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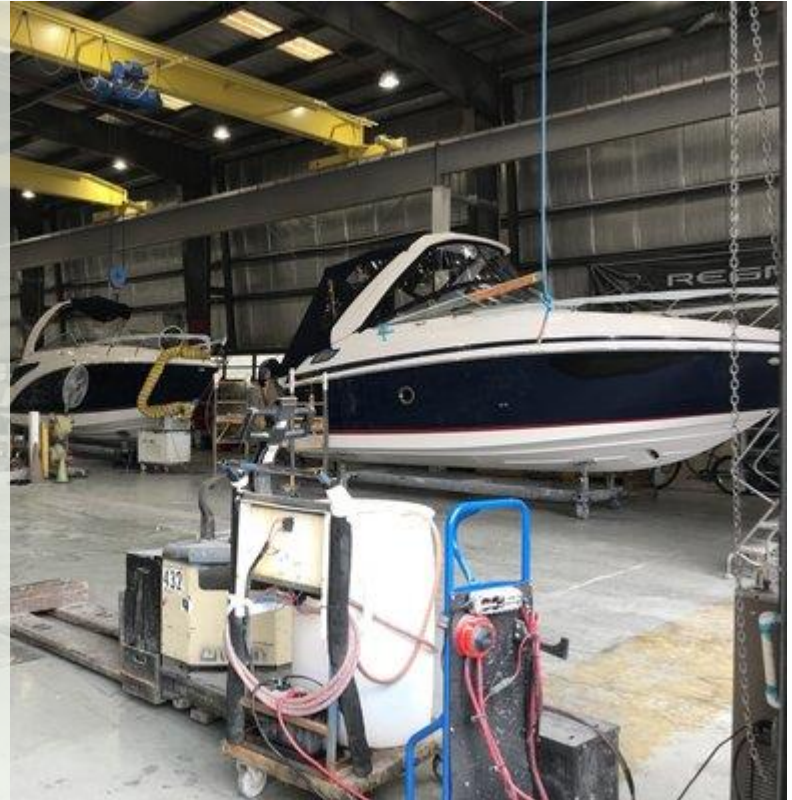
# DESIGN OF GOODS AND SERVICES

PowerPoint presentation to accompany  
Heizer and Render  
Operations Management, Eleventh Edition  
Principles of Operations Management, Ninth Edition

PowerPoint slides by Jeff Heyl

# Regal Marine

- ▶ Global market
- ▶ 3-dimensional CAD system
  - ▶ Reduced product development time
  - ▶ Reduced problems with tooling
  - ▶ Reduced problems in production
- ▶ Assembly line production
- ▶ JIT



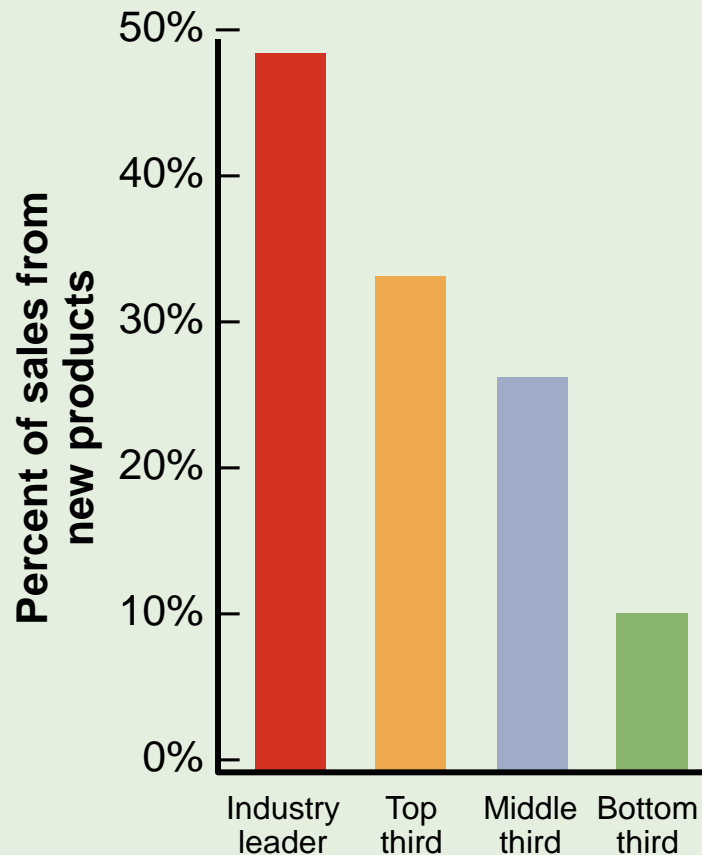
# GOODS AND SERVICES SELECTION

- Organizations exist to provide goods or services to society
- Great products are the key to success
- Top organizations typically focus on core products
- Customers buy satisfaction, not just a physical good or particular service
- Fundamental to an organization's strategy with implications throughout the operations function

# GOODS AND SERVICES SELECTION

- Goods or services are the basis for an organization's existence
- Limited and predicable life cycles requires constantly looking for, designing, and developing new products
- New products generate substantial revenue

# GOODS AND SERVICES SELECTION



The higher the percentage of sales from the last 5 years, the more likely the firm is to be a leader.

