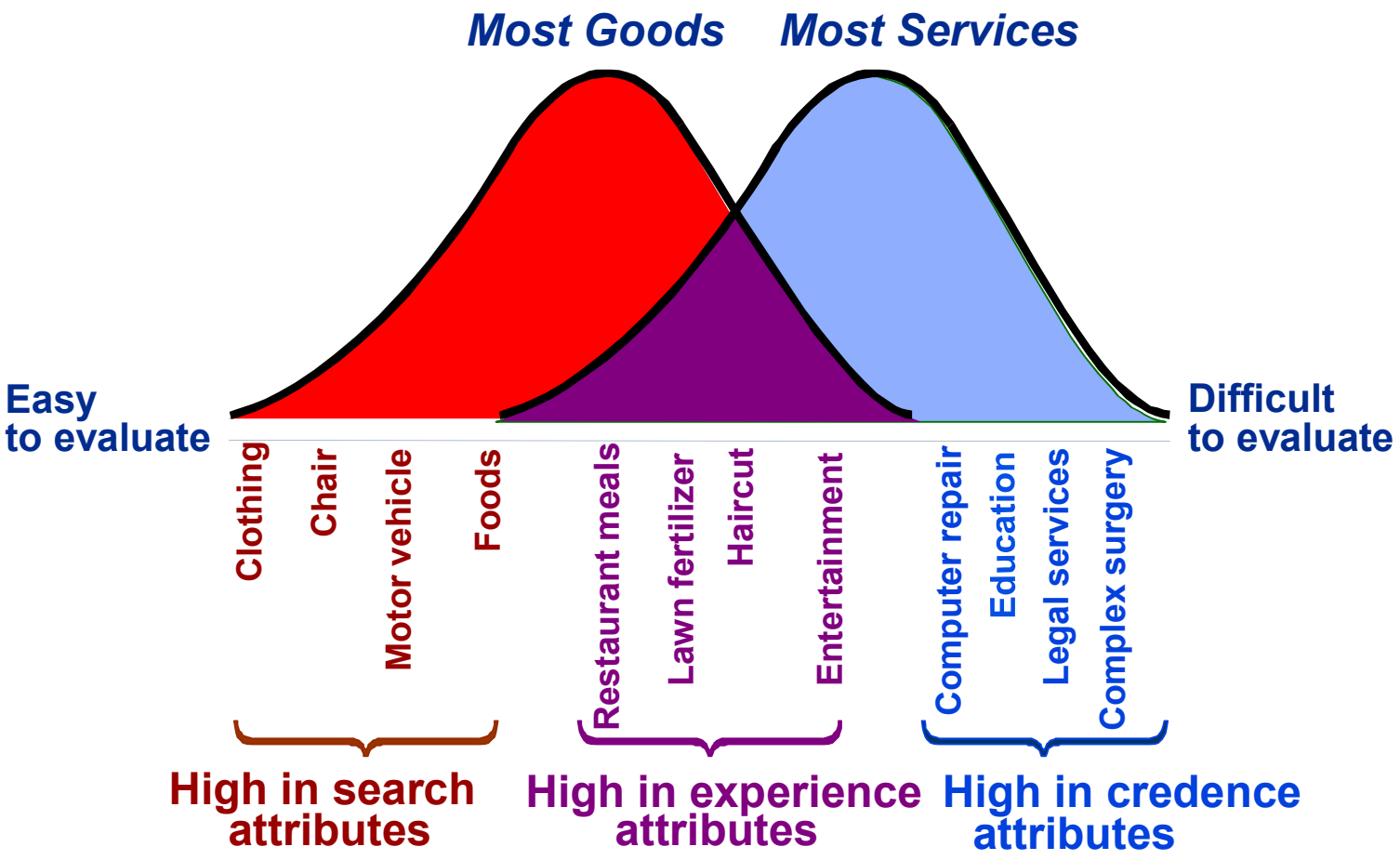
Differences between goods and services

Goods	Services	Resulting Implications
Tangible	Intangible	Services cannot be inventoried. Services cannot be easily patented. Services cannot be readily displayed or communicated. Pricing is difficult.
Standardized	Heterogeneous	Service delivery and customer satisfaction depend on employee and customer actions. Service quality depends on many uncontrollable factors. There is no sure knowledge that the service delivered matches what was planned and promoted.
Production separate from consumption	Simultaneous production and consumption	Customers participate in and affect the transaction. Customers affect each other. Employees affect the service outcome. Decentralization may be essential. Mass production is difficult.
Nonperishable	Perishable	It is difficult to synchronize supply and demand with services. Services cannot be returned or resold.

Source: A. Parasuraman, V.A. Zeithaml, and L. L. Berry, "A Conceptual Model of Service Quality and Its Implications for Future Research," *Journal of Marketing* 49 (Fall 1985), pp. 41–50.


Intangible dominant
Balanced
Tangible dominant
Teaching
Engineering
The theatre
Advertising agency
Air travel
Hotel
Fast-food restaurant
Tailored suit
Automobile
House
Detergent
Necktie
Salt
Balanced item equally weighted between goods and services

Evaluation of Goods and Services



Source: Adapted from Zeithaml

II. Raw Materials and Supplies

- The different materials and inputs required for the operation of the plant are identified and described in this chapter, and their availability and supply, as well as the method of estimating the resulting operating costs, are analysed and described.

- There is a close relationship between the definition of input requirements and other aspects of project formulation, such as the definition of plant capacity, location and selection of technology and equipment, as these inevitably interact with one another.

II. Raw Materials and Supplies

- The selection of raw materials and supplies depends primarily on the technical requirements of the project and the analysis of supply markets.
- Important determinants for the selection of raw materials and factory supplies are environmental factors such as resource depletion and pollution concerns, as well as criteria related to project strategies, for example, the minimization of supply risks and of the cost of material inputs.

II. Raw Materials and Supplies

The following information should be presented:

- Type of material and input;
- Unit of measurement (barrels, tonnes, cubic metres etc.);
- Number of input units consumed per unit produced;
- Estimated cost per input unit;
- Estimated cost per unit produced;
- Estimated cost per unit produced divided into direct (variable) and indirect (fixed) cost components;
- Total cost per year.

Inventory management

What we need, when we need it

- **Too much inventory costs you money.**
- **It ties up cash in stock that can, of course, become obsolete or damaged.**
- **At the other extreme, not enough inventory tests customer loyalty and leads to lost or delayed sales.**
- **We should know the optimum inventory level.**

Consider that the only things that vary are:

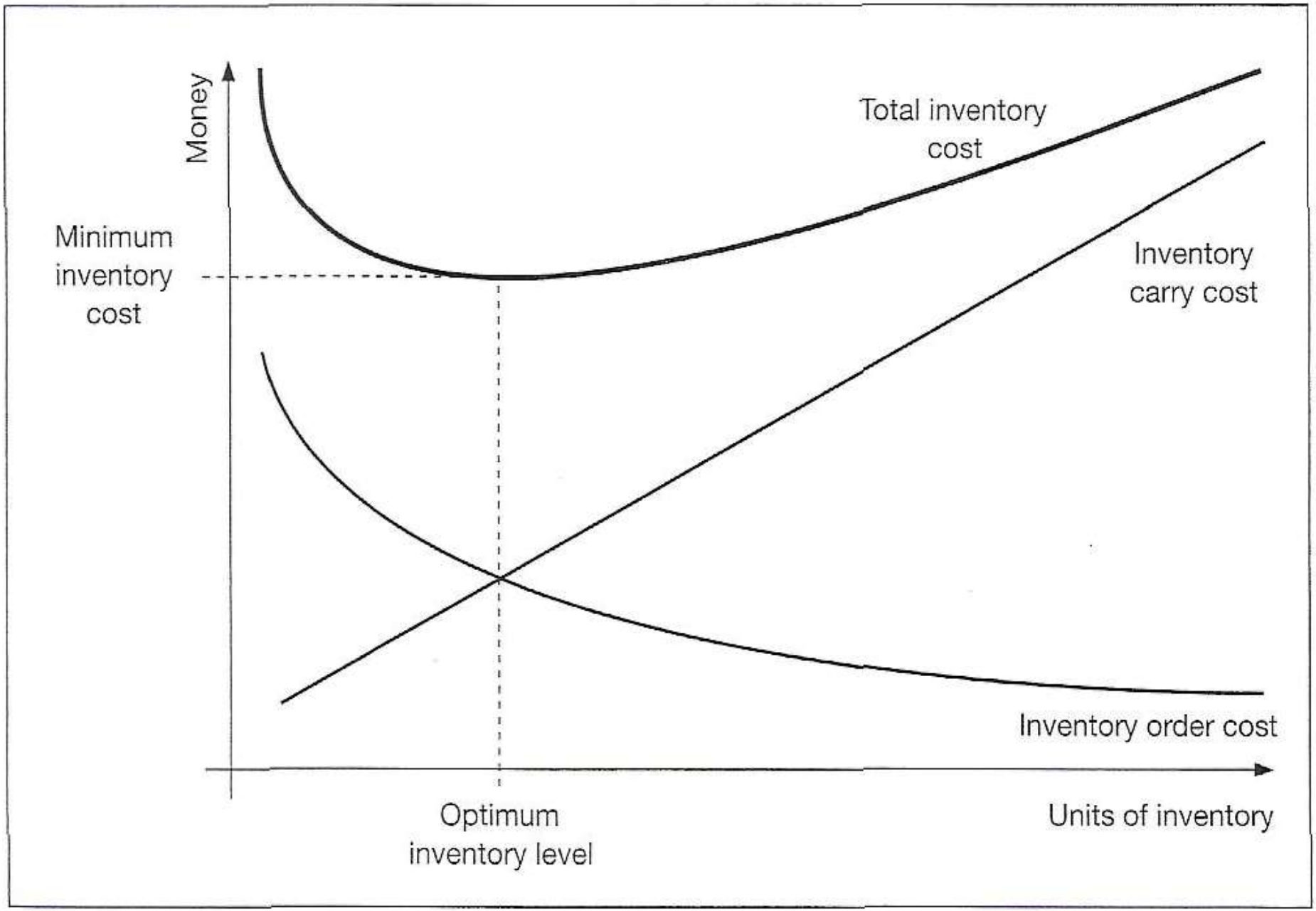
- **<u>Ordering costs</u> - the costs of processing purchase orders, taking delivery and/or tooling up for a production run, and so on.**

  Ordering costs per unit decline as volumes increase due to economies of scale.

- **<u>Carrying costs</u> - including premises, insurance and funding costs.**

  These increase steadily with volume.

Optimum inventory level



The optimum inventory level is where ordering and carrying costs are minimized, which is where they equal each other.

In other words, in any one period, …

… *the quantity of inventory that you should order is the quantity where:*

total ordering costs = total carrying cost

or

number of orders x cost per order = average inventory x carry cost per unit

Just-in-time

For *just-in-time* inventory management, the reorder point is triggered when inventory falls to a level equivalent to daily demand x delivery time in days.

This presupposes that demand is steady and delivery is always on time.

Maybe we have to carry a buffer stock!

So, we know how to minimize the costs of carrying inventory.

But how do we achieve an acceptable chance of having the right products in stock?

Stock Control

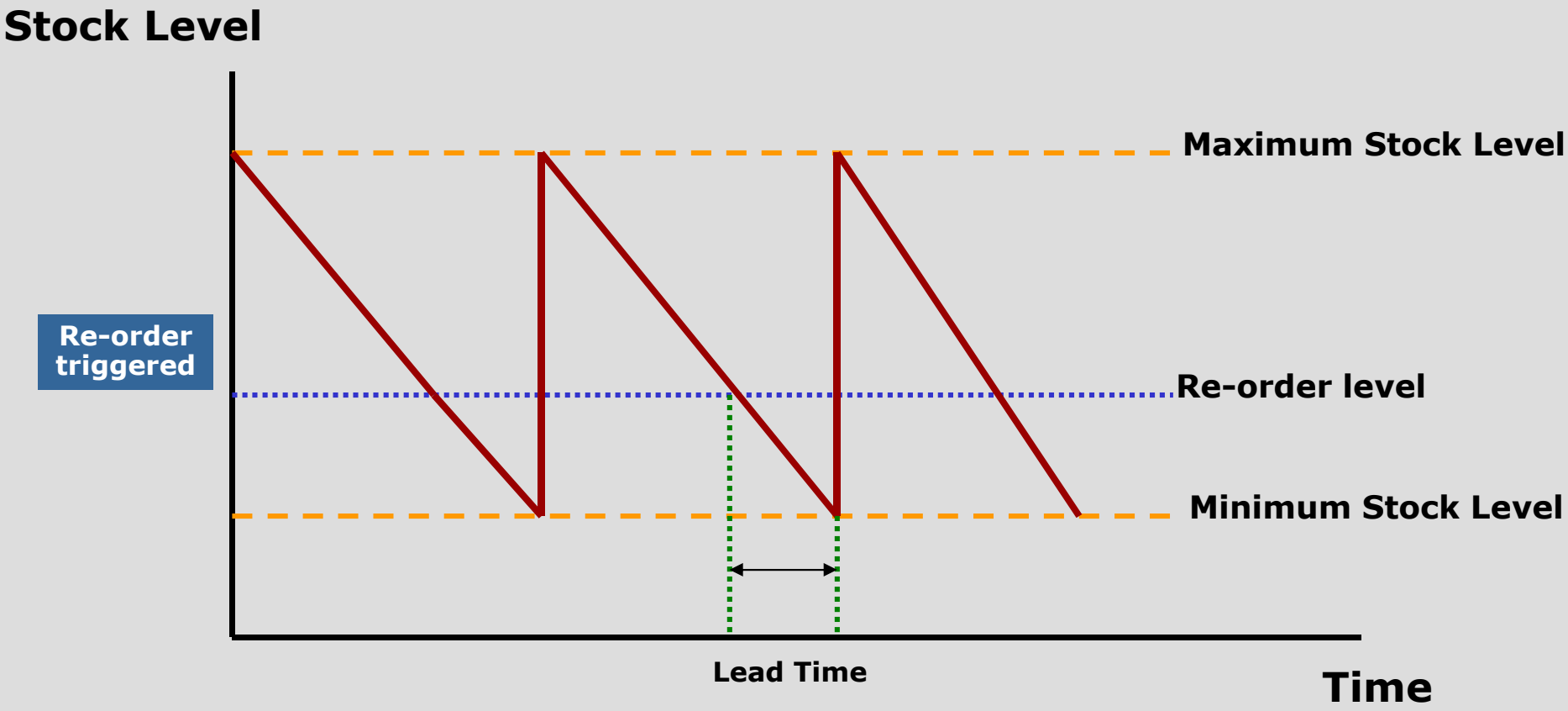
Costs:

- Storage costs – warehousing, etc.
- Depreciation costs – wear and tear, perishability, shelf-life, etc.
- Opportunity cost – zero revenue earned on stocks sitting around!
- Administration costs – monitoring stock levels, ordering and processing, etc.

Benefits:

- Availability of stocks to meet customer needs
- Buffer stocks help to cope with unplanned changes in demand
- Smoothes out the volatility of lead times.

Stock Control



When the stock level reaches the re-order level, it triggers a new order. The difference between the time of re-order and delivery is the 'lead time'.

Consider a transport café,

- **The owner knows from experience that he usually sells 400 meat pies a week and the *standard deviation* of demand is 20 pies.**
- **He will accept a 15% risk of being out of stock.**
- **How many pies should he buy in his weekly order <u>each Monday afternoon</u>?**

The *normal distribution* can be applied to inventory control.

