

# Chapter 3. Design of Goods and Services

3.1. Product concept

3.2. Product design and development process. The time factor

3.3. New techniques for product design and development

3.4. Strategies for external product development

3.5. Service development

Basic references:

- Heizer, J. & Render, B. (2009): Operations Management. New Jersey: Pearson Prentice Hall

## 3.1. The product concept

- ☑ The good or service the organisation provides society
- ☑ Top organisations typically focus on core products
- ☑ Customers buy satisfaction, not just a physical good or particular service
- ☑ Fundamental to an organisation's strategy with implications throughout the operations function

## Product strategy options

### ☑ Differentiation

- ☑ Shouldice Hospital (Hernia repair operations) (Canada, [www.shouldice.com](http://www.shouldice.com))

### ☑ Low cost

- ☑ Taco Bell (minimum labour, small kitchens)

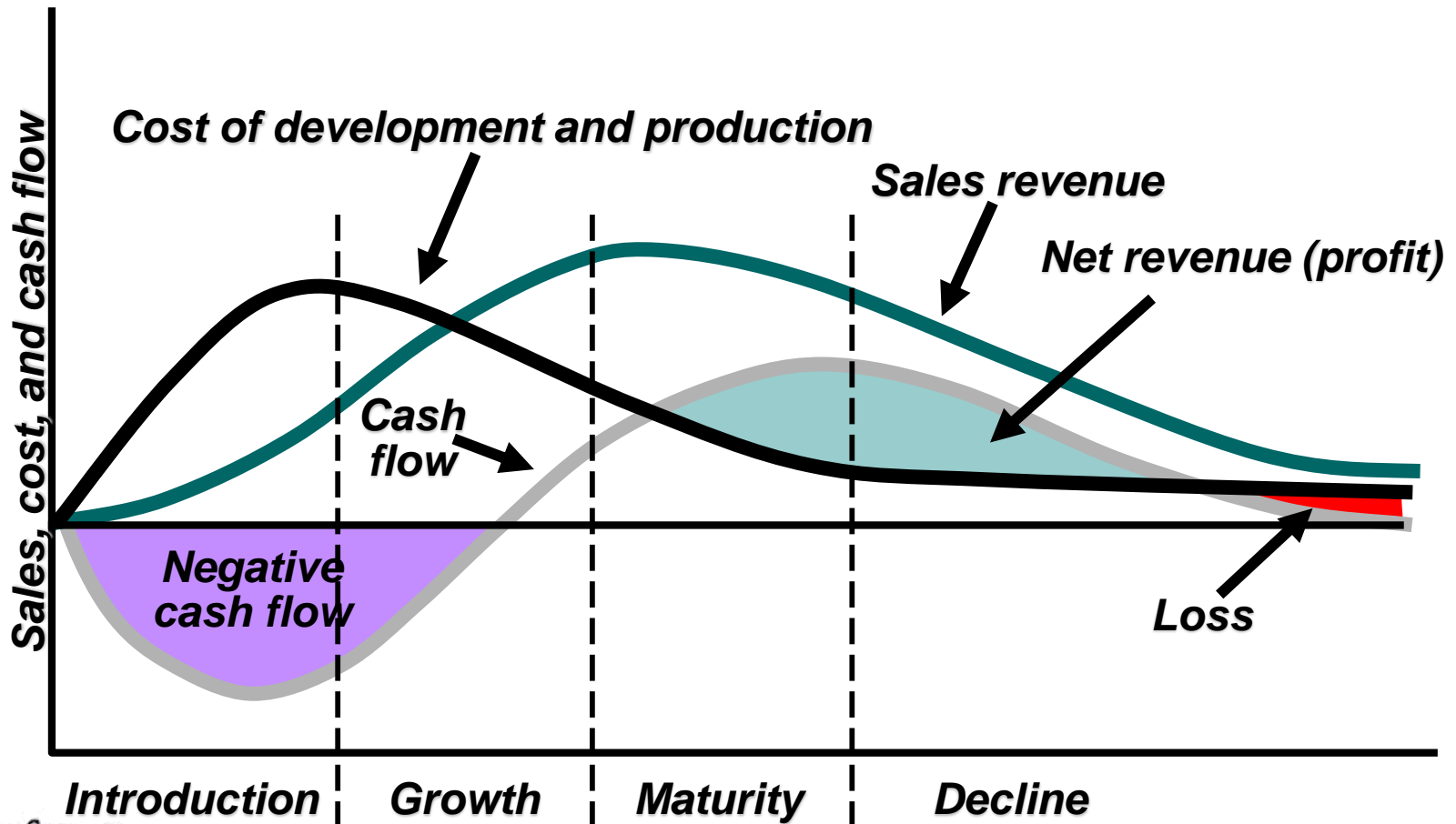
### ☑ Rapid response

- ☑ Toyota (fast design process)

## Product life cycle

- ☑ May be any length from a few hours to decades (concert T-shirt vs Boeing 737)
- ☑ The operations function must be able to introduce new products successfully

# Product life cycles



## Product life cycle

### *Introduction*

- ☑ Fine tuning may warrant unusual expenses for
  - ☑ Research
  - ☑ Product development
  - ☑ Process modification and enhancement
  - ☑ Supplier development

## Product life cycle

### *Growth*

- ☑ Product design begins to stabilise
- ☑ Effective forecasting of capacity becomes necessary
- ☑ Adding or enhancing capacity may be necessary

## Product life cycle

### *Maturity*

- ☑ Competitors now established
- ☑ High volume, innovative production may be needed
- ☑ Improved cost control, reduction in options, paring down of product line