**Position of firm in its industry**

# PRODUCT DECISION

*The objective of the **product decision** is to **develop and implement a product strategy that meets the demands of the marketplace with a competitive advantage***

# PRODUCT STRATEGY OPTIONS

- ❑ **Differentiation**
  - ▶ Shouldice Hospital
- ❑ **Low cost**
  - ▶ Taco Bell
- ❑ **Rapid response**
  - ▶ Toyota

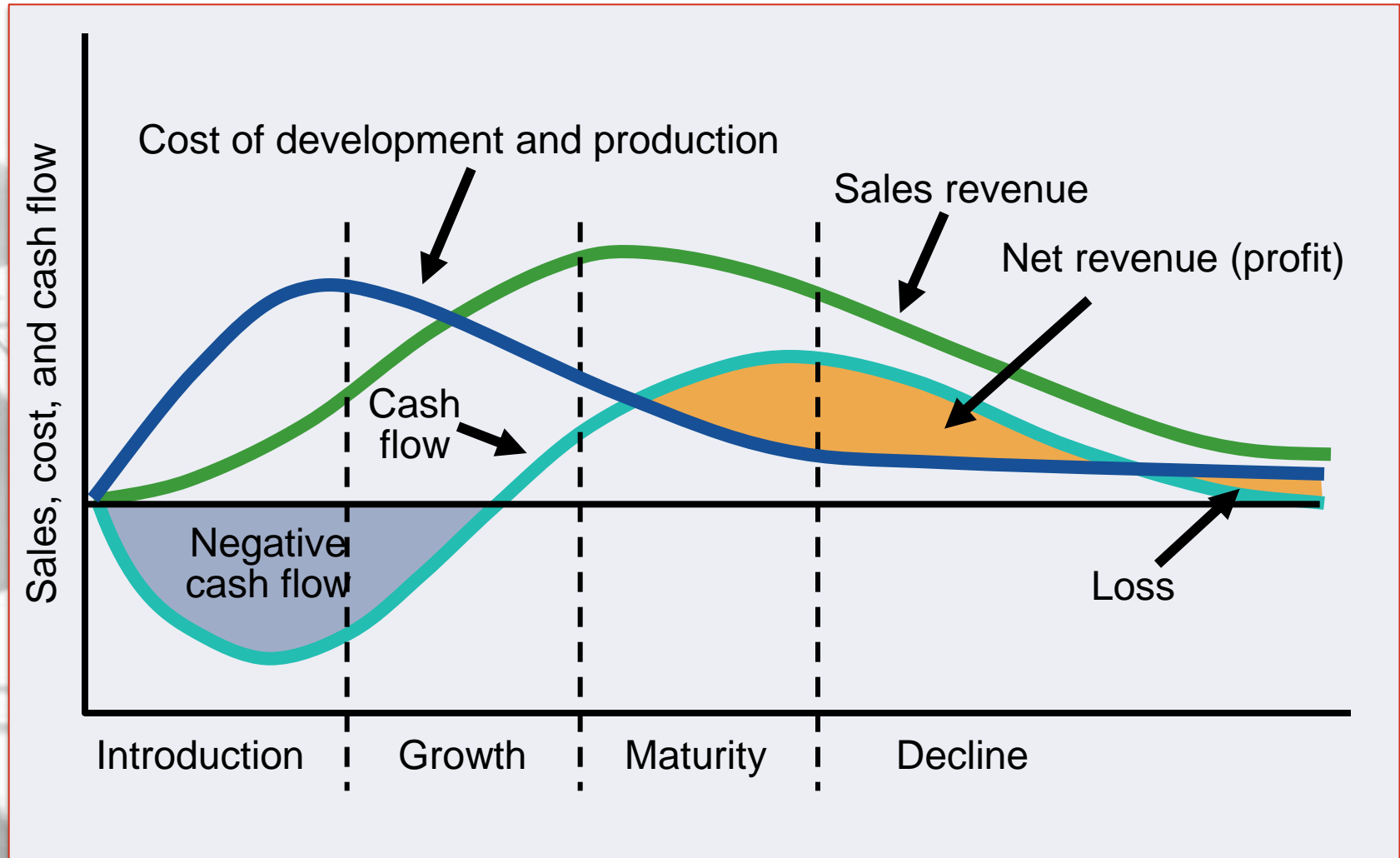


# PRODUCT LIFE CYCLES

- ❑ May be any length from a few days to decades
- ❑ The operations function must be able to introduce new products successfully



# PRODUCT LIFE CYCLES



# Life Cycle and Strategy

## Introductory Phase

- ❑ Fine tuning may warrant unusual expenses for
  1. Research
  2. Product development
  3. Process modification and enhancement
  4. Supplier development