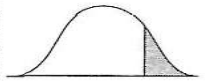
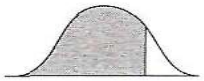
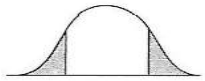
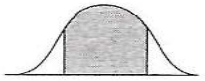
If we look at next figure, we will see that 15% *in one tail* of the normal distribution happens to be:

- about one z score, and therefore

- one standard deviation.!!

Z scores

Showing percentage of distribution in the shaded areas

Column A	Column B	Column C	Column D	Column E
	Your focus is on one side		Your focus is on the middle or both ends	
				
z score	% in tail	% before tail	% in tails	% in middle
0.0	**50.00**	**50.00**	**100.00**	**0.00**
0.1	46.02	53.98	92.04	7.96
0.2	42.07	57.93	84.14	15.86
0.3	38.21	61.79	76.42	23.58
0.4	34.46	65.54	68.92	31.08
0.5	**30.85**	**69.15**	**61.70**	**38.30**
0.6	27.43	72.57	54.86	45.14
0.7	24.20	75.80	48.40	51.60
0.8	21.19	78.81	42.38	57.62
0.9	18.41	81.59	36.82	63.18
1.0	**15.87**	**84.13**	**31.74**	**68.26**
1.1	13.57	86.43	27.14	72.86
1.2	11.51	88.49	23.02	76.98
1.3	9.68	90.32	19.36	80.64
1.4	8.08	91.92	16.16	83.84
1.5	**6.68**	**93.32**	**13.36**	**86.64**
1.6	5.48	94.52	10.96	89.04
1.7	4.46	95.54	8.92	91.08
1.8	3.59	96.41	7.18	92.82
1.9	2.87	97.13	5.74	94.26
2.0	**2.28**	**97.72**	**4.56**	**95.44**
2.1	1.79	98.21	3.58	96.42
2.2	1.39	98.61	2.78	97.22
2.3	1.07	98.93	2.14	97.86
2.4	0.82	99.18	1.64	98.36
2.5	**0.62**	**99.38**	**1.24**	**98.76**
2.6	0.47	99.53	0.94	99.06
2.7	0.35	99.65	0.70	99.30
2.8	0.26	99.74	0.52	99.48
2.9	0.19	99.81	0.38	99.62
3.0	**0.14**	**99.86**	**0.28**	**99.72**
3.1	0.10	99.90	0.20	99.80

For any value *'value'* from a set of values with a given mean and standard deviation:

z = (*value* − mean) ÷ standard deviation

Value = (z × standard deviation) + mean

Mean = *value* − (z × standard deviation)

Standard deviation = (*value* − mean) ÷ z

III. Engineering and Technology

- The task of engineering is to design the functional and physical layout for the industrial plant necessary to produce the defined products, and to determine the corresponding investment expenditures as well as the costs arising during the operational phase.
- The scope of engineering also includes the plant site and all activities required to deliver both inputs and outputs and to provide the necessary secondary infrastructure investments.

III. Engineering and Technology

- An integral part of engineering at the feasibility stage is the selection of an appropriate technology, as well as planning of the acquisition and absorption of this technology and of the corresponding know-how.

- The required machinery and equipment must be determined in relation to the technology and processes to be utilized, the local conditions, the state of the art and human capabilities.

III. Engineering and Technology

- The analysis must include all technical, managerial and administrative, as well as external, sociocultural and economic aspects of the required maintenance system.
- It should also outline the specific requirements of each individual technology, if selected, and specify the need for technical documentation and maintenance procedures (e.g. the necessary lists of spare parts).

Production program

- The initial task and scope of engineering is to define the whole range of project activities and requirements, including production levels to be achieved under the technical, ecological, social and economic constraints.
- This requires identifying the principal products or product range, including by-products, determining the volume of production, and relating production capacity to the flow of materials and performance of services at the selected site.

Determination of the production program

- Market requirements and marketing concept.
- Input requirements
- Technology

Plant capacity

The term plant or production capacity can be generally defined as the volume or number of units that can be produced during a given period.

The following two capacity terms are used:

- Feasible normal capacity.
- Nominal maximum capacity.

Feasible normal capacity

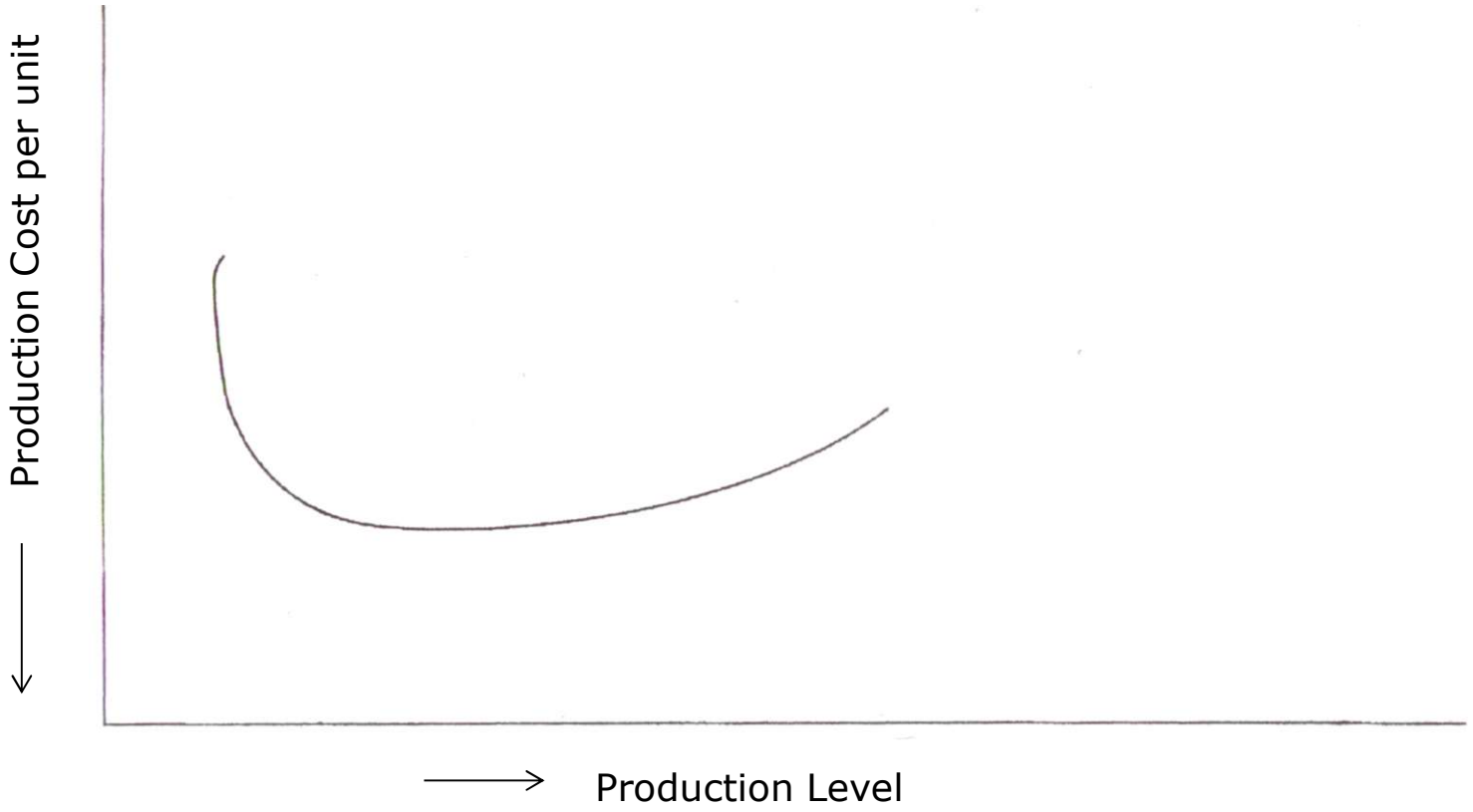
- It is achievable under **normal working conditions**, taking into account not only the **installed equipment** and **technical conditions of the plant**, such as *normal stoppages*, *down time, holidays, maintenance, tool changes, desired shift patterns and indivisibilities of major machines to be combined, but also the management system* applied.

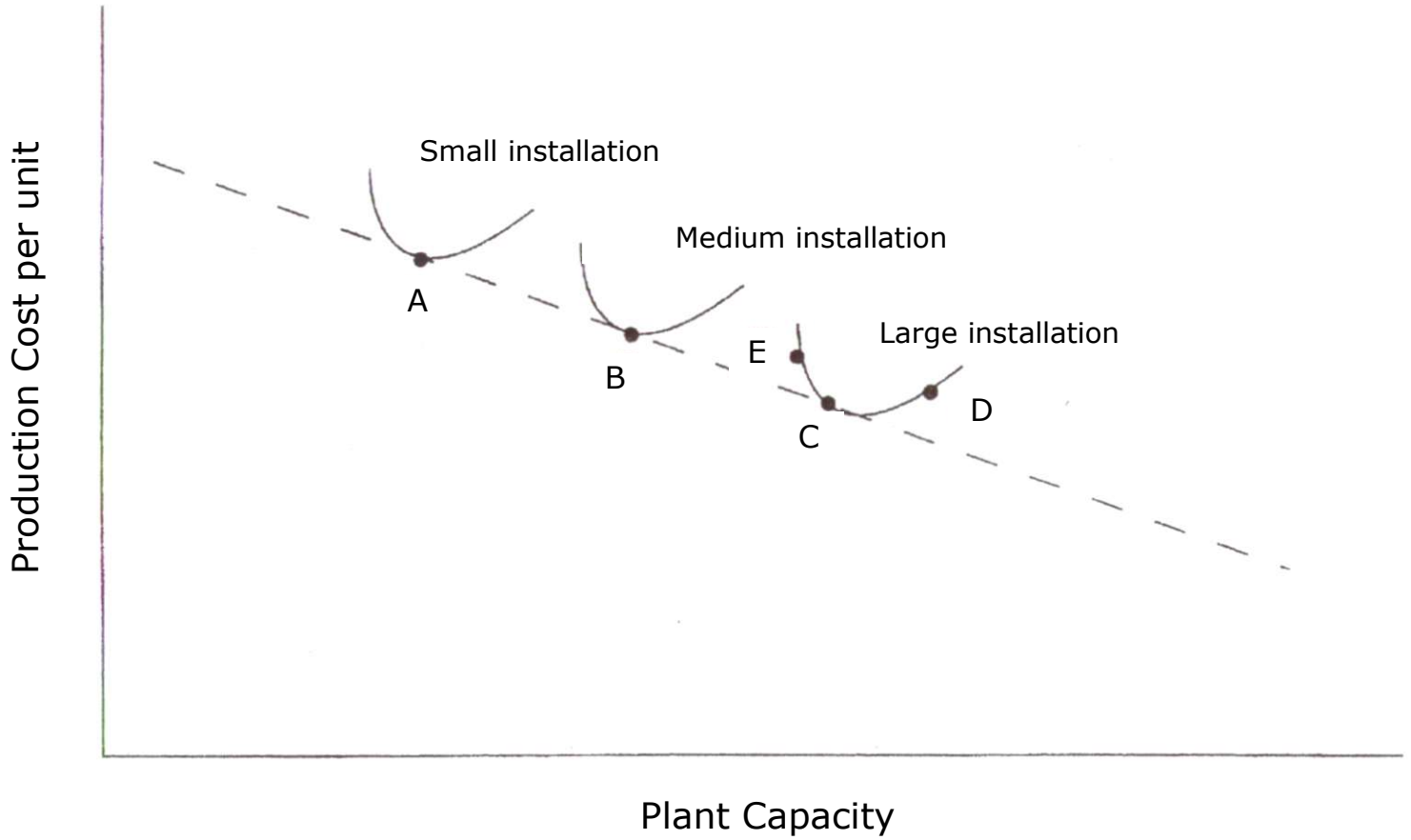
- Thus, the feasible normal capacity is the number of units produced during one year under the above conditions. **This capacity should correspond to the sales derived from the outline of the marketing concept**.

Nominal maximum capacity

- The **nominal capacity** is the technically feasible capacity, which frequently corresponds to the installed capacity as guaranteed by the supplier of the plant.

- A higher capacity-**nominal maximum capacity**-may be achieved, but this would entail *overtime, excessive consumption of factory supplies, utilities, spare parts and wear-and-tear parts, i.e.* **disproportionate production cost increases**.


Production Cost per unit
Production Level


Production Cost per unit
Small installation
Medium installation
Large installation
A
B
C
D
E
Plant Capacity

Determination of Plant Capacity

General Rule:

When the future demand of sales

can be *easily estimated* and seems to be *rising*

then the plant capacity selected is

***bigger* than the initial demand requirements,**

so that the future demand requirements

would be covered as well

Attention! The Critical Factor should be recognized

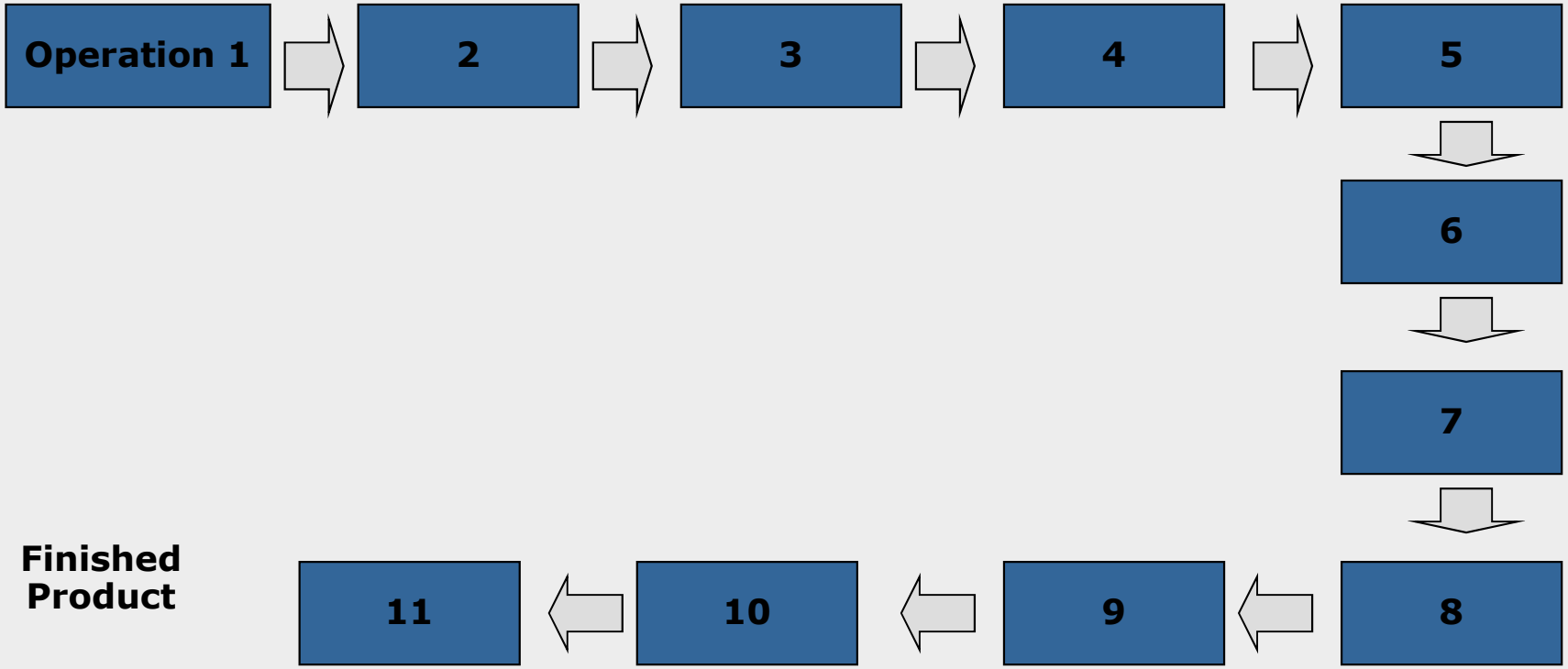
(e.g. a motorway tunnel, a distillation column in chemical industry etc.)