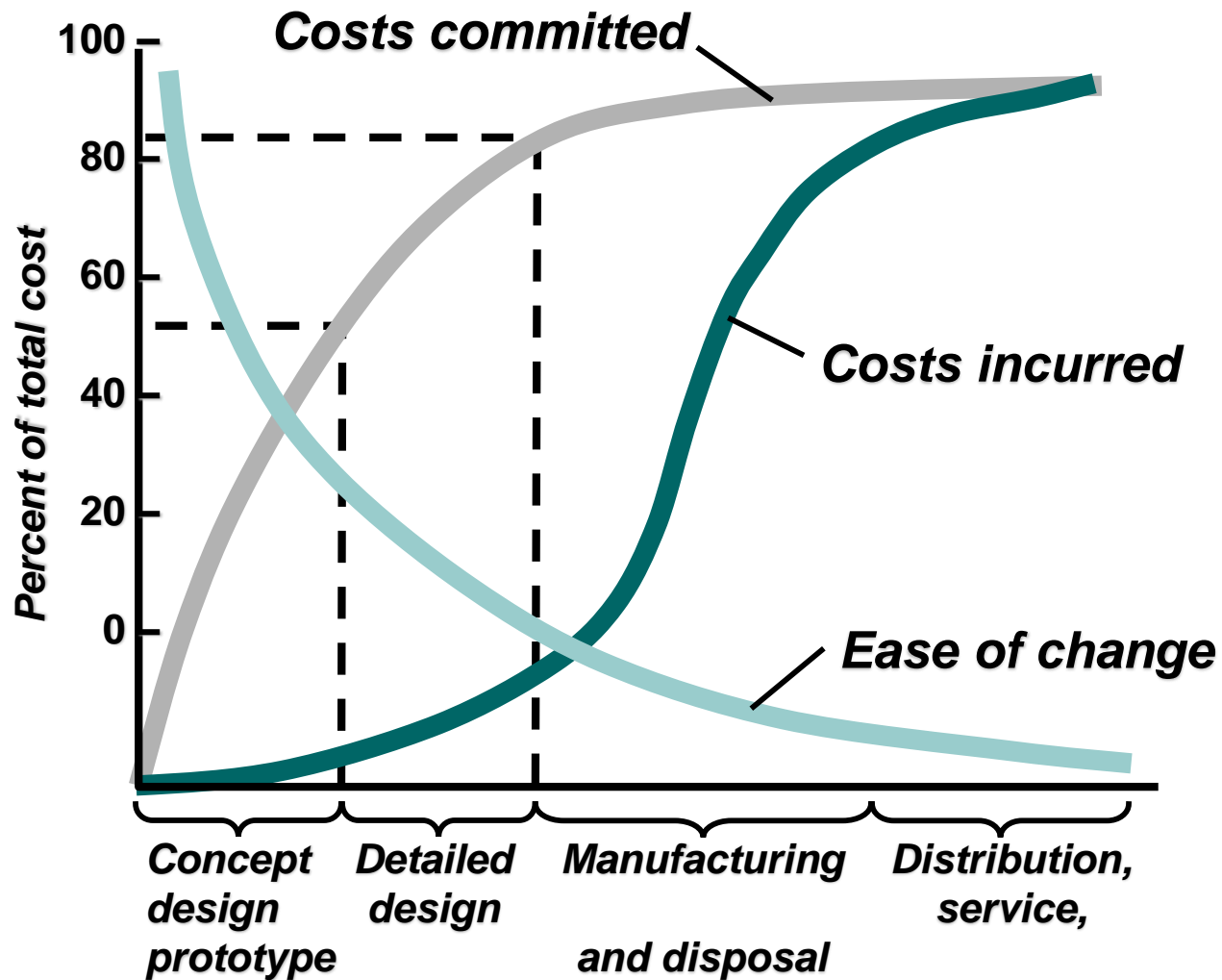


## Product life cycle

### *Decline*

- ☑ Unless product makes a special contribution (selling price – direct costs) to the organisation, plans must be made to terminate offering

# Product life cycle costs



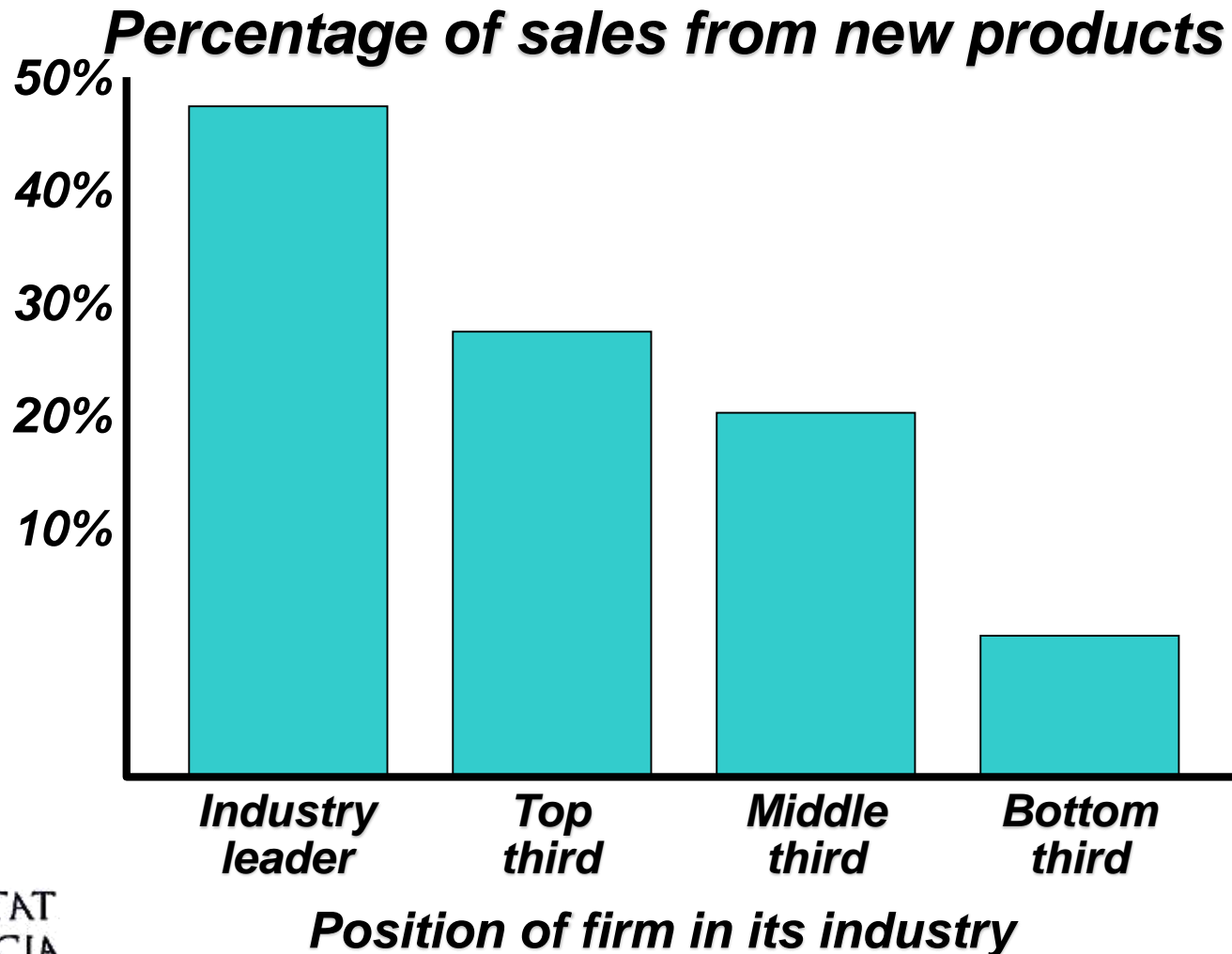
## New product opportunities

- 1. Understanding the customer**
- 2. Economic change**
- 3. Sociological and demographic change** (homes and cars)
- 4. Technological change** (smartphones)
- 5. Political/legal change** (garments from Far East)
- 6. Market practice, professional standards, suppliers, distributors**