# Life Cycle and Strategy

## Growth Phase

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

# Life Cycle and Strategy

## Maturity Phase

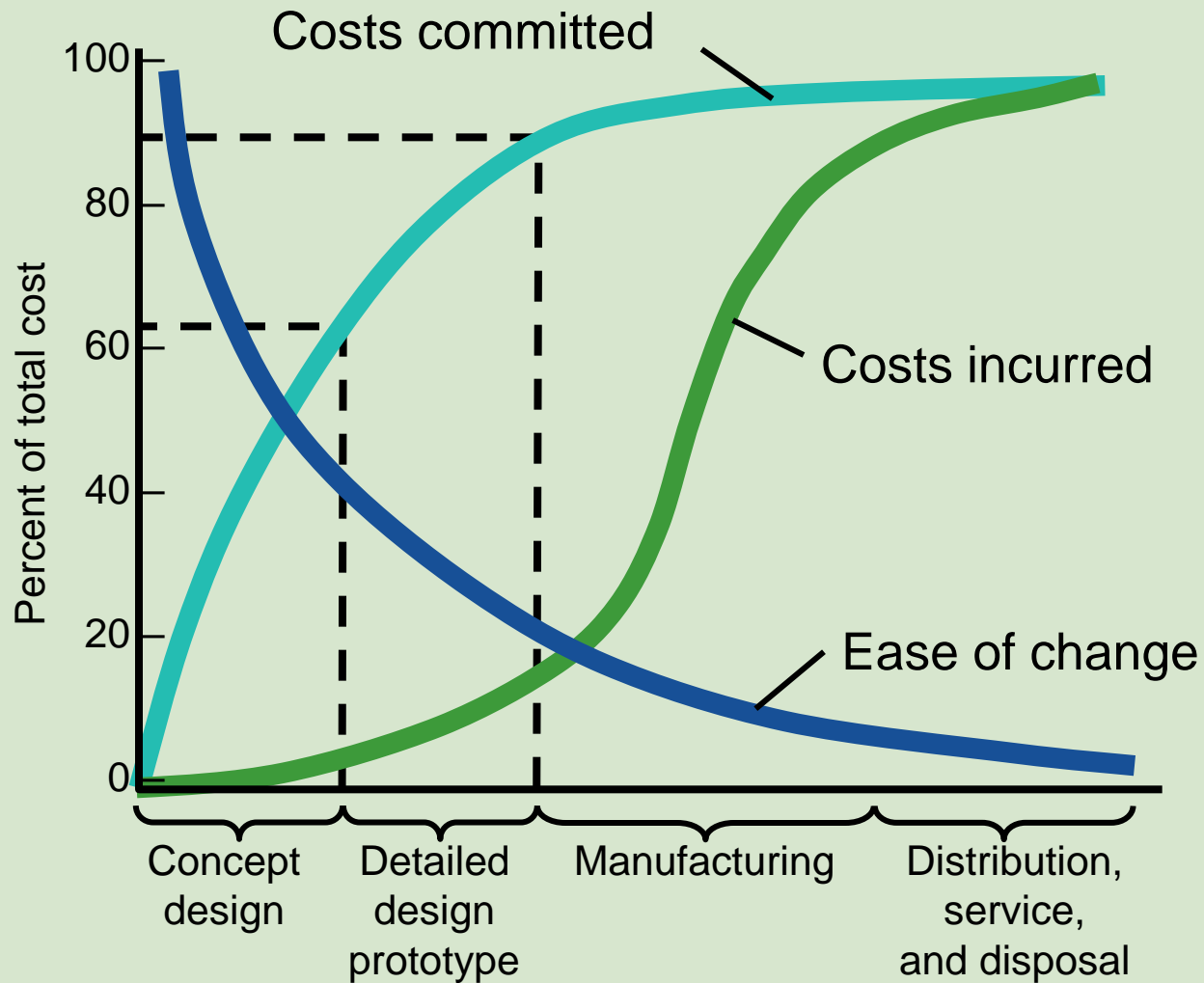
- ❑ Competitors now established
- ❑ High volume, innovative production may be needed
- ❑ Improved cost control, reduction in options, paring down of product line

# Life Cycle and Strategy

## Decline Phase

Unless product makes a special contribution to the organization, must plan to terminate offering

# Product Life Cycle Costs



# Product-by-Value Analysis

- Lists products in descending order of their individual dollar contribution to the firm
- Lists the total annual dollar contribution of the product
- Helps management evaluate alternative strategies



# RANCANGAN PRODUK

Produk yang dihasilkan perusahaan, dalam perjalanannya tentunya mengalami tahapan seperti yang sesuai siklus hidupnya, sehingga pemilihan produk, pendefinisian produk maupun desain produk perlu secara terus menerus diperbaharui

# Product Strategi Options Support Competitive Advantage

- ❑ Manajemen mempunyai berbagai pilihan dalam hal seleksi, ketentuan, dan desain atas barang dan jasa yang akan dijual perusahaan.
- ❑ Seleksi produk adalah kegiatan pemilihan barang atau jasa yang akan digunakan untuk memenuhi kebutuhan konsumen atau klien perusahaan.
- ❑ Hasil keputusan produk dari seleksi yang dilakukan merupakan hal yang fundamental dan mempunyai implikasi yang besar pada fungsi operasi.
- ❑ Keputusan produk akan mempengaruhi biaya peralatan modal, desain tata letak, kebutuhan ruang, keahlian orang-orang yang dipekerjakan dan yang harus diberi pelatihan, bahan mentah, dan proses yang digunakan.

# New Product Opportunities

Ada enam faktor yang mempengaruhi peluang pasar, yaitu perubahan:

1. Selera konsumen,
2. Ekonomi,
3. Sosial dan demografi,
4. Teknologi,
5. Politik dan hukum,
6. Perubahan yang lain seperti:
  - Praktek di pasar
  - Standar profesi
  - Supplier
  - Distributor

# STRATEGI PENGENALAN PRODUK BARU

Ada 3 cara dasar untuk proses pengenalan produk baru:

## 1. Menarik-pasar (*Market-Pull*)

Menurut pandangan ini, "Anda harus membuat apa yang dapat dijual". Produk baru ditentukan oleh pasar berdasarkan kebutuhan pelanggan. Jenis produk baru ditentukan melalui penelitian pasar & umpan balik pelanggan, dgn sedikit perhatian terhadap teknologi.

## 2. Mendorong-teknologi (*Technology Push*)

Pandangan ini menyarankan "Anda harus menjual apa yang dapat anda buat". Produk baru diperoleh dari teknologi produksi, penggunaan teknologi yang canggih dan kemudahan operasi, dengan sedikit perhatian terhadap pasar.