Production Methods

- **Job Production** – One-off production - each item might have particular specifications
- **Flow Production** – suitable for mass market products that are identical
- **Batch Production** – each stage of the production process has an operation completed on it before moving on to the next stage – allows modifications to be made to products that otherwise are the same

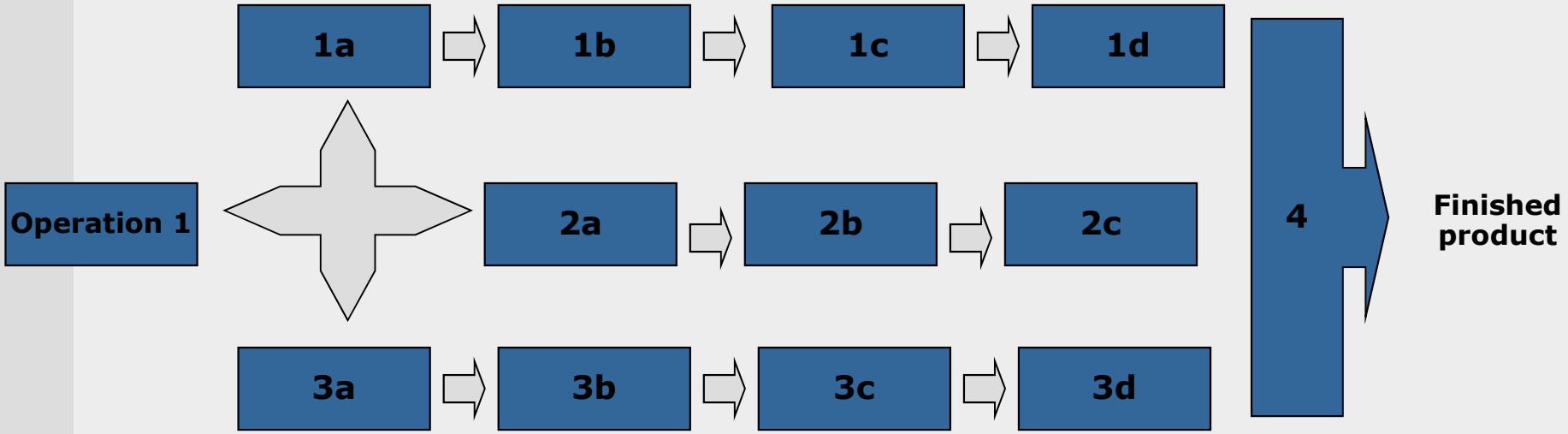
Production Methods

This?Which is more efficient?



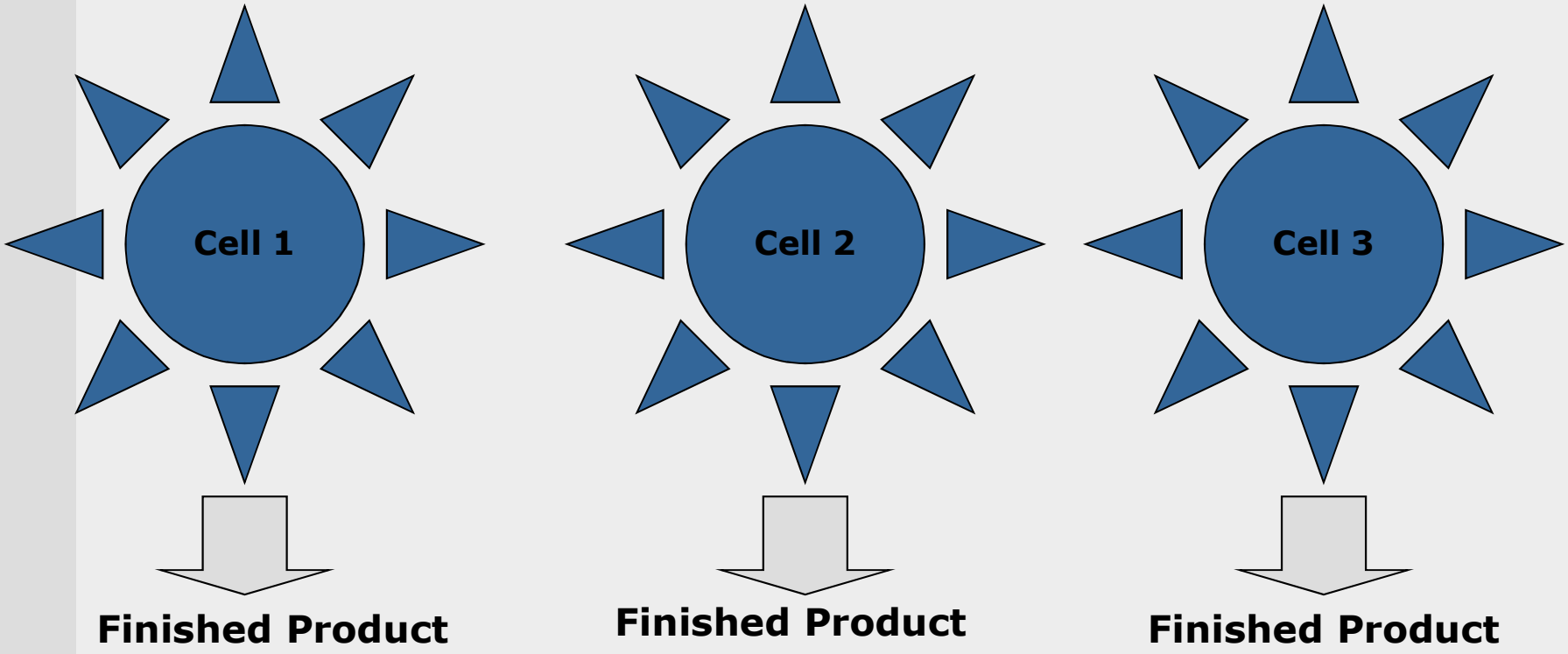
Production Methods

Or this?



Production Methods

Or this?



Production Methods

Answer – it could be any of them!

The design of the production space can influence:

- Output levels
- Factor use
- Efficiency
- Cost levels
- Quality assurance procedures

Civil engineering works

The feasibility study should provide plans and estimates for the civil works related to the project:

- site preparation and development,
- factory and other buildings,
- civil engineering works relating to utilities, transport, emissions and effluent discharge,
- internal roads,
- fencing and security, and
- other facilities and requirements of the plant.

Maintenance and replacement requirements

- An important aspect of project engineering is the determination of critical maintenance and replacement requirements for the project.
- Satisfactory maintenance of plant, buildings and various facilities is essential for efficient plant operations.
- Similarly, replacement requirements for various parts, components and materials at different stages of construction and production need to be identified and planned for.

Technology Selection

- The selection of appropriate technology and know-how is a critical element in any feasibility study.
- Such selection should be based on a **detailed consideration and evaluation of technological alternatives** and the selection of the most suitable alternative in relation to the project or investment strategy chosen and to socio-economic and ecological conditions.
- What may be appropriate in industrialized economies with high labor costs may not necessarily be the optimum for low-wage developing countries, with severe constraints on infrastructure and availability of inputs.

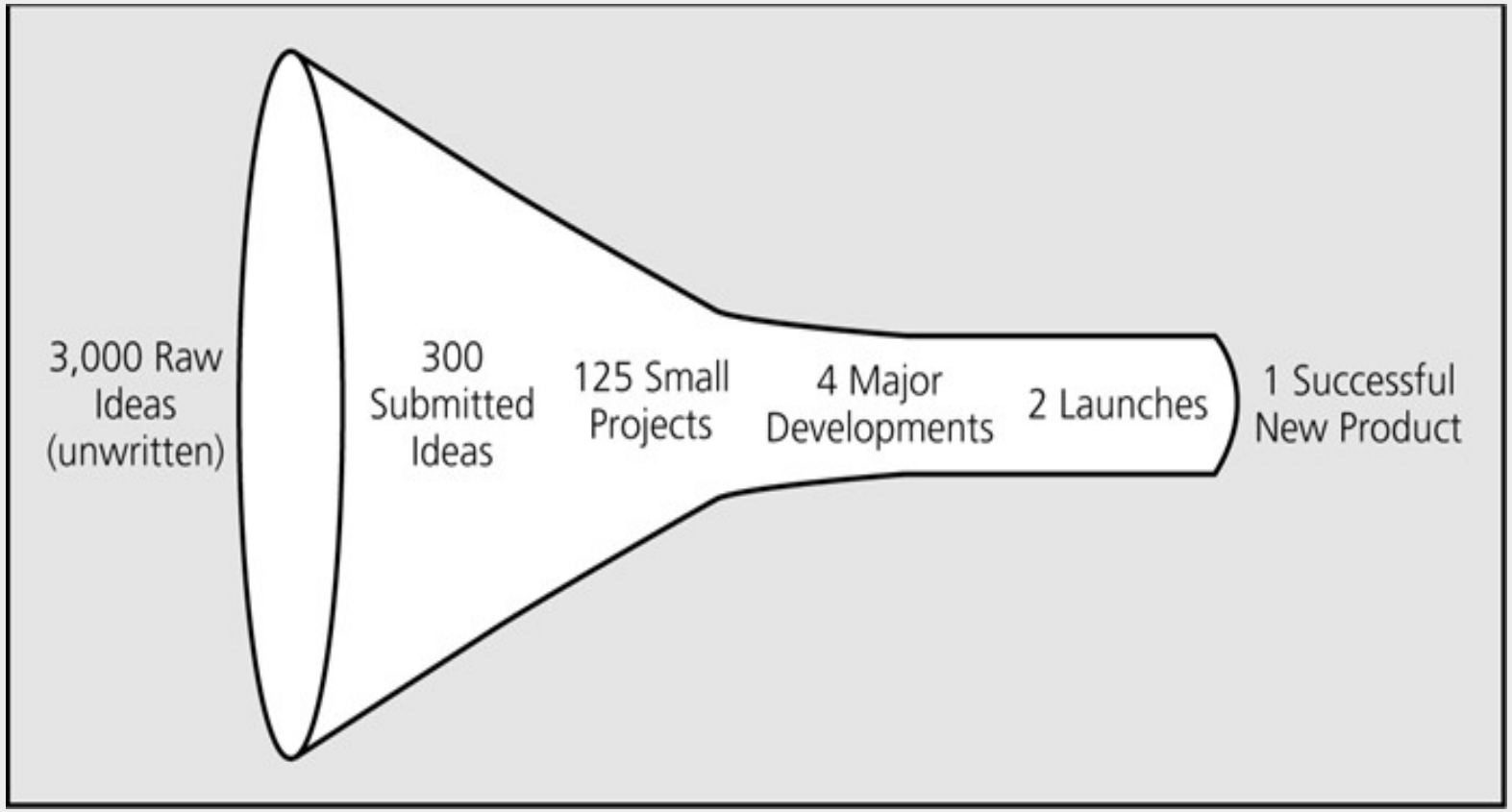
Importance of Technology Selection

- Technological innovation now the single most important driver of competitive success in many industries
- Many firms earn over one-third of sales on products developed within last five years
- Product innovations help firms protect margins by offering new, differentiated features.
- Process innovations help make manufacturing more efficient.

Successful innovation requires carefully crafted strategies and implementation processes.

Innovation funnel

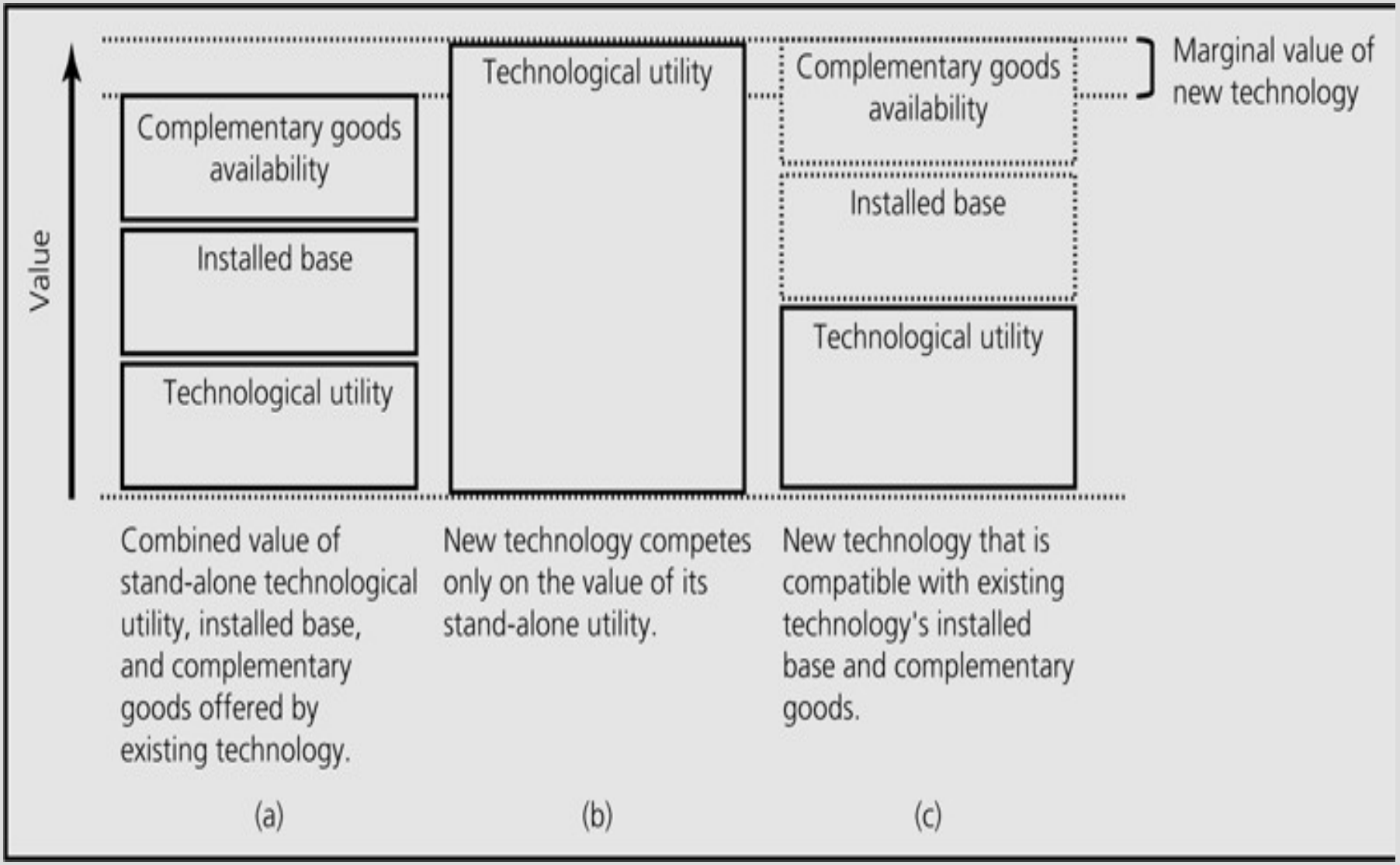
Most innovative ideas do not become successful new products.