**Brainstorming  
is a useful tool**

## Importance of new products



## Reasons for failure of new products

To think that, automatically, a success in a country will imply success in every country

Design problems

A bad choice of product name

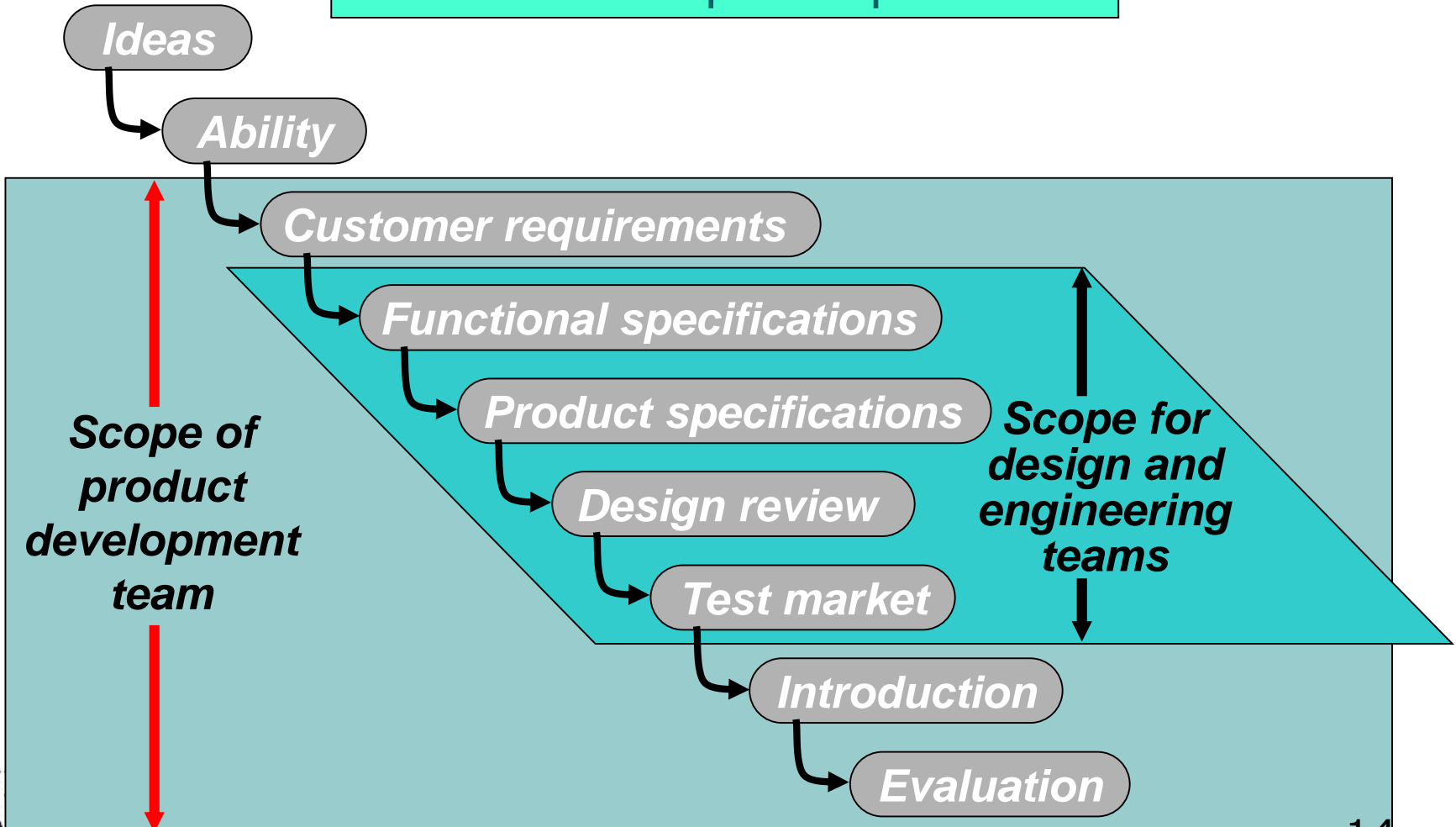
Inadequate timing for launch

Competitor reactions

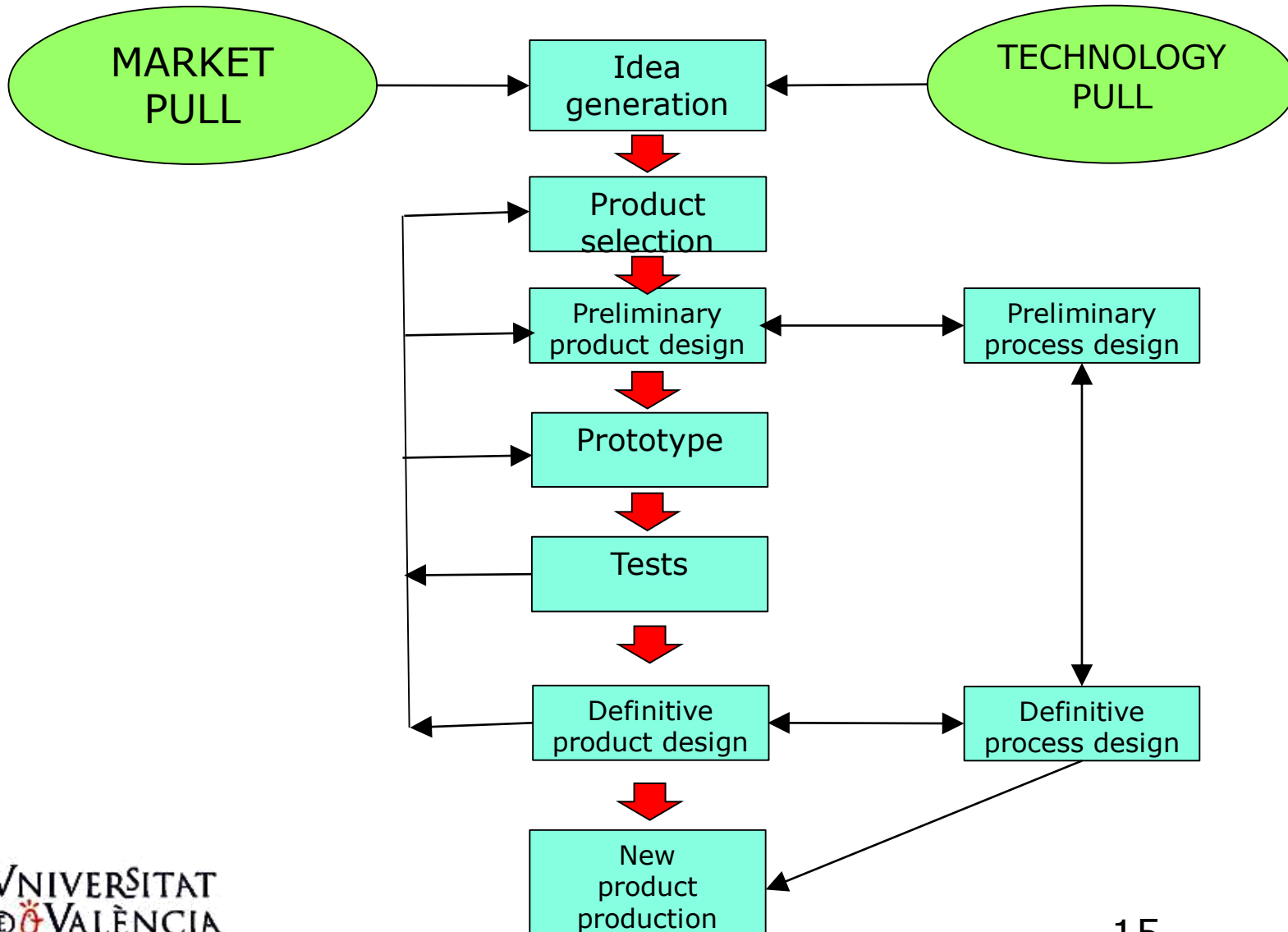
Out-of-focus product positioning

## 3.2. Product design and development process. The time factor

### Product development process



# Product development process



## Organising for product development

- ☑ Historically – distinct departments
  - ☑ Duties and responsibilities are defined
  - ☑ Difficult to foster forward thinking
- ☑ A champion
  - ☑ Product manager drives the product through the product development system and related organisations



## Organising for product development

- ☑ Team approach
  - ☑ Cross functional – representatives from all disciplines or functions
  - ☑ Product development teams, design for manufacturability teams, value engineering teams
- ☑ Japanese 'whole organisation' approach