## 3. Antarfungsional (*Interfunctional*)

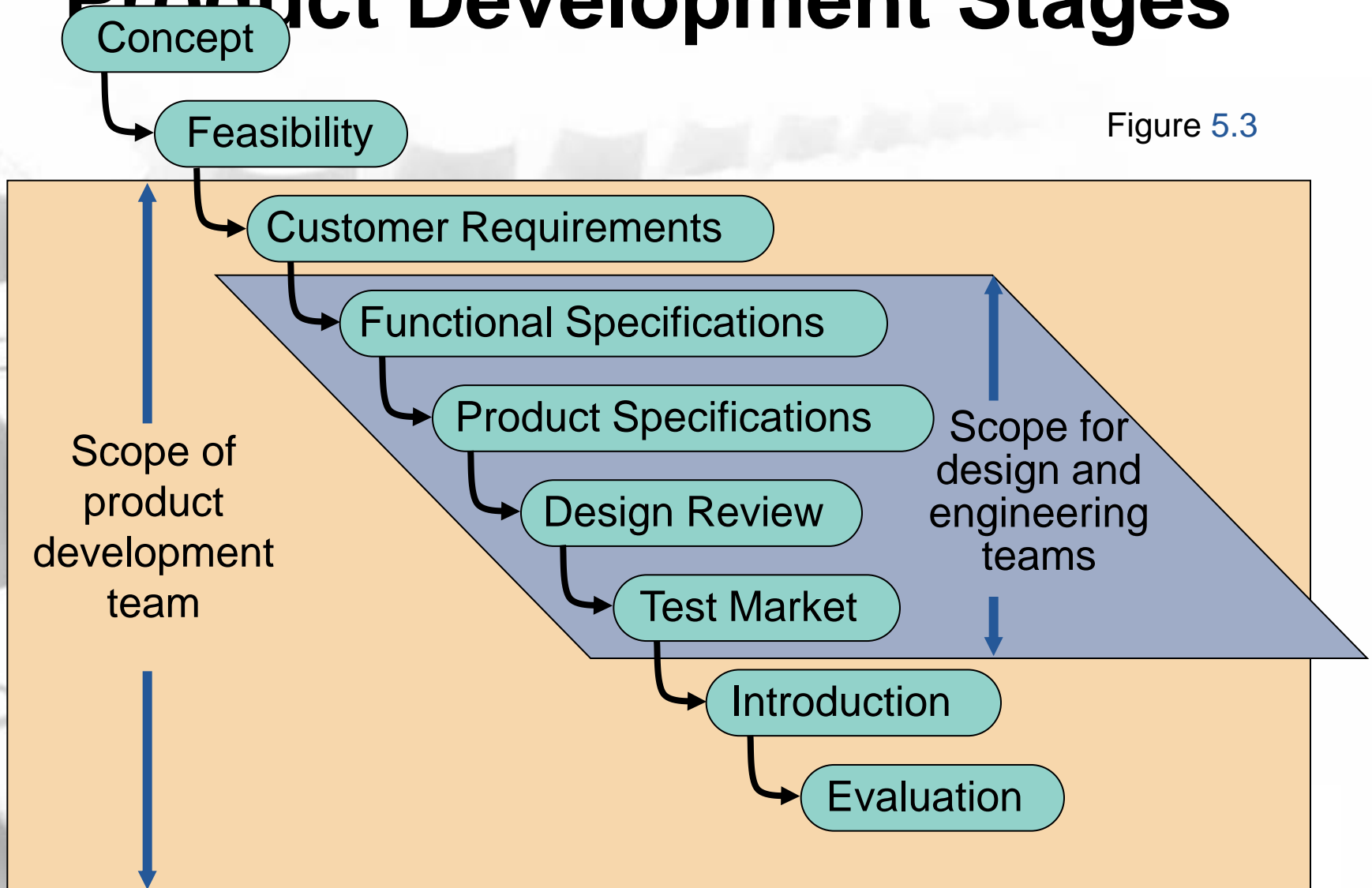
Produk baru memerlukan kerjasama diantara pemasaran, operasi, keterampilan teknik, dan fungsi lainnya sehingga menghasilkan produk yang memenuhi kebutuhan pelanggan dengan penggunaan teknologi yang memberikan manfaat terbaik.

# Generating New Products

1. Understanding the customer
2. Economic change
3. Sociological and demographic change
4. Technological change
5. Political and legal change
6. Market practice, professional standards, suppliers, distributors