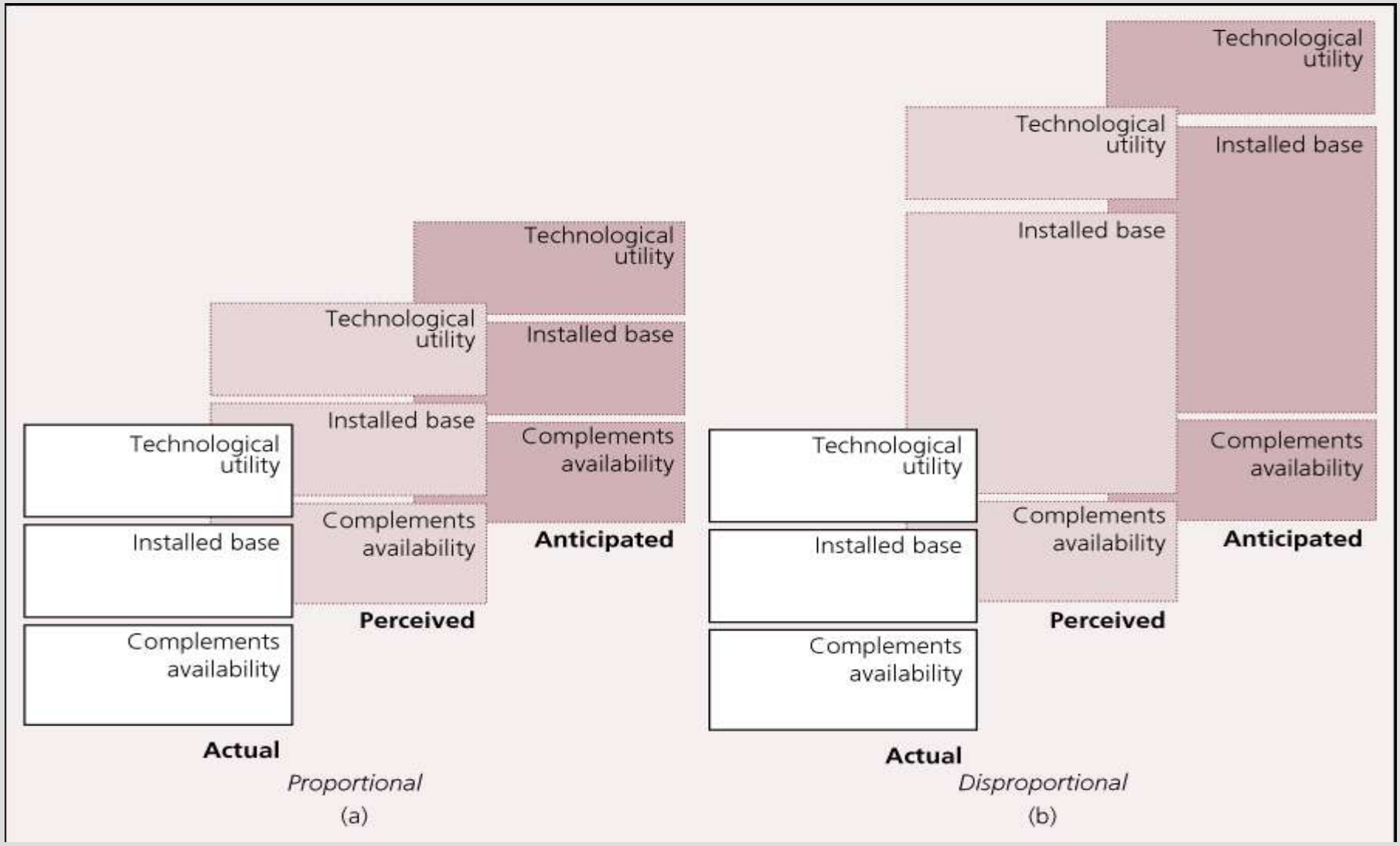
First-Mover Advantages and Disadvantages

- **Being a first mover can confer the advantages of:**
  - **Brand loyalty and technological leadership**
  - **Preemption of scarce assets**
  - **Exploiting buyer switching costs**
  - **Reaping increasing returns advantages.**
- **However, first movers often bear disadvantages also:**
  - **High research and development expenses**
  - **Undeveloped supply and distribution channels**
  - **Immature enabling technologies and complements**
  - **Uncertainty of customer requirements**

Multiple Dimensions of Value

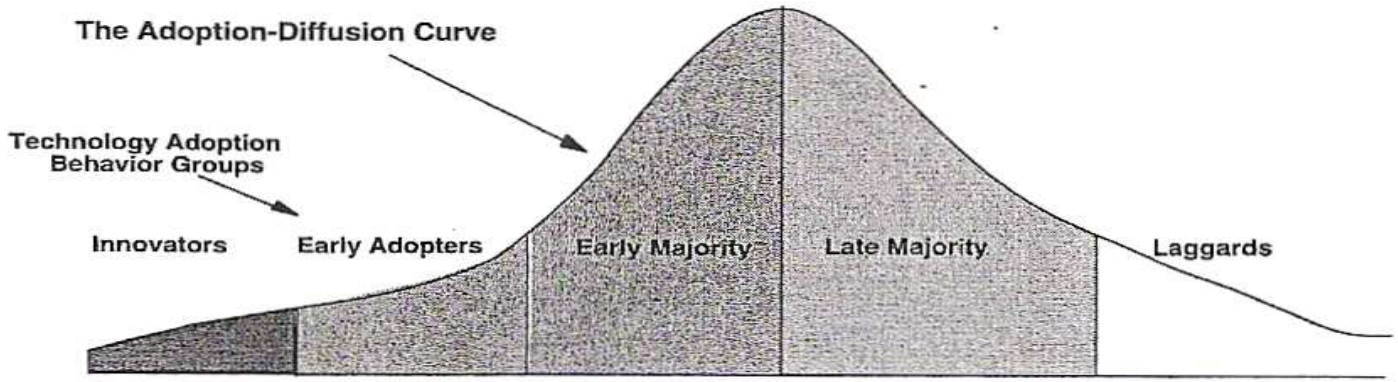


Multiple Dimensions of Value



Integration
of
technology management,
the project strategy
and
the marketing concept

Adoption-Diffusion Model, Characterizing Technology Adopters

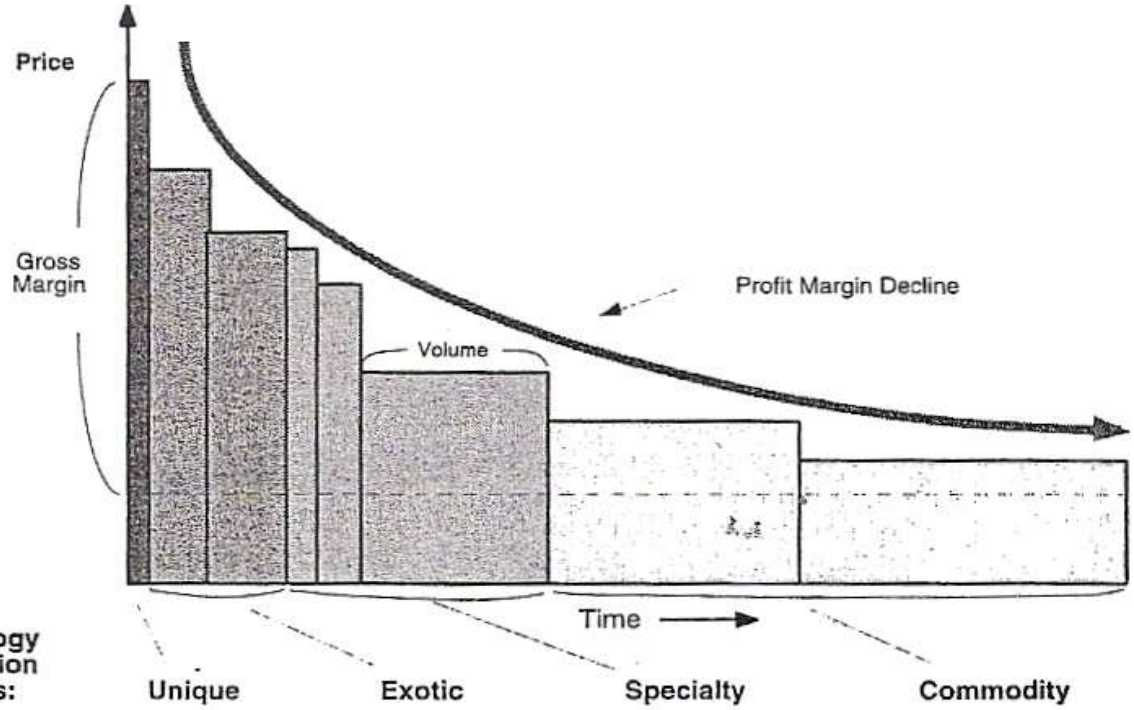


Innovators	Early Adopters	Early Majority	Late Majority	Laggards
Want Highest Performance Available Most Independent Highly Knowledgeable About Their Their Business Best Informed, Most Profitable Eager for New Solutions Will Buy an Unproven Concept	Want to Be Leaders In Their Business Want to See It Done Before They Buy It Among the More Profitable Interested in New Solutions Very Closely Watched by the Early Majority	Want to Stay Ahead, but Not Be the Guinea Pig Want to Buy From Established, Accessible Suppliers Product Must Be Easy to Buy Want to Know You Have Sold Lots of Them, or Have Done It Often	Don't Want to Fall Too Far Behind Want No Glitches; Need a Thoroughly Proven Performer Most Price-Conscious Buyers of All Want to Buy Locally Absolute Simplicity of Purchase and Use is Critical	Reluctant to Change Most Fearful Least Well Informed About Their Business Adopt Innovations When They Can No Longer Be Avoided Often the Least Profitable

Sales Challenges in Various Market Segments

Product Characteristic and Departmental Approach	Market and New Buyers: Innovators	Early Adopters	Early Majority	Late Majority	Laggards
Market condition	Introduction	Acceptance	Growth	Maturity	Decline
This segment's percentage of market	2.5%	13.5%	34%	34%	16%
Key sales task	Find first customers	Broaden sales base	Establish complete account coverage	Maximize market share	Maximize sales dollar productivity
Size or type of sales force required	1-3 people	5+ people	Many people	Multiple sales teams and structures	Shrinking sales force
Type of salesperson	Highly entrepreneurial individualistic; a "first account" ace	Good in small teams; a gifted teacher	Organizer and account penetrator	Persuader and comfort provider	Hard-nosed; nuts & bolts orientation
Sales message	"This is brand new and offers high performance."	"New, but proven."	"Everybody's doing it."	"You'd better catch up."	"You have no other choice."

Picking Your Zone on the Technology Applications Spectrum

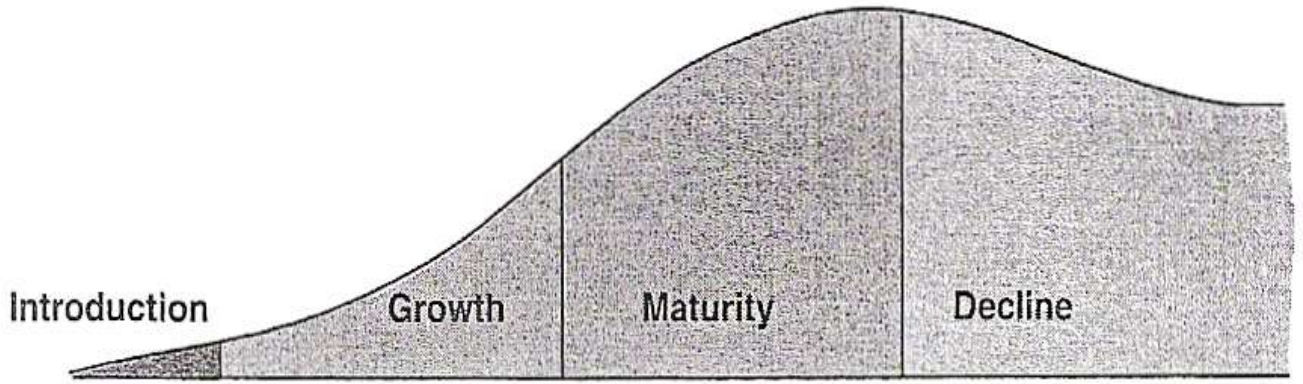


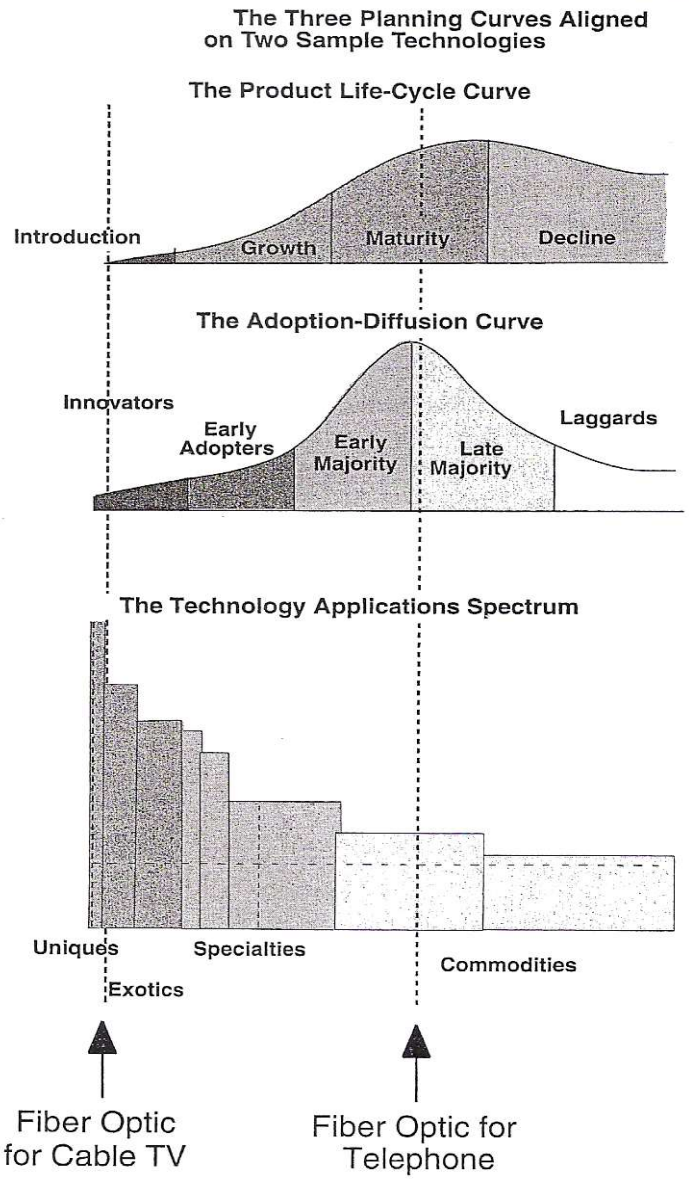
Technology Application Status:	Unique	Exotic	Specialty	Commodity
Key Skills Required:	Research, New-Product Development, Low-Volume Manufacturing, First-Customer Sales	Applications Engineering, Planned Performance Improvements, Key-Account Sales	Sales, Marketing, Channel Development, Partnering, Sales Engineering, Service	Cost Reduction, Industrial Engineering, Service

Organizational Challenges of Various Applications

	Application Type			
Product Characteristics and Departmental Approaches	**Unique**	**Exotic**	**Specialty**	**Commodity**
Example application	Electrically darkening window glass	Cellular phone electronics	Specialty polymers	Photocopy paper
Relative labor content	Very high	High	Medium; declining	Very low
Corporate mission	Produce usable products	Gain acceptance	Broaden awareness of utility	Maintain high sales volume and low costs
Best style for senior management	Explorers	Proselytizers	Penetration builders	Centralizers
Best style for administration	Project management	Flexible; experimental	Interpreting data; budgeting	Cost cutting
Best style for sales	One account per product; intensive hand-holding	Key account; innovative approaches	Finding new uses and customers; finding vertical markets; leaving no stone unturned	Inside order taking; great service for large customers
Best style for manufacturing	100% custom; made to order	Customized	Proliferating new products from basic designs	100% standardized production
Best style for R&D/engineering	Nobel Prize aspirants	Developmental engineers	Application engineers	Industrial and production engineers

The Product Life-Cycle Curve




The Three Planning Curves Aligned
on Two Sample Technologies
The Product Life-Cycle Curve
Introduction
Growth
Maturity
Decline
The Adoption-Diffusion Curve
Innovators
Early
Adopters
Early
Majority
Late
Majority
Laggards
The Technology Applications Spectrum
Uniques
Exotics
Specialties
Commodities
Fiber Optic
for Cable TV
Fiber Optic for
Telephone

Estimates of overall investment costs

- Once the production program and plant capacity are defined, a preliminary order-of-magnitude estimate can be drawn up regarding the broad investment requirements of the project.
- To calculate cost estimates, a detailed breakdown to the various cost items would be necessary, e.g.
  - plant machinery and equipment
  - civil engineering works
  - utilities, instrumentation, piping and other ancillary facilities and requirements.