  - ☑ No organisational divisions

## Manufacturability and value engineering

### ☑ Benefits:

1. Reduced complexity of products
2. Additional standardisation of products
3. Improved functional aspects of product
4. Improved job design and job safety
5. Improved maintainability (serviceability) of the product
6. Robust design

# Time-based competition

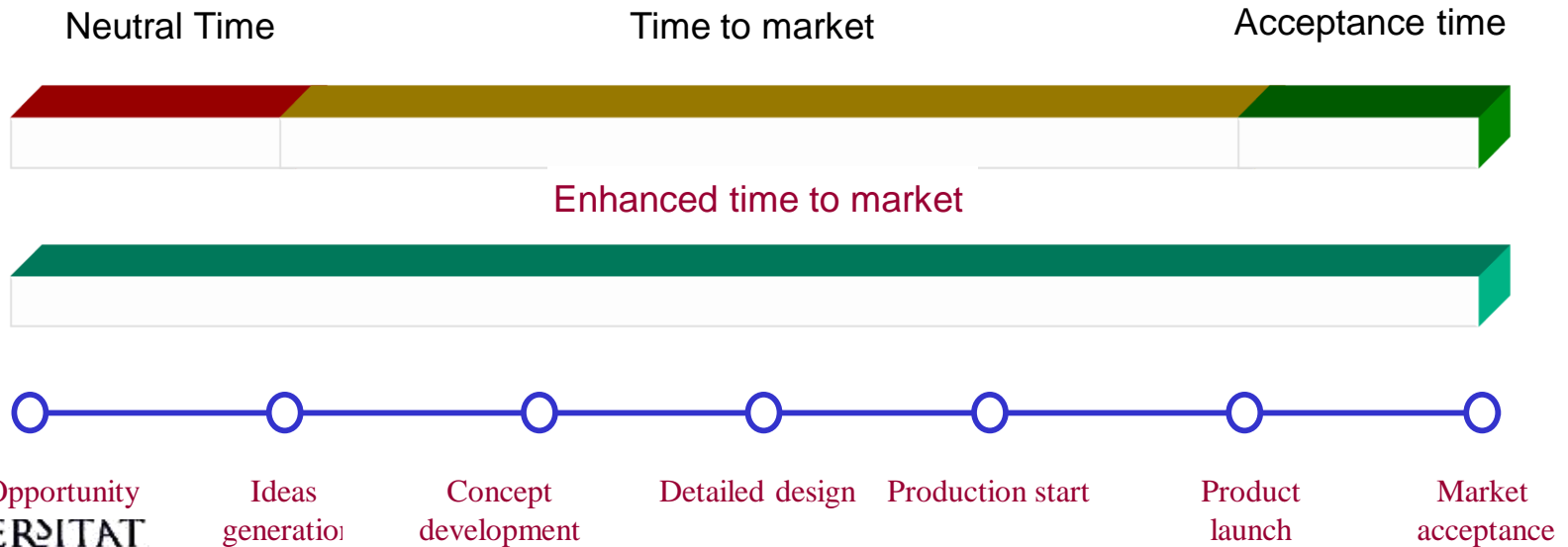
+ NEUTRAL TIME

+ ACCEPTANCE TIME

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= ENHANCED TIME TO MARKET

**Time to market**  
*Time spent from the product definition till product is available in the marketplace*



## Time-based competition

- ☑ Product life cycles are becoming shorter and the rate of technological change is increasing
- ☑ Developing new products faster can result in a competitive advantage

## 3.3. New techniques for product design and development

### Issues for product development

- ☑ Robust design
- ☑ Concurrent engineering
- ☑ Modular design
- ☑ Computer-aided design (CAD)
- ☑ Computer-aided manufacturing (CAM)
- ☑ Virtual reality technology
- ☑ Value analysis
- ☑ Environmentally friendly design