# Product Development Stages

Figure 5.3

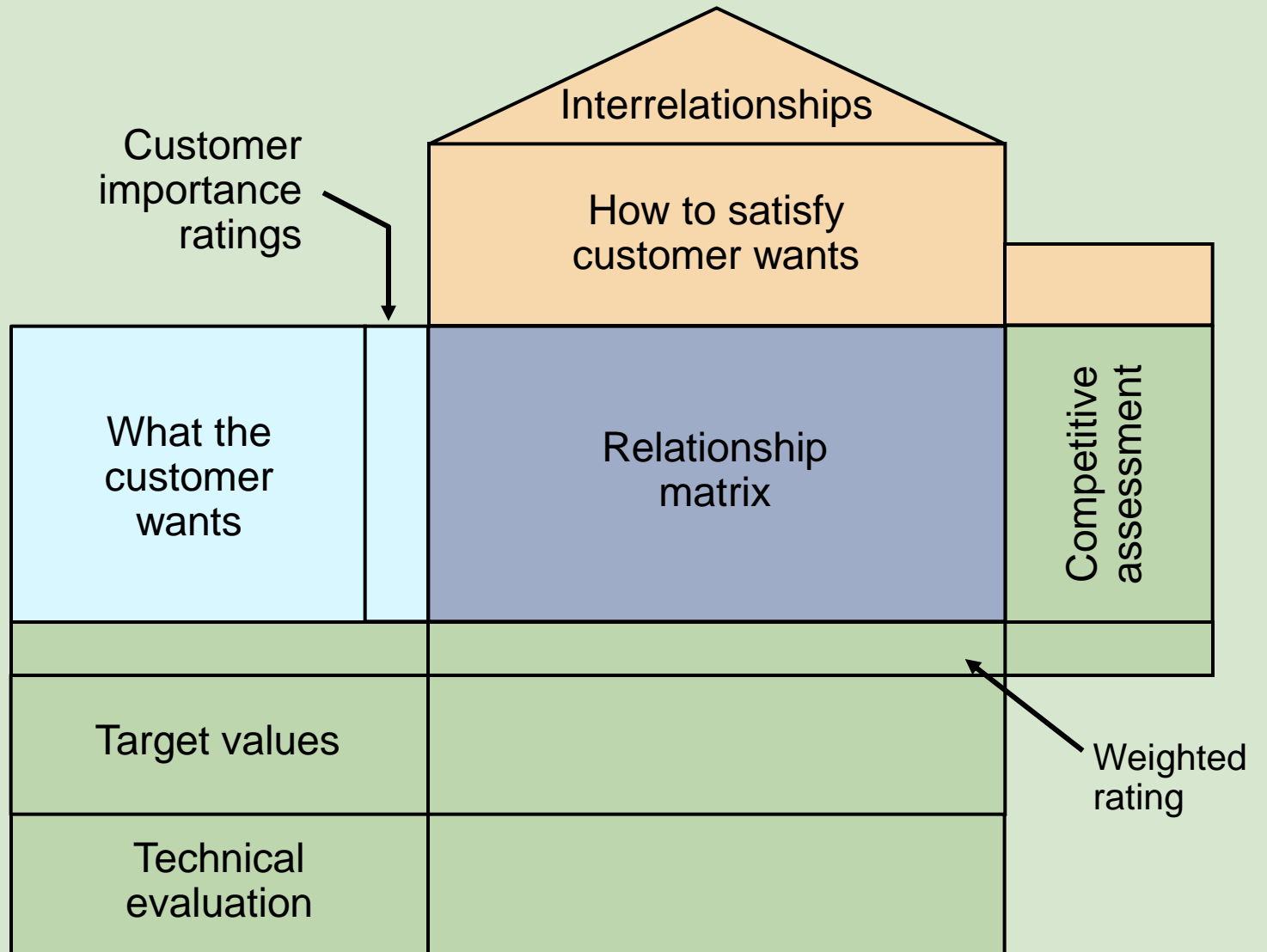


# Quality Function Deployment

1. Identify **customer wants**
2. Identify *how* the good/service will **satisfy customer wants**
3. Relate customer wants to **product hows**
4. Identify relationships between the **firm's hows**
5. Develop **customer importance ratings**
6. **Evaluate** competing products
7. **Compare performance** to desirable technical attributes



# QFD House of Quality



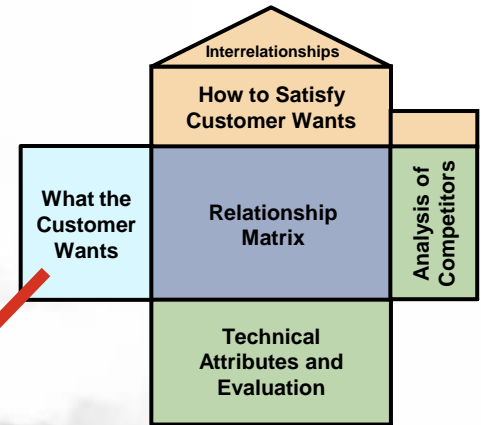
# House of Quality Example

Your team has been charged with designing a new camera for Great Cameras, Inc.

The first action is to construct a House of Quality



# House of Quality Example



What the customer wants



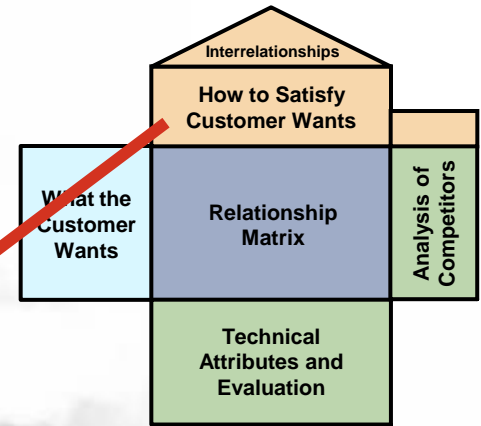
Customer Importance rating  
(5 = highest)

Lightweight	3
Easy to use	4
Reliable	5
Easy to hold steady	2
High resolution	1

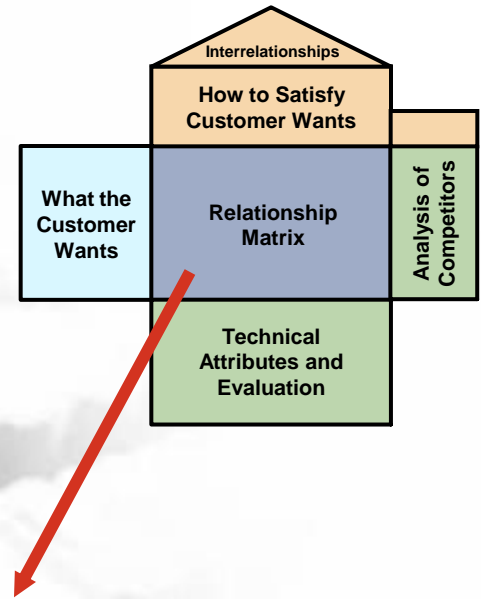





# House of Quality Example

Low electricity requirements
Aluminum components
Auto focus
Auto exposure
High number of pixels
Ergonomic design