Exponential cost estimating

Exponential cost estimating is based on the following function:

If the relative size of two plants or plant items is S_1/S_2 , then the relative costs would be $(C_1/C_2)^n$,

where n is the exponential factor that for many plants and equipment lies between 0.6 and 0.7.

$$\left(\frac{C_1}{C_2}\right)^n = \frac{S_1}{S_2}$$

IV. Organization and overhead costs

- The present chapter deals with the **development and design of the organization** needed to manage and control the entire operation of the factory, and with the related **overhead costs**.
- A division of the company into organizational units in line with the marketing, supply, production and administrative functions is necessary not only from the operational point of view, but also during the planning phase, to allow the assessment and projection of overhead costs.
- Furthermore, it is essential for the feasibility of a project that a proper organizational structure should be determined in accordance with the corporate strategies and policies.

Organizational design

The design of the organization usually includes the following steps:

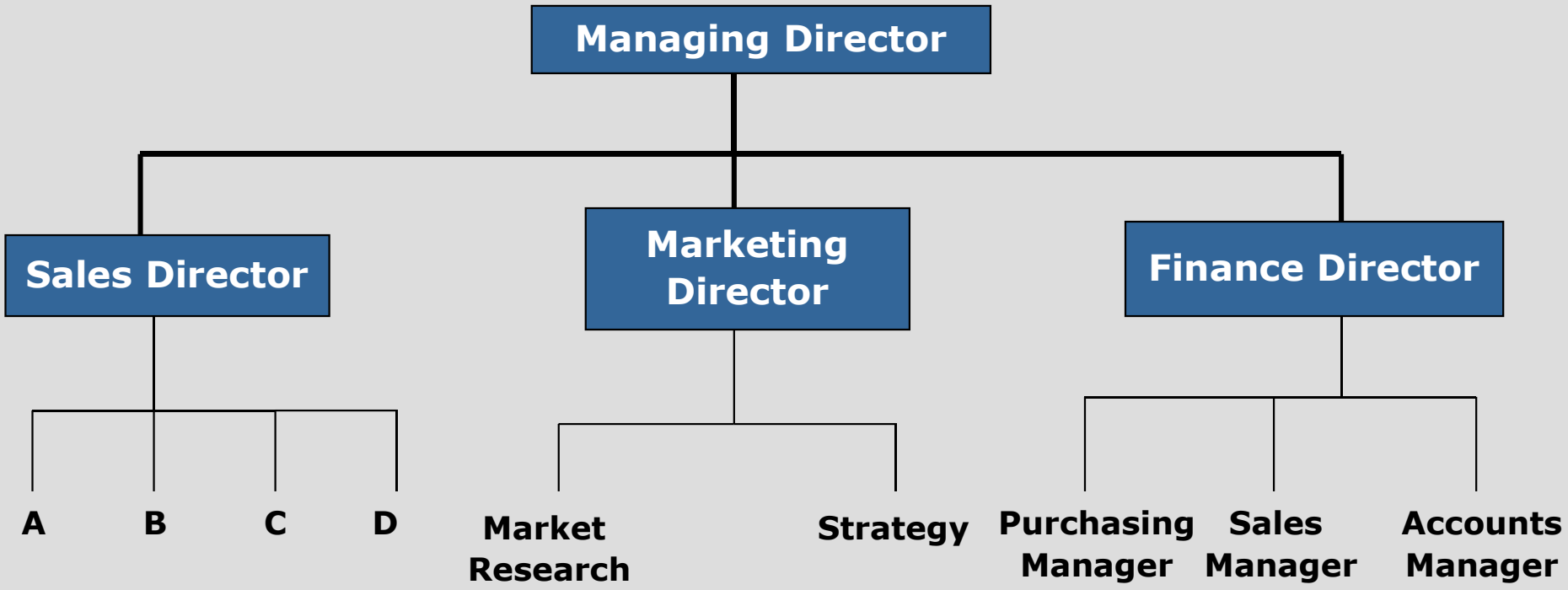
- The goals and objectives for the business are stated;
- The functions that are necessary to achieve the goals are identified;
- The necessary functions are grouped or related;
- The organizational framework or structure is designed;
- All key jobs are analyzed, designed and described;
- A recruiting and training program is prepared.

Business Functions

- Human Resources
- Sales and Marketing
- Research and Development
- Production/Operations
- Customer Service
- Finance and Accounts
- Administration and IT