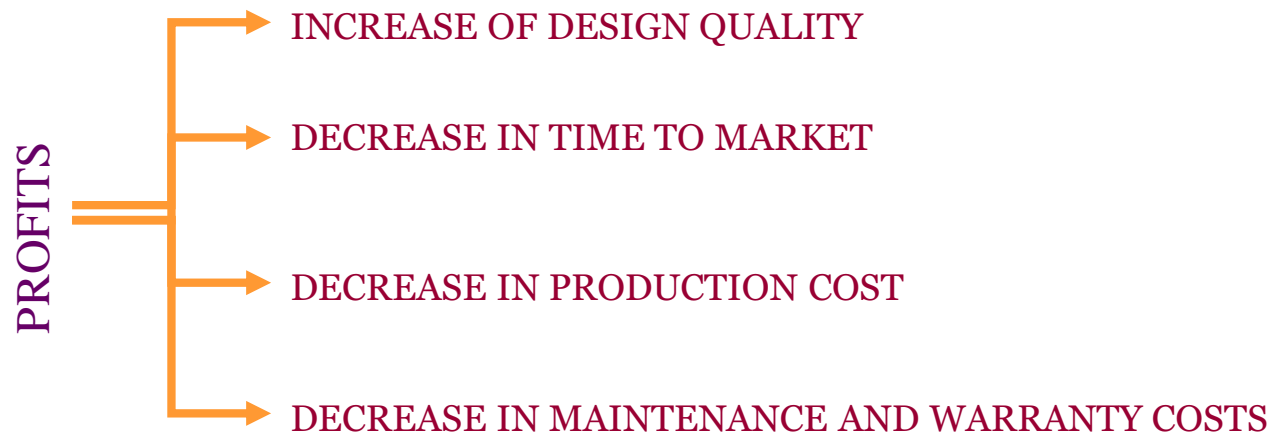
## Robust design

- ☑ Product is designed so that small variations in production or assembly do not adversely affect the product
- ☑ Typically results in lower cost and higher quality

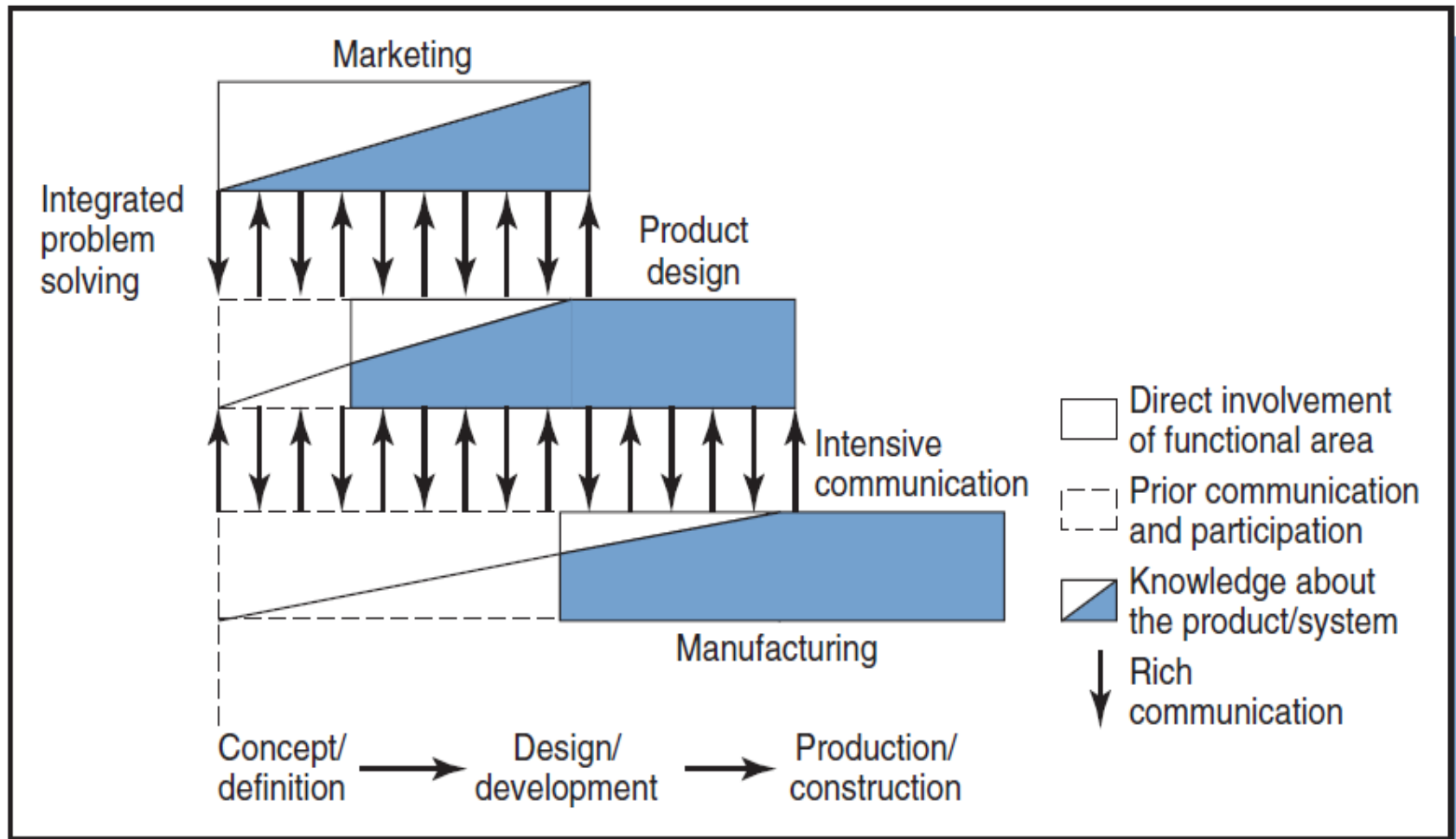
# Concurrent engineering

*In parallel implementation of the different phases of the product and process design, in a way that:*

- *Designs, production means, and information technologies are efficiently used.*
- *Workteam is emphasised.*
- *Redundancies and activities not generating value are eliminated*
- *Integration in the company is promoted.*
- *Customer requirement and quality are taken into account from the product design stage.*