# House of Quality Example



-  High relationship
-  Medium relationship
-  Low relationship

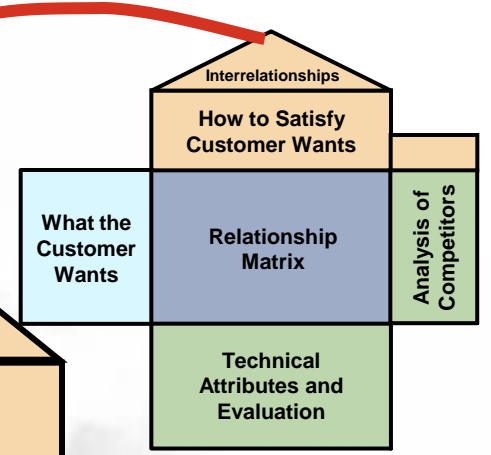
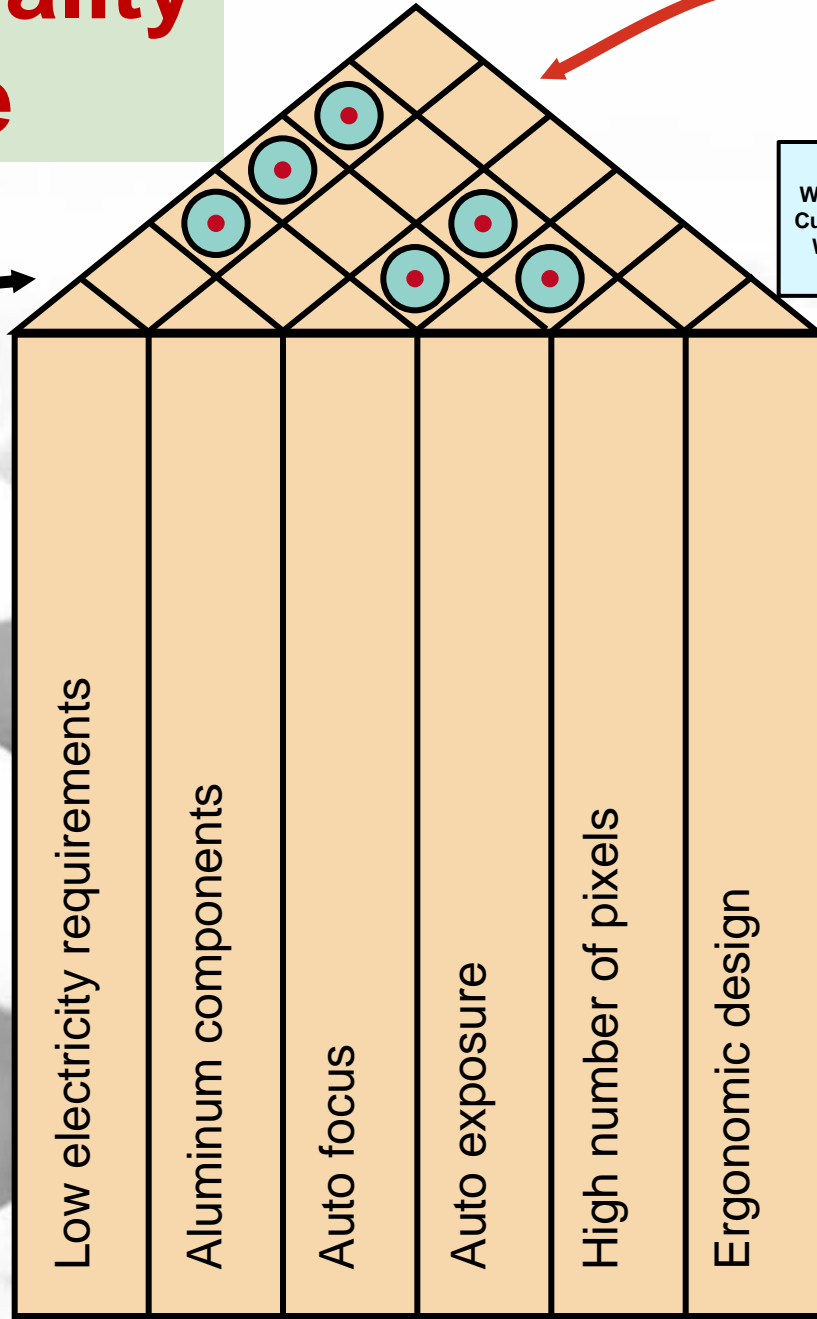
Lightweight	3	●	●				●
Easy to use	4	●		●	●	●	●
Reliable	5	●		●	●	●	
Easy to hold steady	2						●
High resolution	1					●	

Relationship matrix

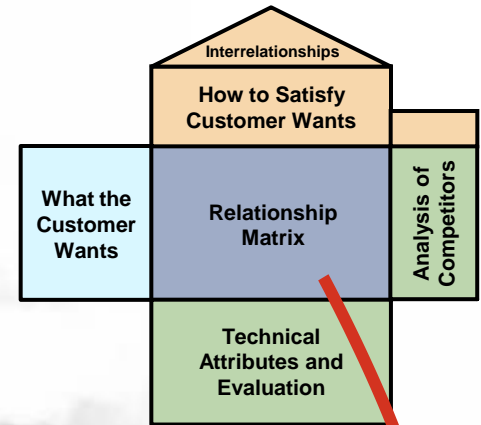


# House of Quality Example

Relationships between the things we can do



# House of Quality Example



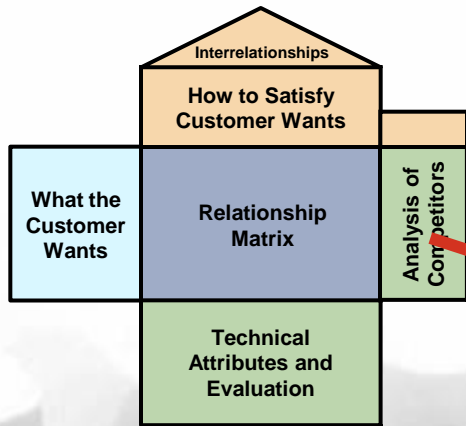
Lightweight	3	●	○				●
Easy to use	4	●		○	○	○	○
Reliable	5	○		○	○	○	
Easy to hold steady	2						●
High resolution	1					●	
Our importance ratings		22	9	27	27	32	25