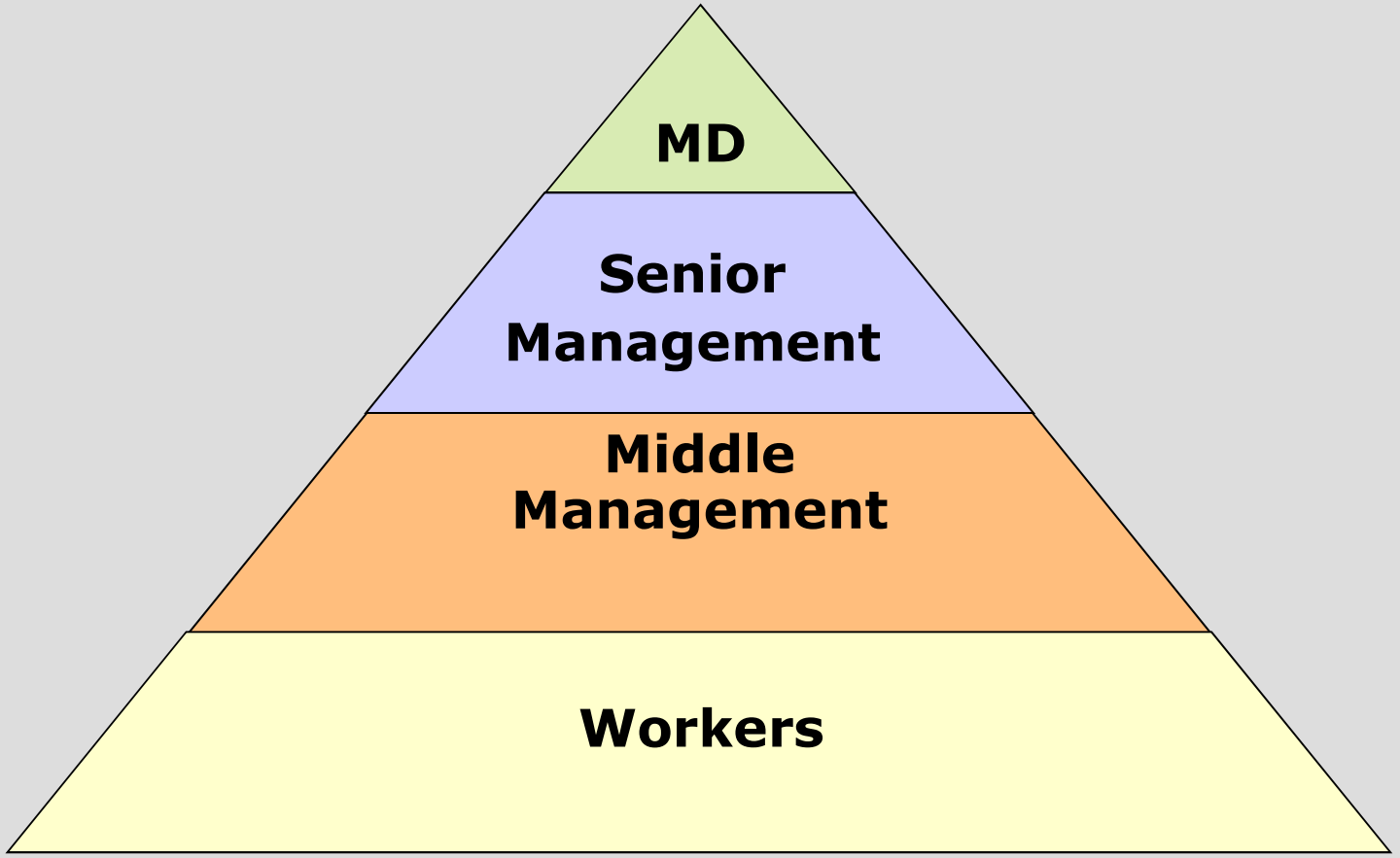
Organisation Charts

Hierarchical Structure



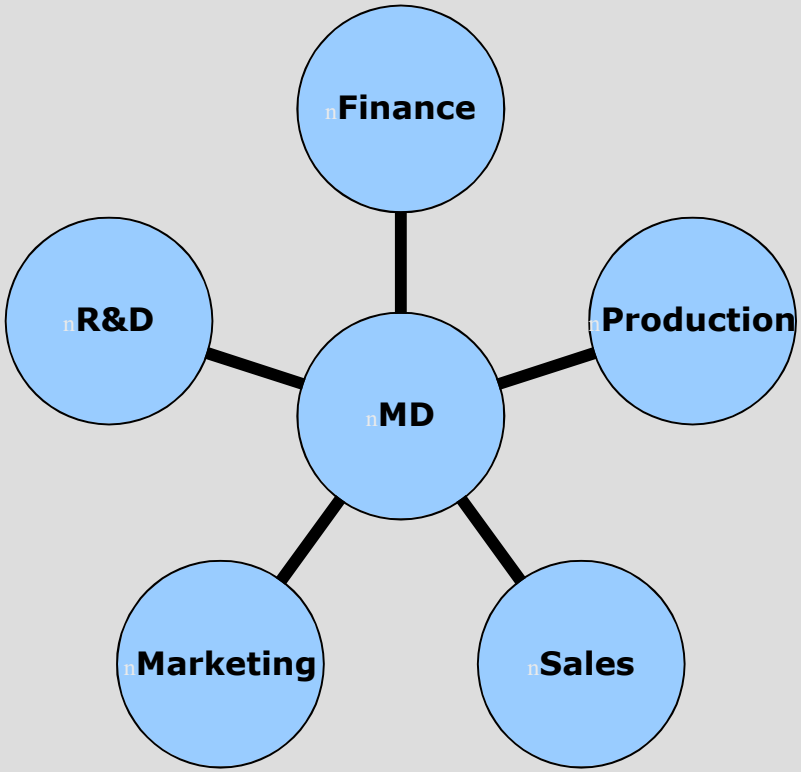
Organisation Charts

Pyramidal Structure



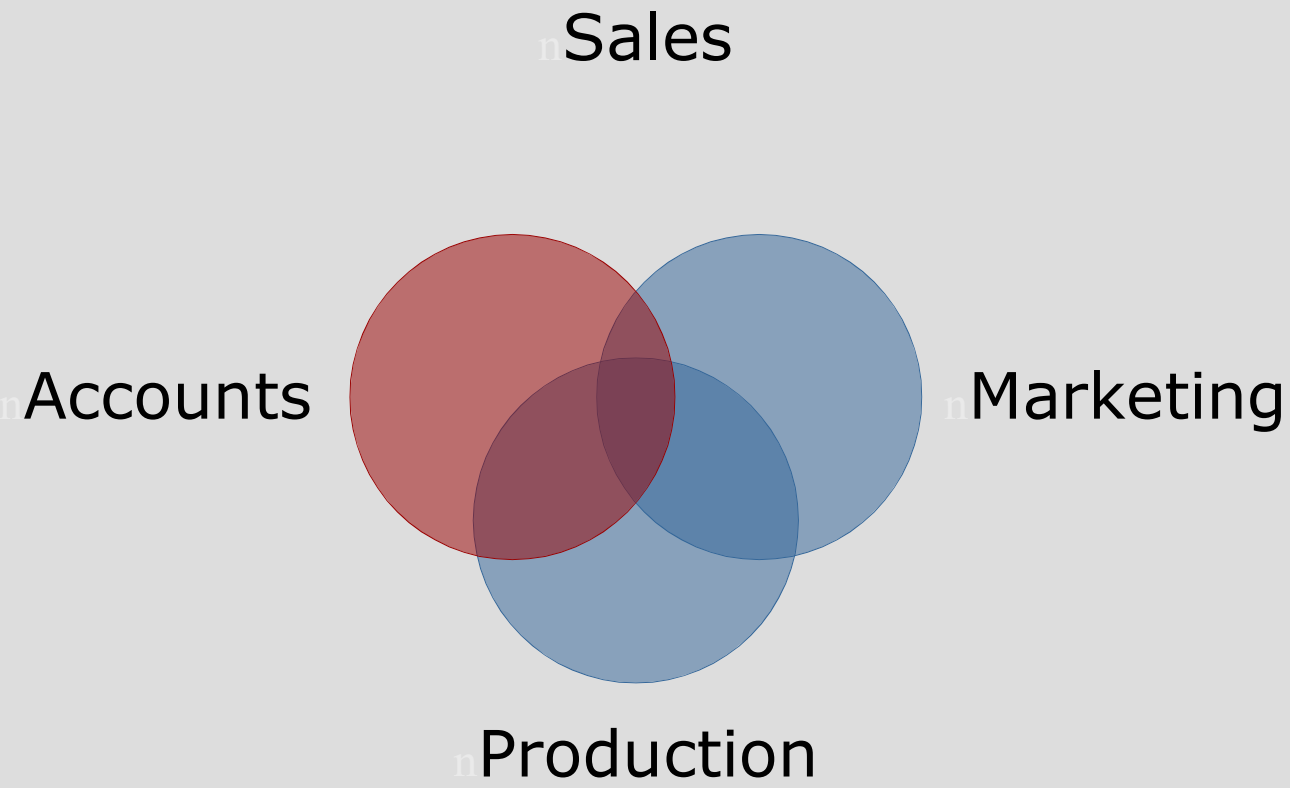
Organisation Charts

Centralised/Entrepreneurial

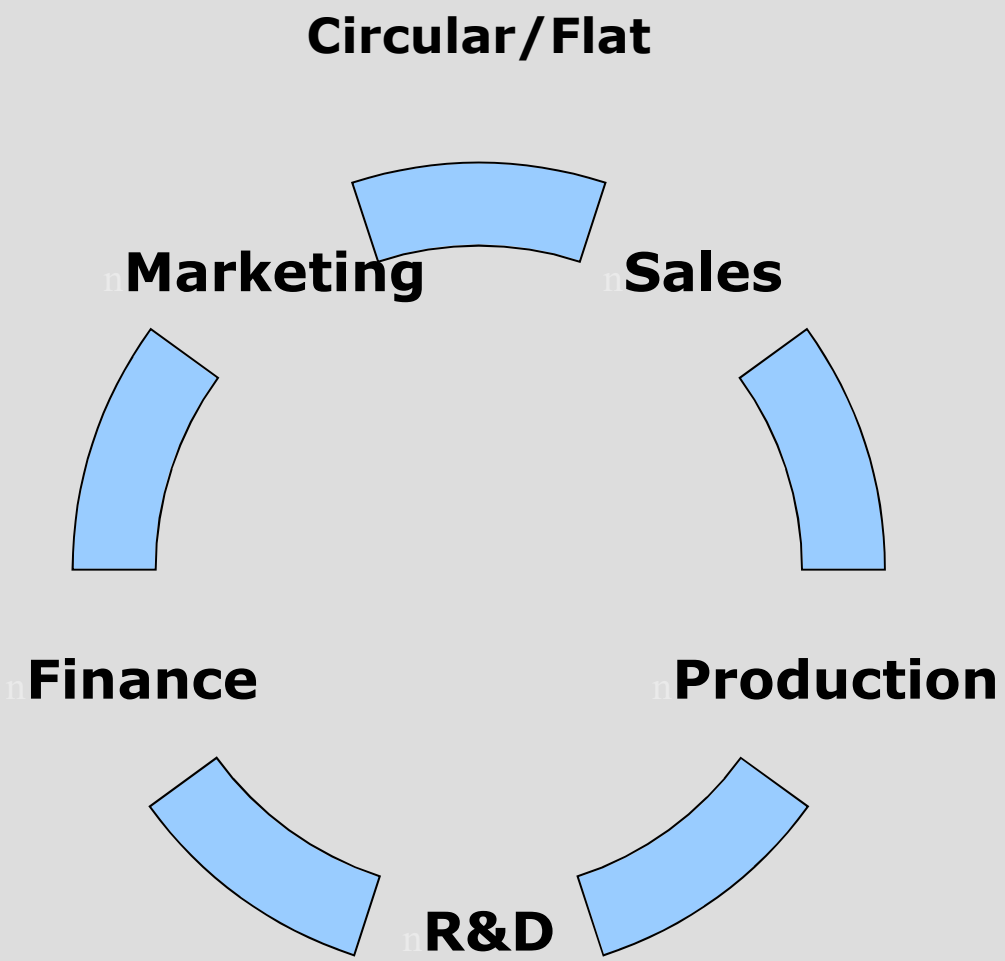


Organisation Charts

Collaborative

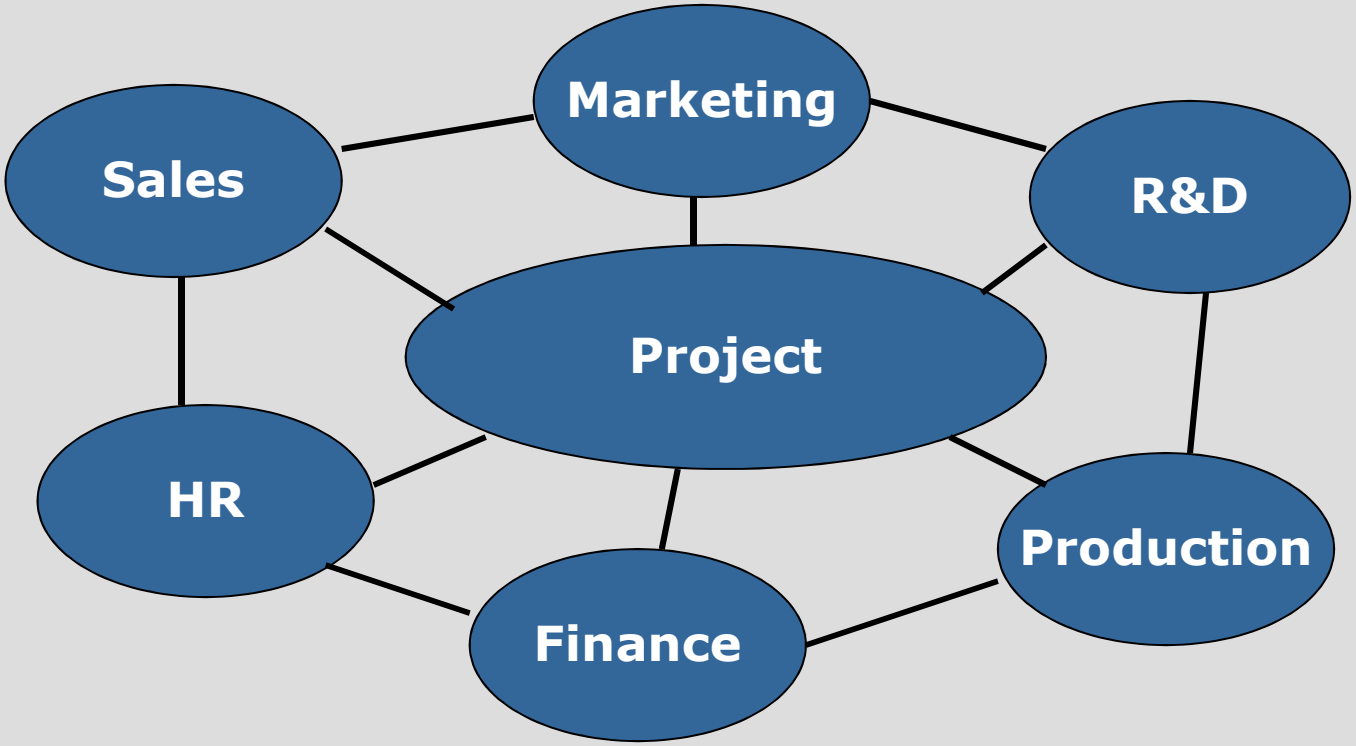


Organisation Charts



Organisation Charts

Matrix Structure



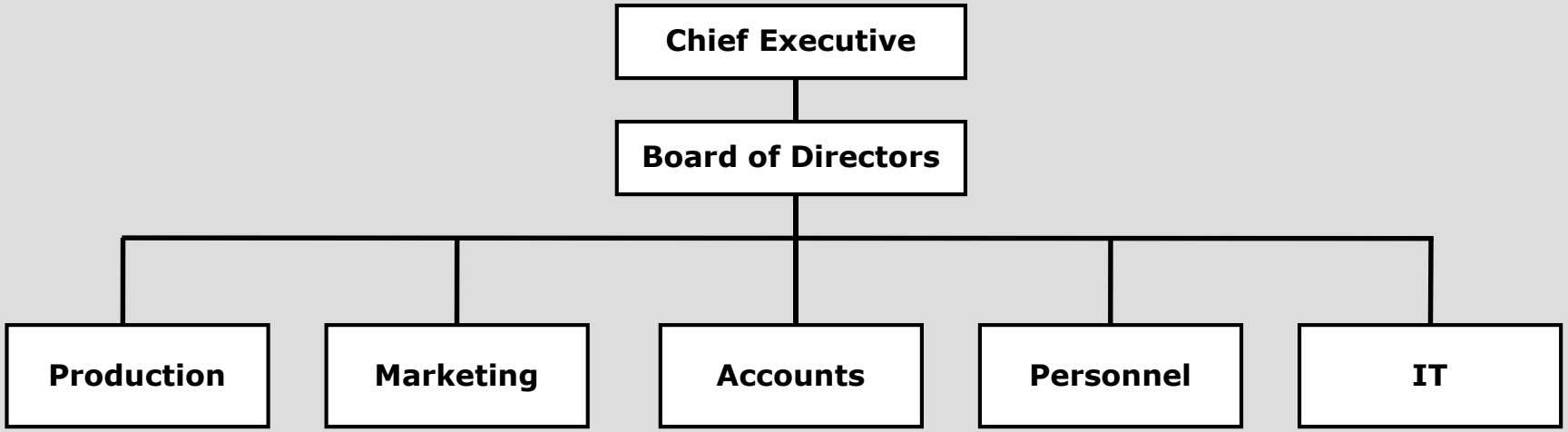
Ways to Structure a Business

- **By function**: arranging the business according to what each section or department does
- **By product or activity**: organising according to the different products made
- **By area**: geographical or regional structure

Pros and Cons of Different Structures

This depends on the business type, size and structure used

Let's look at a functional structure:



Functional Structure

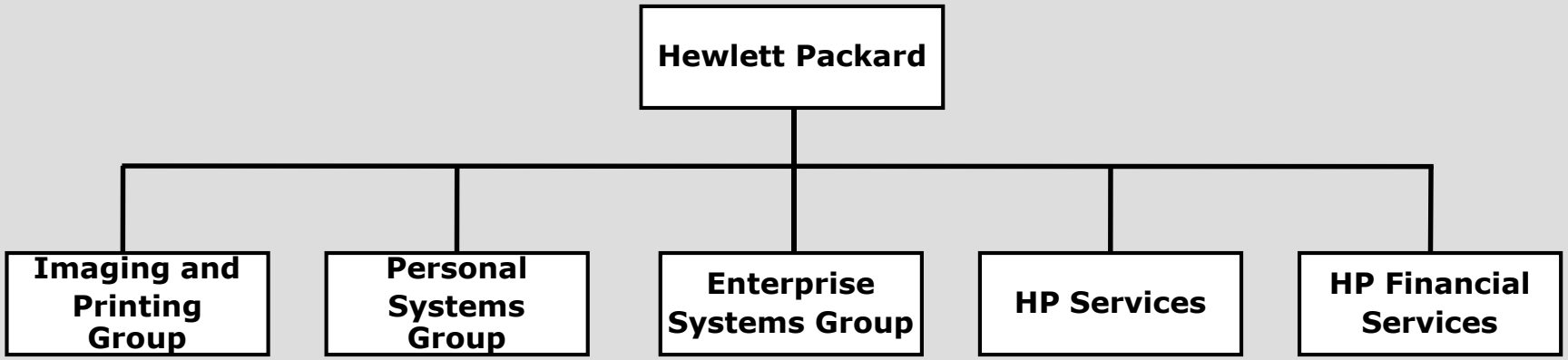
Advantages

- Specialisation – each department focuses on its own work
- Accountability – someone is responsible for the section
- Clarity – know your and others' roles

Disadvantages

- Closed communication could lead to lack of focus
- Departments can become resistant to change
- Coordination may take too long
- Gap between top and bottom

An Example of Organisation by Product/Activity



Organisation by Product/Activity

Advantages

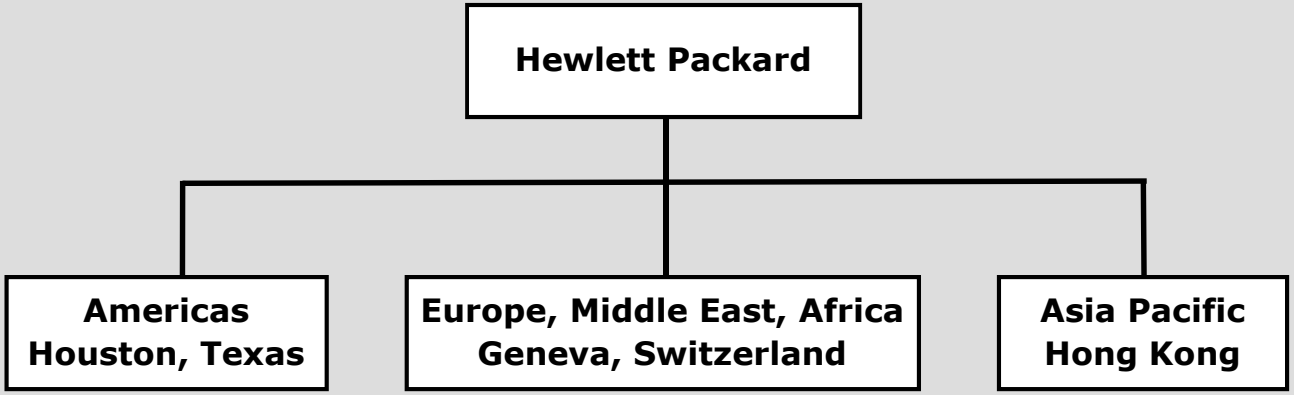
- Clear focus on market segment helps meet customers' needs
- Positive competition between divisions
- Better control as each division can act as separate profit centre

Disadvantages

- Duplication of functions (e.g. different sales force for each division)
- Negative effects of competition
- Lack of central control over each separate division

Organisation by Area

Hewlett-Packard's Headquarters Worldwide



Organisation by Area

Advantages

- Serve local needs better
- Positive competition
- More effective communication between firm and local customers

Disadvantages

- Conflict between local and central management
- Duplication of resources and functions

Overhead costs

Costs not directly involved in production or very small.

For instance:

- internal logistics costs

- insurance fees

- board of directors payments

- office supplies costs

- royalties

- quality assurance costs

- depreciation costs

- financial costs (interests)

V. Human Resources

The determination of human resources required, as well as the assessment of the resources available for the project, are often an important part of a feasibility study, because managerial or supervisory staff and skilled labor can be a critical factor for the success of a project.

V. Human Resources

- **Job specification (outline of the role of the job holder)**
- **Job description (outline of the skills and qualities required of the post holder)**
- **Personnel training needs**
- **Cost estimates for wages, salaries, other personnel-related expenses and training are prepared.**

V. Human Resources

Determination of human resources based on:

- ***organization charts***
- ***production plan***
- ***plant capacity***
- ***business strategy***
- ***desired shift patterns***
- ***production technology***
- ***personnel availability***

Twenty-four categories of employee-related costs

(Read down, prefixing each item with the words 'employee-related')

Direct	**Benefits**	**Other costs**
Salaries	Termination benefits	Recruitment
Wages	Pension plan	Relocation
Overtime	Rent allowances	Legal expenses
Shift allowances	Transport allowances	Training
Bonuses	Other allowances	Secondment
Employers' social welfare	Medical cover	Medical expenses
Employers' payroll taxes	Accident insurance	Professional subscriptions
Contract and temporary staff costs	Life assurance	Entertainment

VI. Location, site and environment

- Location and site are often used synonymously but must be distinguished. The choice of location should be made from a fairly wide geographical area, within which several alternative sites can be considered.
- **Location analysis has to identify locations suitable for the industrial project under consideration**.
- A location may sometimes be suggested at an early stage by the project promoters. However, the methodology of analyzing such a suggestion is the same, and the location in question will still have to fulfil the key requirements identified as essential or critical for a feasible and viable implementation and operation of the project.

VI. Location, site and environment

- **The feasibility study should include a thorough and realistic analysis of the environmental impact of industrial investment projects.**

- **The environmental impact is often of crucial importance for the socio-economic, financial and technical feasibility of a project.**

Business Location

In general a business will look to locate its activities where the costs of production are minimised.