# Concurrent engineering





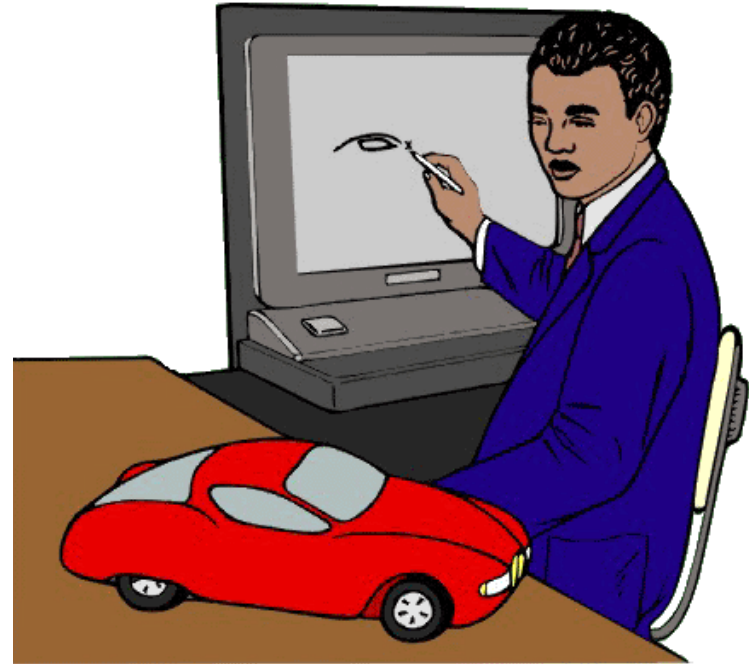
## Modular design

- ☑ Products designed in easily segmented components
- ☑ Adds flexibility to both production and marketing
- ☑ Improved ability to satisfy customer requirements

## 2. Product development

### Computer aided design (CAD)

- ☑ Using computers to design products and prepare engineering documentation
- ☑ Shorter development cycles, improved accuracy, lower cost
- ☑ Information and designs can be deployed worldwide



### Extensions of CAD

- ☑ Design for manufacturing and assembly (DFMA)
  - ☑ Solve manufacturing problems during the design stage
- ☑ 3-D object modeling
  - ☑ Small prototype development
- ☑ CAD through the internet
- ☑ International data exchange through STEP

### Computer-aided manufacturing (CAM)

- ☑ ***Utilising specialised computers and programs to control manufacturing equipment***
- ☑ ***Often driven by the CAD system (CAD/CAM)***

### Benefits of CAD/CAM

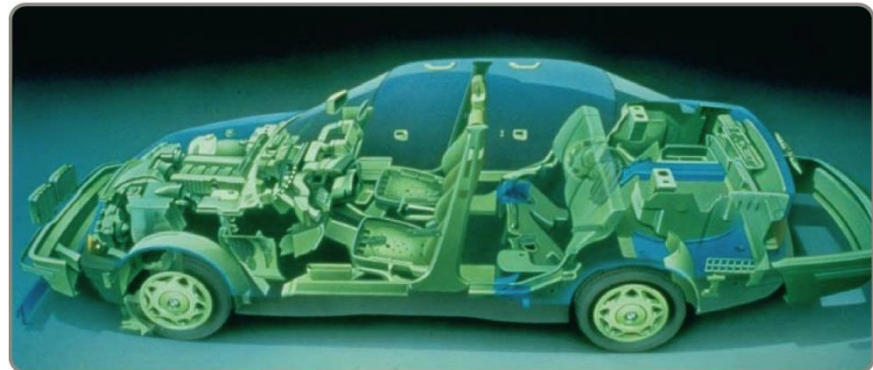
1. Product quality
2. Shorter design time
3. Production cost reductions
4. Database availability
5. New range of capabilities

### Ethics and environmentally friendly designs

It is possible to enhance productivity, drive down costs, and preserve resources

Effective at any stage of the product life cycle

- ☑ Design
- ☑ Production
- ☑ Destruction



## The ethical approach

- ☑ View product design from a systems perspective
  - ☑ Inputs, processes, outputs
  - ☑ Costs to the firm/costs to society
- ☑ Consider the entire life cycle of the product

### Goals for ethical and environmentally friendly designs

1. Develop safe and more environmentally sound products
2. Minimise waste of raw materials and energy
3. Reduce environmental liabilities
4. Increase cost-effectiveness of complying with environmental regulations
5. Be recognised as a good corporate citizen



### Guidelines for environmentally friendly designs

1. Make products recyclable
2. Use recycled materials
3. Use less harmful ingredients
4. Use lighter components
5. Use less energy
6. Use less material



## 3.4. Strategies for external product development

### Acquiring technology

- ✓ By purchasing a firm
  - ✓ Speeds development
  - ✓ Issues concern the fit between the acquired organisation and product and the host
- ✓ Through joint ventures
  - ✓ Both organisations learn
  - ✓ Risks are shared
- ✓ Through alliances
  - ✓ Cooperative agreements between independent organisations

# Product development continuum

## *External development strategies*

*Alliances*

*Joint ventures*

*Purchase technology or expertise  
by acquiring the developer*

## *Internal development strategies*

*Migrations of existing products*

*Enhancements to existing products*

*New internally developed products*

**Internal** ← **Cost of product development** → **Shared**

**Lengthy** ← **Speed of product development** → **Rapid and/  
or existing**

**High** ← **Risk of product development** → **Shared**

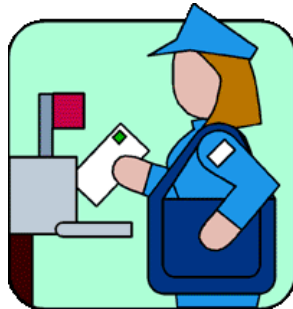
## 3.5. Service development

### Characteristics of goods

- ☑ Tangible product
- ☑ Consistent product definition
- ☑ Production usually separate from consumption
- ☑ Can be inventoried
- ☑ Low customer interaction



## Characteristics of service



- ☑ Intangible product
- ☑ Produced and consumed at same time
- ☑ Often unique
- ☑ High customer interaction
- ☑ Inconsistent product definition
- ☑ Often knowledge-based
- ☑ Frequently dispersed