Weighted rating





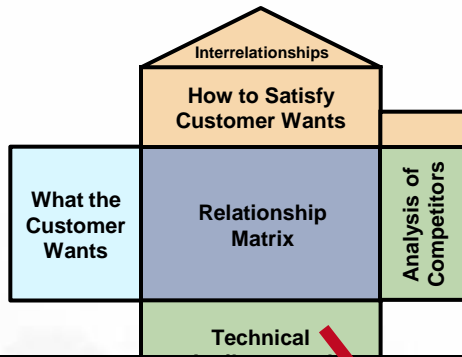
# House of Quality Example



How well do competing products meet customer wants

				Company A	Company B
Lightweight	3	●	●	G	P
Easy to use	4	●	●	G	P
Reliable	5	●	●	F	G
Easy to hold steady	2			G	P
High resolution	1			P	P
Our importance ratings		22	5		

# House of Quality Example



Target values (Technical attributes)		0.5 A	75%	2' to $\infty$	2 circuits	Failure 1 per 10,000	Panel ranking
Technical evaluation	Company A	0.7	60%	yes	1	ok	G
	Company B	0.6	50%	yes	2	ok	F
	Us	0.5	75%	yes	2	ok	G

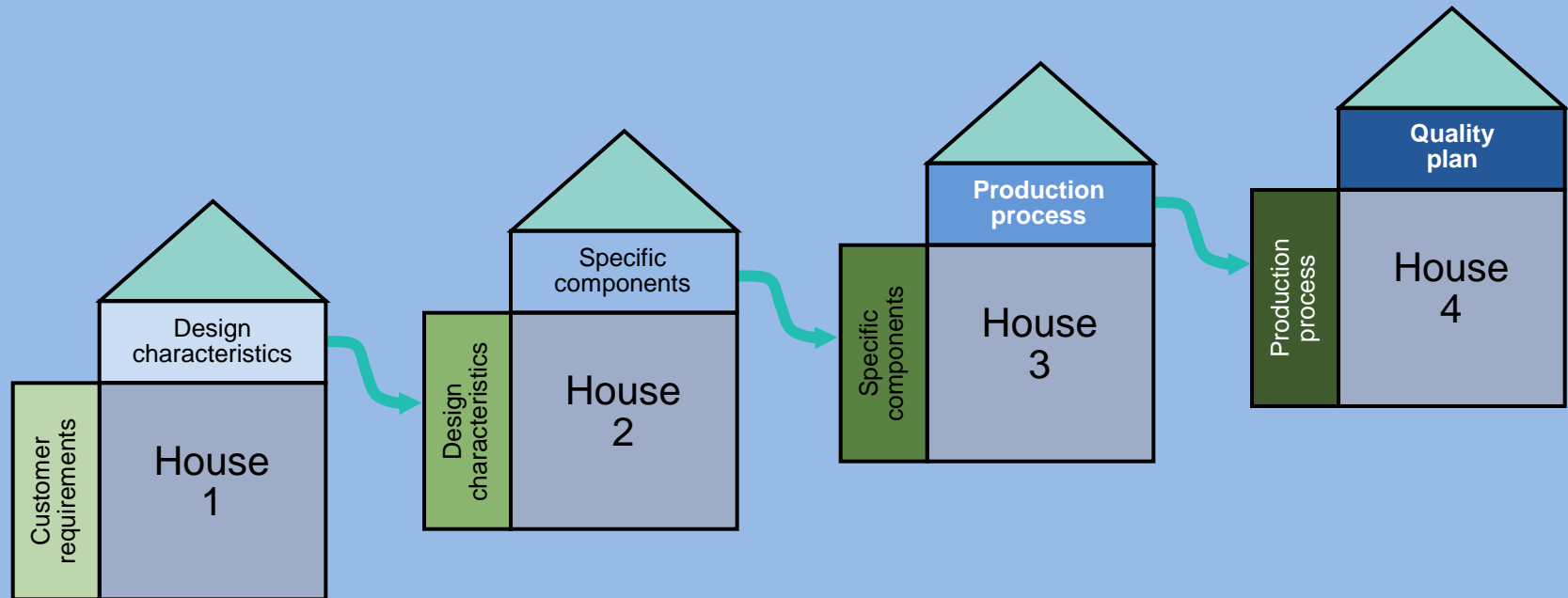
# House of Quality Example

Completed House of Quality

		Low electricity requirements	Aluminum components	Auto focus	Auto exposure	High number of pixels	Ergonomic design	Company A	Company B
Lightweight	3	●	○				●	G	P
Easy to use	4	●		○	○	○	○	G	P
Reliable	5	○		○	○	○		F	G
Easy to hold steady	2						●	G	P
High resolution	1					○		P	P
Our importance ratings		22	9	27	27	32	25		
Target values (Technical attributes)		0.5 A	75%	2' to ∞	2 circuits	Failure 1 per 10,000	Panel ranking		
Technical evaluation	Company A	0.7	60%	yes	1	ok	G		
	Company B	0.6	50%	yes	2	ok	F		
	Us	0.5	75%	yes	2	ok	G		

# House of Quality Sequence

Deploying resources through the organization in response to customer requirements



# Organizing for Product Development

- ❑ **Traditionally** – 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 organizations