The nature of the business will heavily influence location decisions:

- Type and nature of market
- Type of business – production of goods or services, retail, wholesale?
- Sector – primary, secondary, tertiary, quaternary?

Location selection

For location selection, the following factors should be considered:

- climate conditions
- raw materials and factory materials availability
- market orientation
- human resources availability
- infrastructure services (electricity, transport, communication)
- effluent and waste disposal
- appropriate (affordable) land availability
- fiscal and legal aspects (e.g. subsidies etc.)
- support / tolerance by local community
- quality if life (health, education services) etc.

Site selection

For sites available within the selected area, the following requirements and conditions are to be assessed:

- Ecological conditions on site (soil, site hazards, climate etc.)
- Environmental impact (restrictions, standards, guidelines)
- Socio-economic conditions (restrictions, incentives, requirements)
- Local infrastructure at site location (existing industrial infrastructure, economic and social infrastructure, availability of critical project inputs such as labor and factory supplies)
- Strategic aspects (corporate strategies regarding possible future extension, supply and marketing policies)
- Cost of land
- Site preparation and development, requirements and costs.

Costs estimates

Investment costs estimates:

- acquisition of land,
- real estate taxes,
- legal expenses,
- rights of way,
- site preparation and development,
- factory-external facilities (such as generation of electricity, water supply system, storage, housing and schools, etc.),
- environmental protection costs.

Annual costs estimates:

- annual payments for rent,
- real estate tax,
- rights of way,
- annual charges for easements and other cost items,
- costs for disposal and treatment of waste and effluents.

	FACTOR	LOCATION			WF	LOCATION		
		A	B	C		A	B	C
1	Climate conditions	7	9	4	5	35	45	20
2	Availability of labor	10	7	6	10	100	70	60
3	Raw materials and supplies	9	10	7	10	90	100	70
4	Economic and social background	9	6	6	5	45	30	30
5	Transportation services	7	9	8	10	70	90	80
6	Waste disposal infrastructure	10	9	8	10	100	90	80
7	Communication services	10	9	6	10	100	90	60
8	Incentives	4	5	10	20	80	100	200
9	Land Purchase Cost	4	5	9	15	60	75	135
10	Support of local community	6	7	7	5	30	35	35
	Total weighted score:				100	710	725	770

VII. Implementation Planning and budgeting

Implementation planning and budgeting includes the following major tasks:

- Determination of the type of work tasks, on- and off-site, that are necessary to implement the project.
- Preparation of a time-phased implementation schedule, positioning all the work tasks correctly in time and allowing for adequate time to complete each individual task.
- Determination of the resources needed to complete the individual tasks and the extraction of the corresponding costs.
- Preparation of an implementation budget and cash flow that will ensure the availability of adequate funds throughout the implementation phase.

VII. Implementation Planning and budgeting

Sample breakdown of project implementation costs:

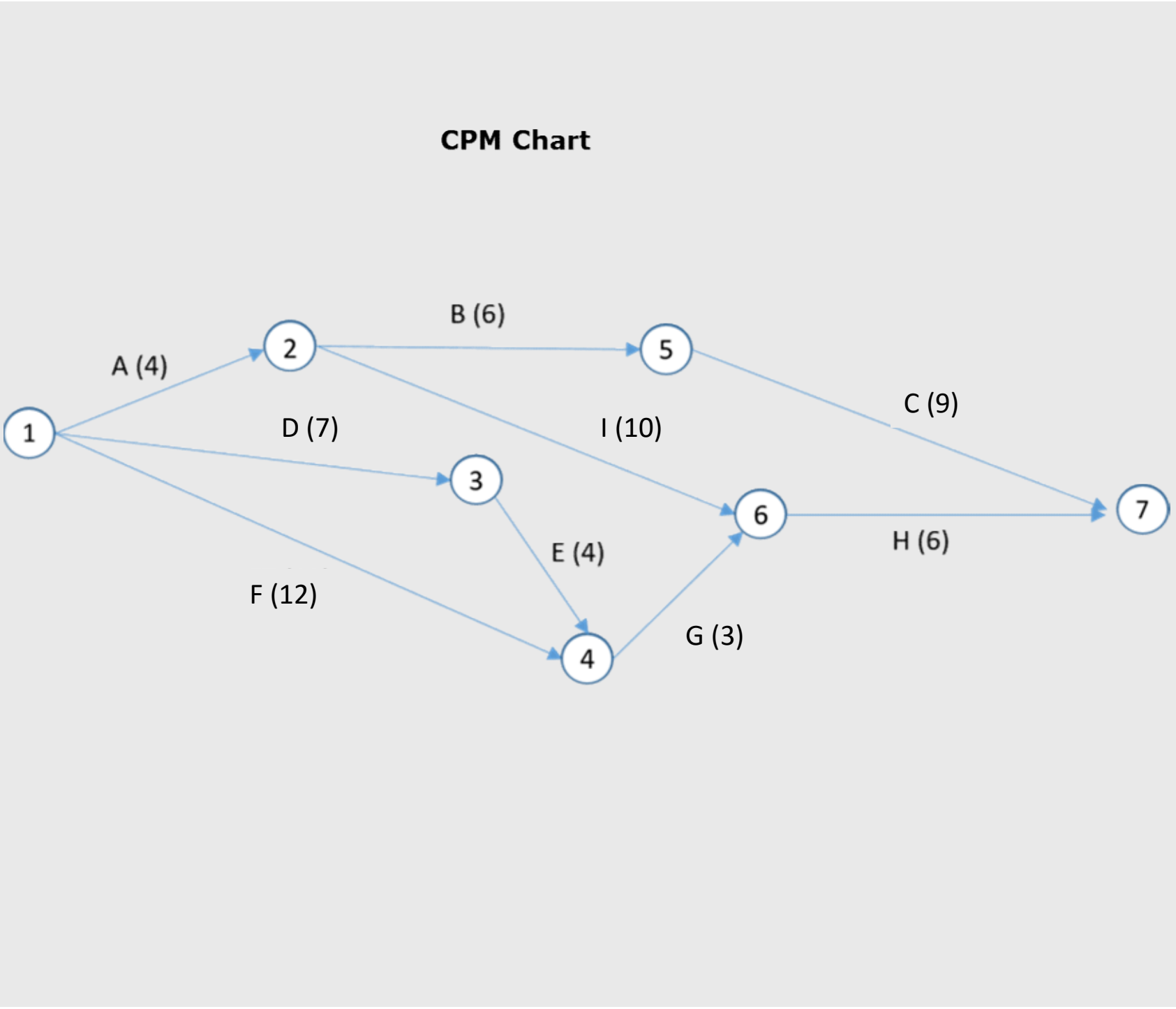
- Costs of project implementation management
- Costs of company formation and organizational build-up
- Technology acquisition and transfer
- Detailed engineering of equipment and civil works, tendering, evaluation of bids, negotiations and contract awards
- Supervision and coordination of construction work, installation, testing, trial runs, start-up and commissioning
- Arrangements for supplies
- Arrangements for pre-production marketing
- Preliminary expenses and costs involved in capital issues (unless included already in cost groups listed above)

Gantt Chart


Jan 11
Jan 18
Jan 25
Feb 1
Feb 8
Feb 15
S M T W T F S S M T W T F S S M T W T F S S M T W T F S S M T W T F S S M T W T F
Task 1
Task 2
Task 3
Task 4
Task 5
Task 6
Task 7
Task 8
Task 9
Task 10
Task 11
Task 12

CPM Chart

Task	Just previous task	Implementation time (week)
A	-	4
B	A	6
C	B	9
D	-	7
E	D	4
F	-	12
G	F, E	3
H	G, I	6
I	A	10


CPM Chart
1
2
3
4
5
6
7
A (4)
B (6)
C (9)
D (7)
E (4)
F (12)
G (3)
H (6)
I (10)

VIII. Financial Analysis and Investment Appraisal

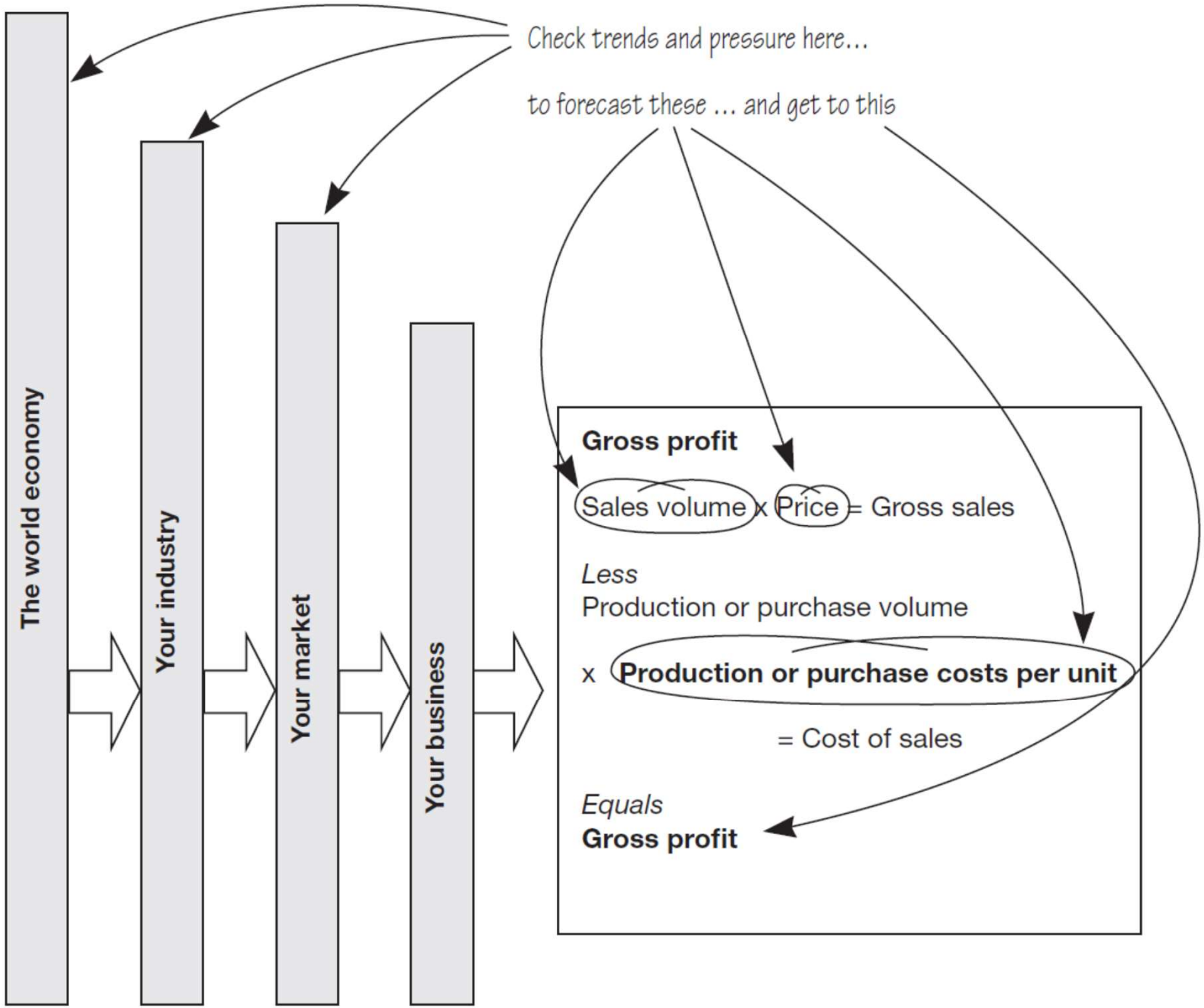
- **From a financial and economic point of view, investment can be defined as a long-term commitment of economic resources made with the objective of producing and obtaining net gains in the future.**

- **These gains should be calculated, as:**

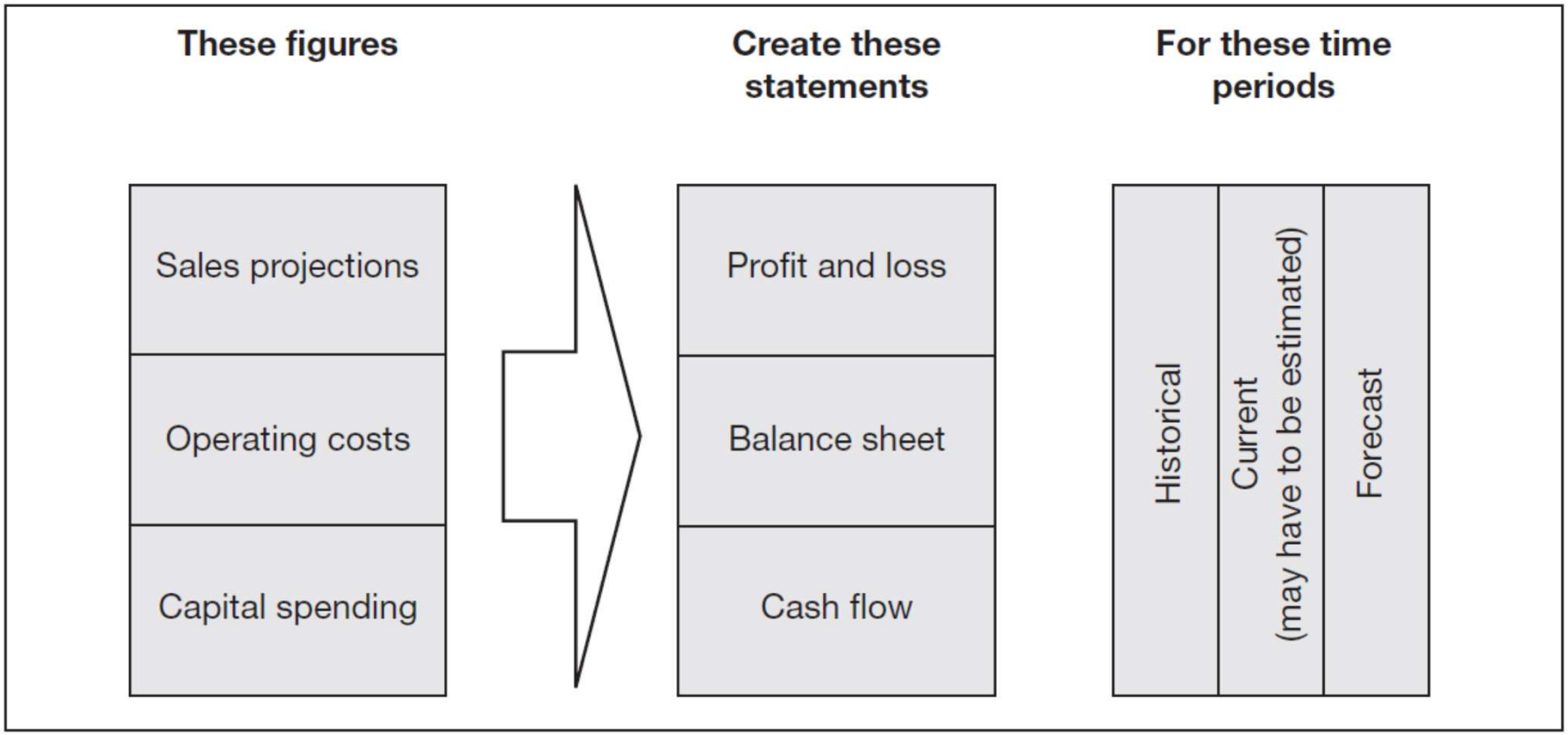
Profit = Total Revenues – Total Costs

and compared with:

Initial Investment Cost


Check trends and pressure here…
to forecast these … and get to this
The world economy
Your industry
Your market
Your business
Gross profit
Sales volume x Price = Gross sales
Less
Production or purchase volume
x Production or purchase costs per unit
= Cost of sales
Equals
Gross profit

Basic Relationships



Financial Analysis

The balance sheet

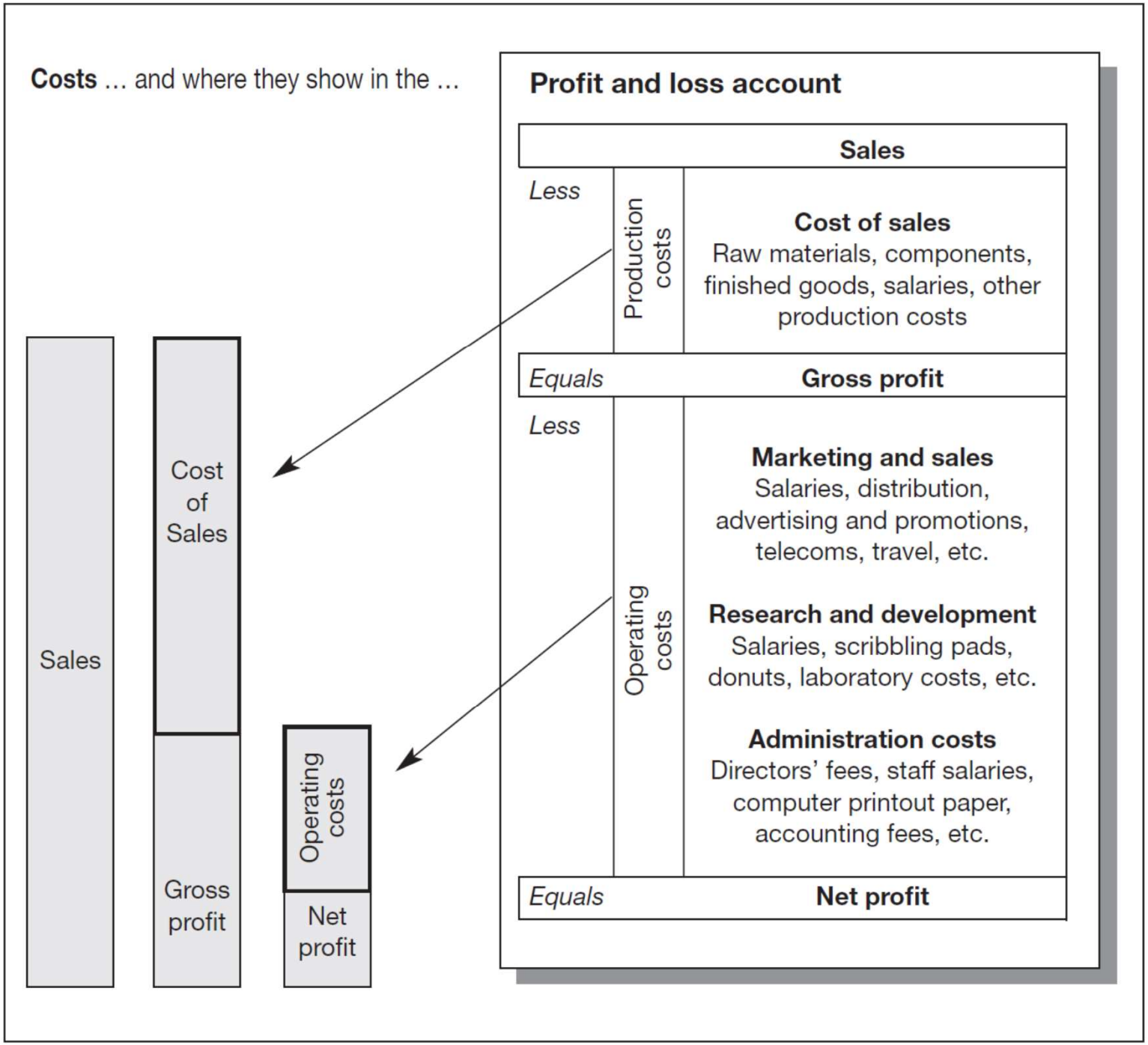
- The balance sheet shows, in financial terms and to the best of the accounting world's ability, the sum total of what you have done in the past and where you are today.

The profit and loss (P&L) account

- It records financial flows relating to a specific period, perhaps a year. The flows are essentially sales income less production costs and operating costs. The difference is net profit (or loss). Transactions are recorded in the period to which they relate. For example, rent for May is entered in the accounts for May even if it was actually paid in advance in April. US readers will know this as an *income statement* even though it includes expenditure.

The cash flow statement

- This shows financial flows as and when they actually happen (rent for May paid in advance in April is recorded in April). It is not unusual for the profit and loss account to look very healthy at the precise moment that negative cash flow (a big borrowing requirement) is strangling the business.

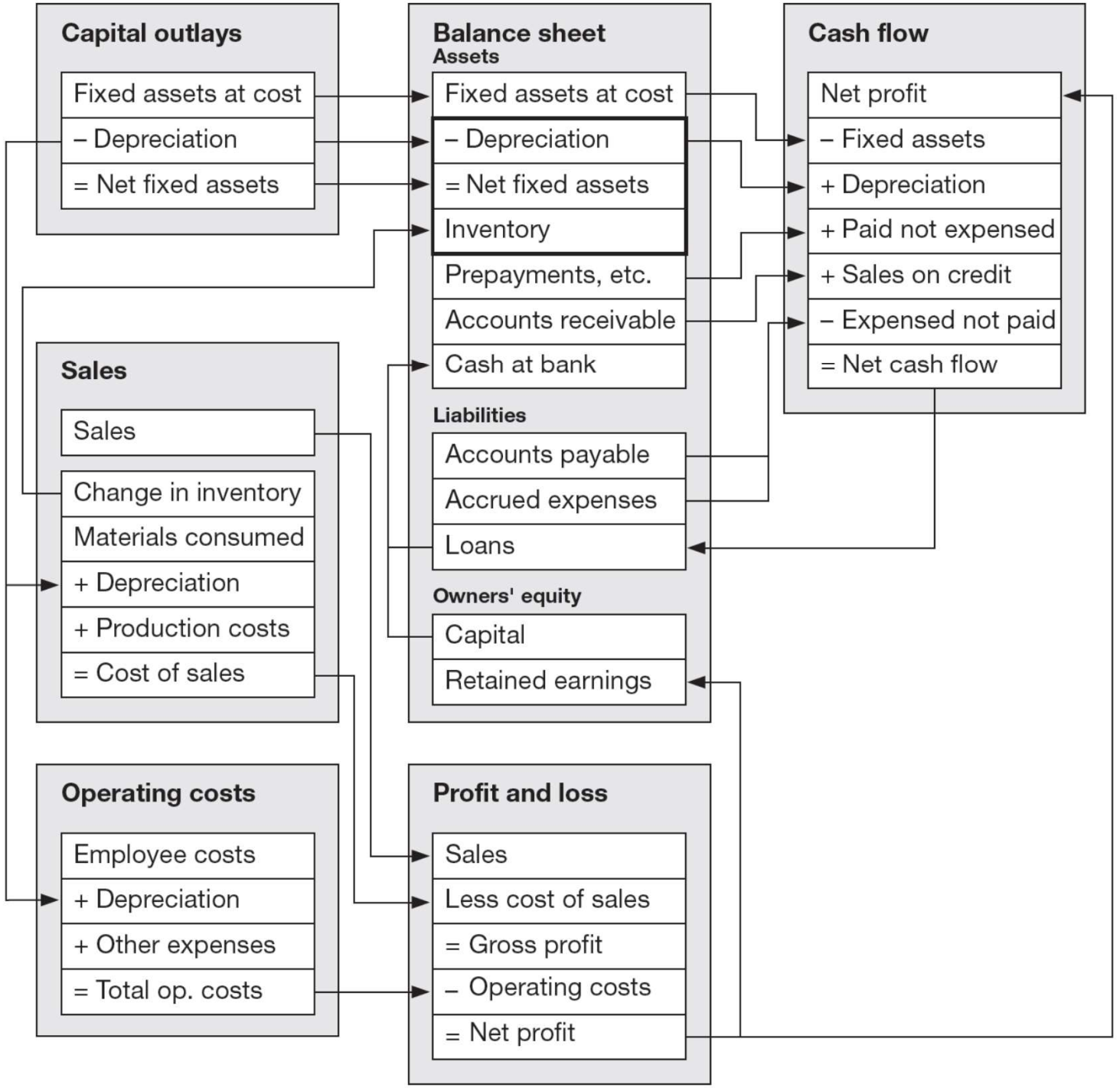

Costs ... and where they show in the ...
Profit and loss account
Sales
Less
Production costs
Cost of sales
Raw materials, components, finished goods, salaries, other production costs
Equals
Gross profit
Less
Operating costs
Marketing and sales
Salaries, distribution, advertising and promotions, telecoms, travel, etc.
Research and development
Salaries, scribbling pads, donuts, laboratory costs, etc.
Administration costs
Directors' fees, staff salaries, computer printout paper, accounting fees, etc.
Equals
Net profit
Sales
Cost of Sales
Gross profit
Operating costs
Net profit

Financial relationships exposed

This diagram shows the interrelationships between the three sets of transactions and the three financial statements.

All the accounts show flows over time, except the balance sheet, which shows balances at a point in time.

The changes in balance sheet between two dates reveal flows.



Total initial investment cost

1. Establishment costs (opportunity / feasibility studies, surveys , travel expenses etc.)

2. Fixed investment costs (land purchase, site preparation and improvements, building and civil works, plant machinery and equipment including auxiliary equipment, certain incorporated fixed assets such as industrial property rights and payments for know-how and patents etc.)

3. Project implementation cost and pre-production expenditures

4. Net working capital

Net working capital

Net working capital is defined to **include current assets** (the sum of raw materials inventories, finished products, prepaid items, accounts receivable and cash) **minus current liabilities** (accounts payable).

It forms an essential part of the initial capital outlays required for an investment project, because it is required to finance the operation of the plant.

Finding funding

- Loans
- Leasing
- Profits that are fed back into the business
- Shares
- Grants and donations
- venture capital providers
- start-up capital from family, friends, working partners and angels

Investment Appraisal

The project financial appraisal (a 3- 5 years analysis) is based on:

- balance sheet

- cash flows statement

- net present values (NPV)

- payback period

- internal rate of return (IRR)

- return over investment (ROI)

- break-even analysis (BEP)

- sensitivity analysis

Net present values (NPV)

Net Present Value (NPV) is the difference between the present value of cash inflows and the present value of cash outflows. NPV is used in capital budgeting to analyze the profitability of a projected investment or project. The following is the formula for calculating NPV:

$$NPV = \sum_{t=1}^{T} \frac{C_t}{(1+r)^t} - C_0$$

where
C_t = net cash inflow during the period t
C_o = total initial investment costs
r = discount rate, and
t = number of time periods

A positive net present value indicates that the projected earnings generated by a project or investment (in present value) exceeds the anticipated costs (also in present value).

Generally, an investment with a positive NPV will be a profitable one and one with a negative NPV will result in a net loss.

Discounted cash flow (DCF)

DCF analysis uses **future free cash** flow projections and discounts them to arrive at a **present value** estimate, which is used to evaluate the potential for investment.

If the value arrived at through DCF analysis is higher than the current cost of the investment, the opportunity may be a good one.

It is calculated as:

$$DCF = \frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2} + \ldots + \frac{CF_n}{(1+r)^n}$$

$CF = \text{Cash Flow}$

$r = \text{discount rate (WACC)}$

The discount rate in DCF analysis takes into account **not just the time value of money, but also the risk or uncertainty of future cash flows**; the greater the uncertainty of future cash flows, the higher the discount rate.

Payback period

The payback period is the length of time required to recover the cost of an investment.

The payback period of a given investment or project is an important determinant of whether to undertake the position or project, as longer payback periods are typically not desirable for investment positions.

The payback period ignores the time value of money, unlike other methods of capital budgeting, such as net present value, internal rate of return or discounted cash flow.

The following is the formula for calculating the payback period:

Payback Period = Cost of Investment / Annual Net Cash Inflows

Internal rate of return (IRR)

Internal rate of return (IRR) is a tool measuring the profitability of potential investments. **Internal rate of return is a discount rate that makes the net present value (NPV) of all cash flows from a particular project equal to zero.** IRR calculations rely on the same formula as NPV does.

To calculate IRR using the formula, one would set NPV equal to zero and solve for the discount rate *r*, which is here the IRR. Because of the nature of the formula, however, IRR cannot be calculated analytically, and must instead be calculated either through trial-and-error or using software programmed to calculate IRR.

Generally speaking, the higher a project's internal rate of return, the more desirable it is to undertake the project.

Assuming the costs of investment are equal among the various projects, the project with the highest IRR would probably be considered the best and undertaken first.

Internal rate of return (IRR)

An alternative calculation procedure begins with the preparation of a cash flow table.

An estimated discount rate is then used to discount the net cash flow to the present value. If the NPV is positive, a higher discount rate is applied. If the NPV is negative at this higher rate, the IRR must be between these two rates.

However, if the higher discount rate still gives a positive NPV, the discount rate must be increased until the NPV becomes negative.

If the positive and negative NPVs are close to zero, a good approximation of the IRR value can be obtained, using the following linear interpolation formula:

$$i_r = i_1 + \frac{\mathrm{PV}\,(i_2 - i_1)}{\mathrm{PV} + \mathrm{NV}}$$

Where i_r is the IRR, PV is the positive NPV (at the lower discount rate i_1), and NV is the negative NPV (at the higher discount rate i_2).

Return over investment (ROI)

A performance measure used **to evaluate the efficiency of an investment** or to compare the efficiency of a number of different investments. **ROI measures the amount of return on an investment relative to the investment's cost.**

To calculate ROI, the benefit (or return) of an investment is divided by the cost of the investment, and the result **is expressed as a percentage** or a ratio. The return on investment formula:

ROI = (Total Revenues – Total Costs) / Initial Investment Cost

Because ROI is measured as a percentage, it can be easily compared with returns from other investments, allowing one to measure a variety of types of investments against one another.

Break-even analysis (BEP)

The purpose of break-even analysis is to determine **the equilibrium point at which sales revenues equal the costs of products sold**.

When sales (and the corresponding production) are below this point, the firm is making a loss, and at the point where revenues equal costs, the firm is breaking even. Break-even analysis serves to compare the planned capacity utilization with the production volume below which a firm would make losses.

Break-even production is the number of units U necessary to produce and sell in order fully to cover the annual fixed costs C_f for a given unit sales price p_s and the variable unit costs c_v, or

$$(p_s - c_v)\, U = C_f$$

$$\text{or } U = \frac{C_f}{(p_s - c_v)}$$

Sensitivity analysis

- With the help of sensitivity analysis it is possible to show how the net cash returns or the profitability of an investment **alter** with different values assigned to the variables needed for the computation (unit sales price, unit costs, sales volume etc.)

- To determine the critical variables, the structure of cash flows should be analyzed first. The variables having the greatest share of cash inflows and outflows are then subject to variations of quantities or prices or both parameters at the same time.