## Goods versus services

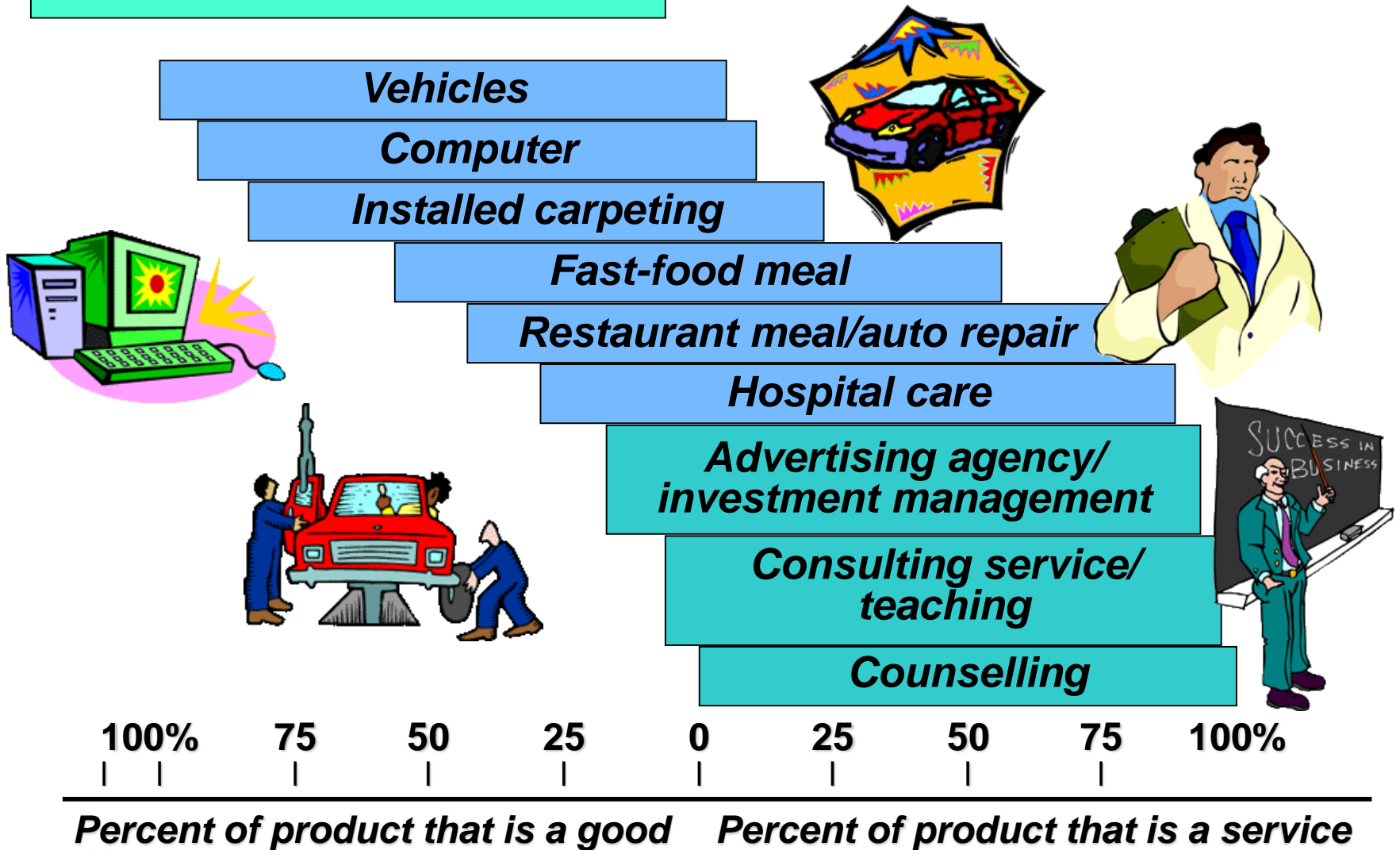
### ***Attributes of goods (tangible product)***

Can be resold  
Can be inventoried  
Some aspects of quality measurable  
Selling is distinct from production  
Product is transportable  
Site of facility important for cost  
Often easy to automate  
Revenue generated primarily from tangible product

### ***Attributes of services (intangible product)***

Reselling unusual  
Difficult to inventory  
Quality difficult to measure  
Selling is part of service  
Provider, not product, is often transportable  
Site of facility important for customer contact  
Often difficult to automate  
Revenue generated primarily from the intangible service

# Goods and services



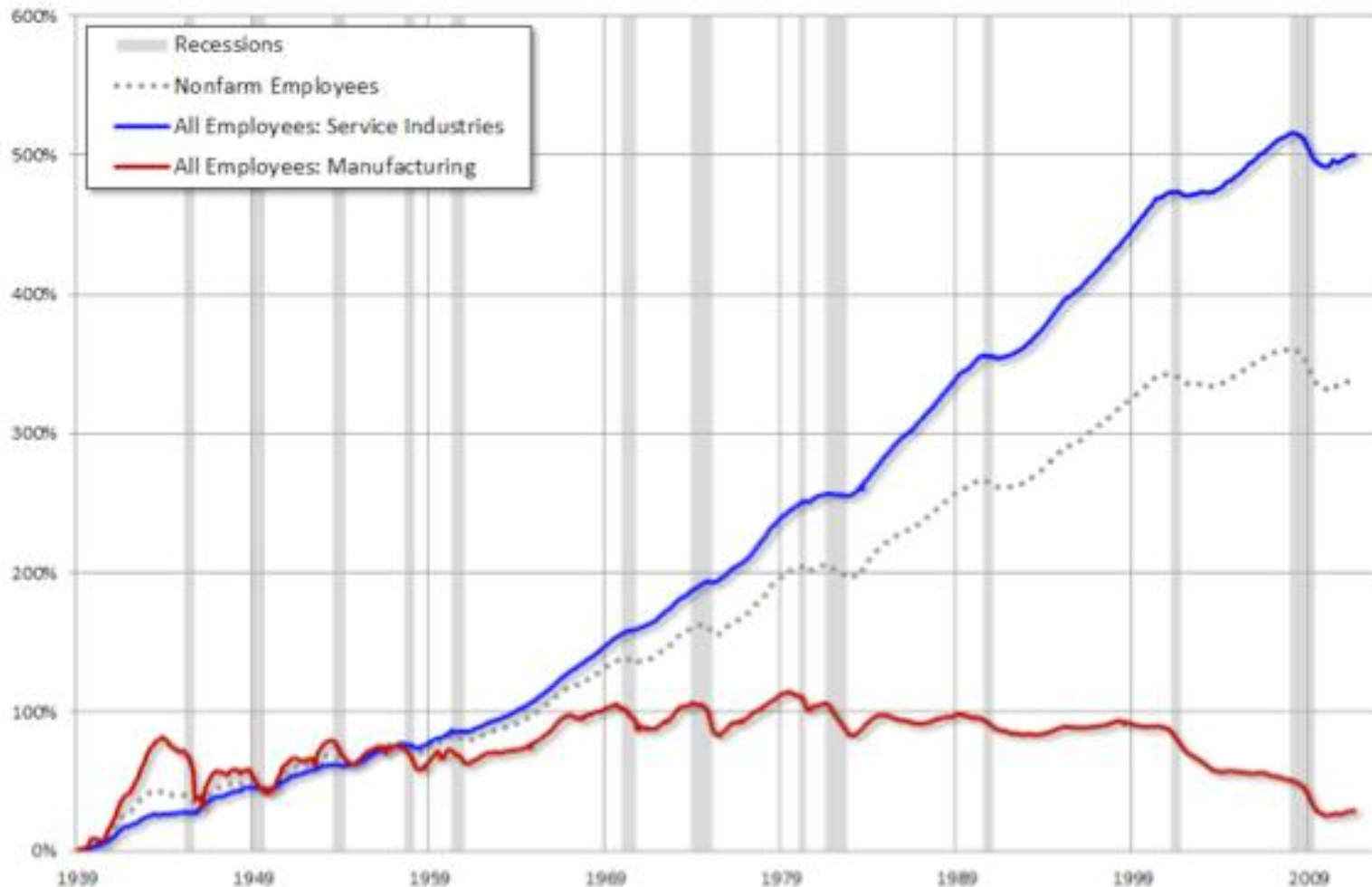
Percent of product that is a good

Percent of product that is a service

# Manufacturing and service employment (USA)

Employment Growth Since 1939  
Service Industries versus Manufacturing

dshort.com  
September 2011



Source : [www.businessinsider.com](http://www.businessinsider.com)

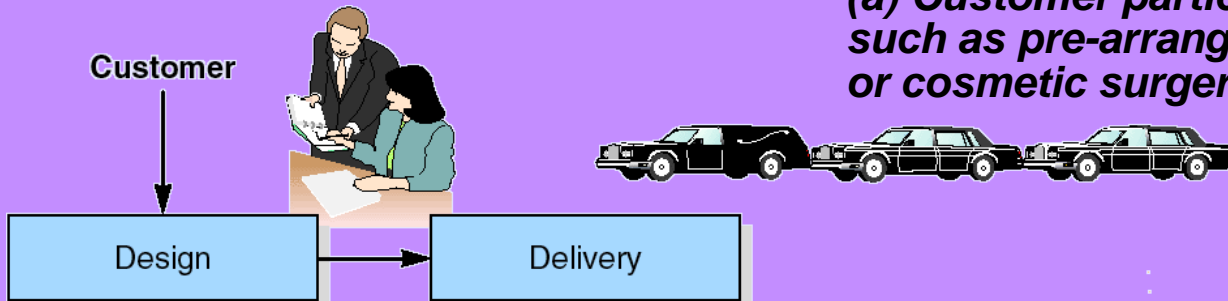


## Service design

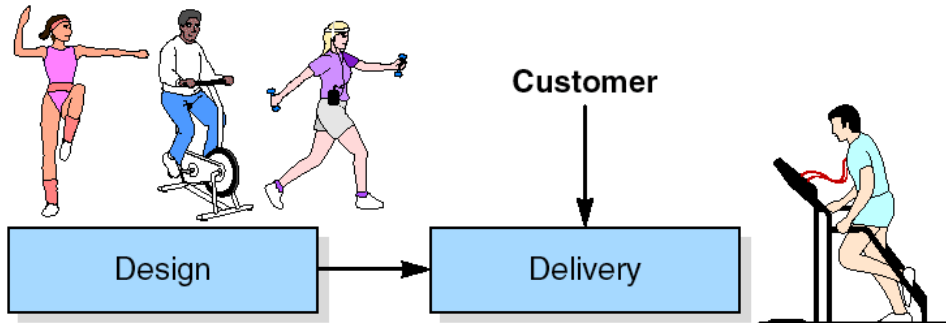
- ☑ Service typically includes direct interaction with the customer
  - ☑ Increased opportunity for customisation
  - ☑ Reduced productivity
- ☑ Cost and quality are still determined at the design stage
  - ☑ Delay customisation
  - ☑ Modularisation
  - ☑ Reduce customer interaction, often through automation

# Service design

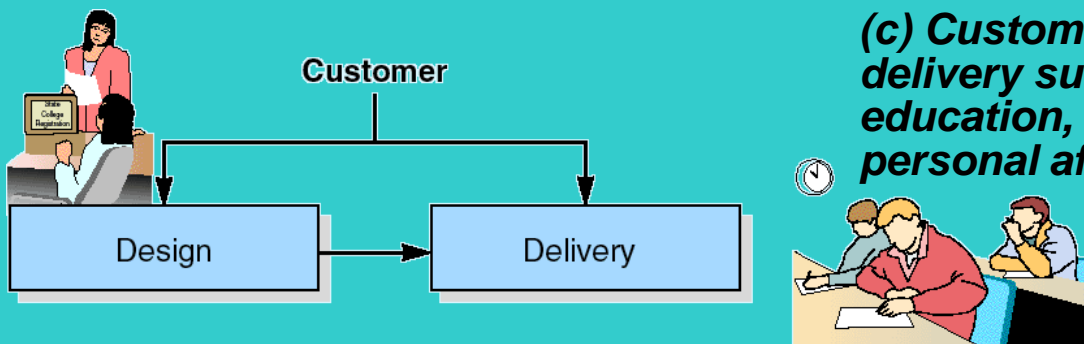
**(a) Customer participation in design such as pre-arranged funeral services or cosmetic surgery**



**(b) Customer participation in delivery such as stress test for cardiac exam or delivery of a baby**



**(c) Customer participation in design and delivery such as counselling, college education, financial management of personal affairs, or interior decorating**



## Specific service development techniques

- ☑ **Delay of customisation** to the latest stages of the delivery process (hairstyler, restaurants,...).
- ☑ **Service modularisation**: service is configured as an addition of modules: university training, pizza outlets,...
- ☑ **Automation**, where possible: ATM, paperless air tickets bought via web, machine check-in at airports,...
- ☑ **Moments of truth**: design of operations that fulfill or surpass customer expectations. Interaction moments with customers.

## Moments of truth

- ☑ Concept created by Jan Carlzon of Scandinavian Airways
- ☑ Critical moments between the customer and the organisation that determine customer satisfaction
- ☑ There may be many of these moments
- ☑ These are opportunities to gain or lose business

# Moments-of-truth computer company hotline