# Organizing 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 organization” approach

- ▶ No organizational divisions

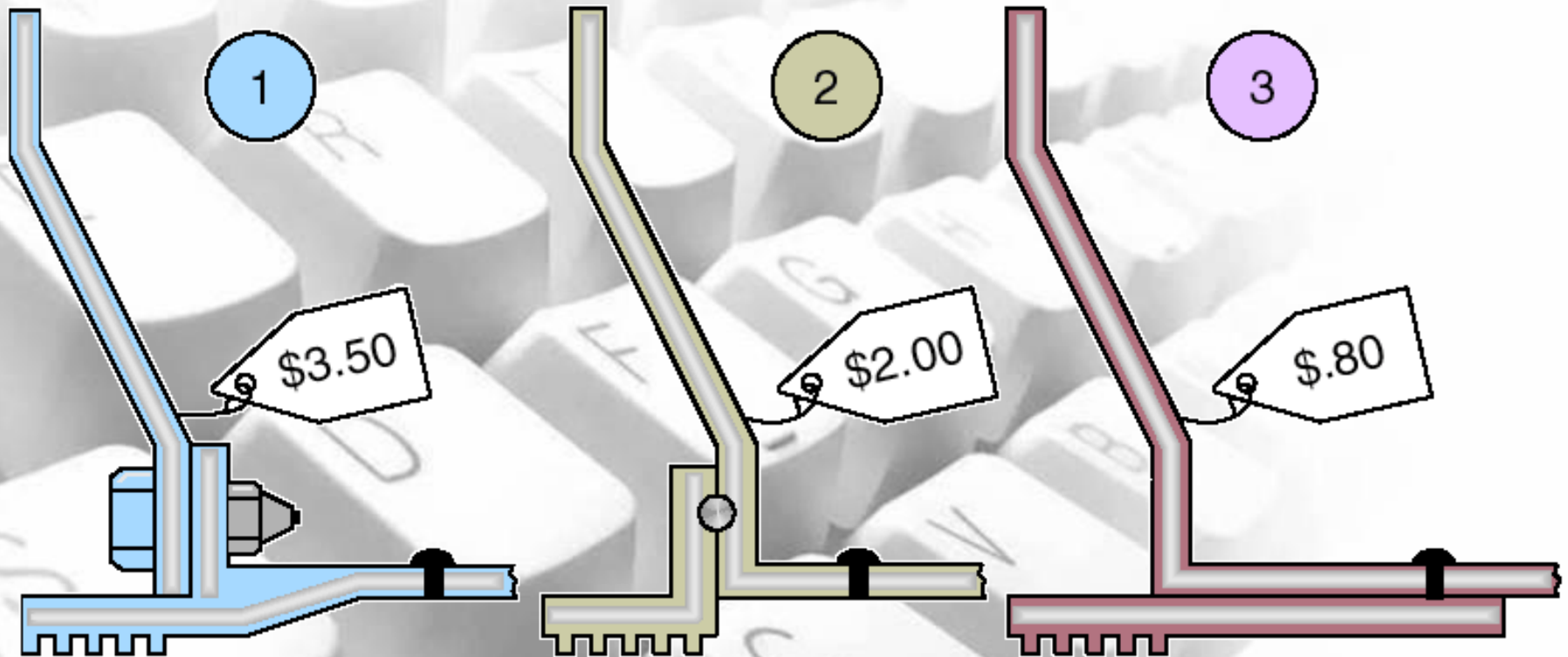
# MANUFACTURABILITY AND VALUE ENGINEERING

## Benefits:

1. Reduced complexity of the product
2. Reduction of environmental impact
3. Additional standardization of components
4. Improvement of functional aspects of the product
5. Improved job design and job safety
6. Improved maintainability (serviceability) of the product
7. Robust design



# Cost Reduction of a Bracket via Value Engineering



# Issues for Product Design

- ❑ Robust design
- ❑ Modular design
- ❑ Computer-aided design (CAD)
- ❑ Computer-aided manufacturing (CAM)
- ❑ Virtual reality technology
- ❑ Value analysis
- ❑ Sustainability and Life Cycle Assessment (LCA)

# Product Development Continuum

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

# Product Development Continuum

## *External Development Strategies*

Alliances

Joint ventures

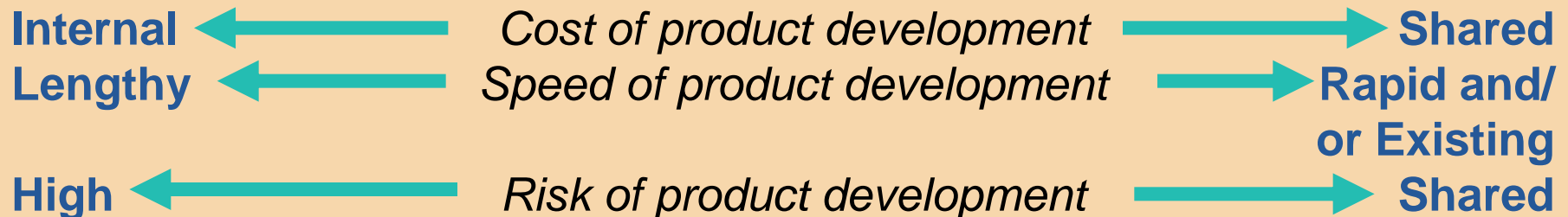
Purchase technology or expertise  
by acquiring the developer

## *Internal Development Strategies*

Migrations of existing products

Enhancements to existing products

New internally developed products



# Product Development Continuum

- ❑ Purchasing technology by acquiring a firm
  - ▶ Speeds development
  - ▶ Issues concern the fit between the acquired organization and product and the host
- ❑ Joint Ventures
  - ▶ Both organizations learn
  - ▶ Risks are shared

# Product Development Continuum

## □ Through Alliances

- ▶ Cooperative agreements between independent organizations
- ▶ Useful when technology is developing
- ▶ Reduces risks

# Defining a Product

- ❑ First definition is in terms of functions
- ❑ Rigorous specifications are developed during the design phase
- ❑ Manufactured products will have an engineering drawing
- ❑ Bill of material (BOM) lists the components of a product

# Product Documents

- ❑ Engineering drawing
  - ▶ Shows dimensions, tolerances, and materials
  - ▶ Shows codes for Group Technology
- ❑ Bill of Material
  - ▶ Lists components, quantities and where used
  - ▶ Shows product structure



# GROUP TECHNOLOGY

- ❑ Parts grouped into families with similar characteristics
- ❑ Coding system describes processing and physical characteristics
- ❑ Part families can be produced in dedicated manufacturing cells

# Group Technology Scheme

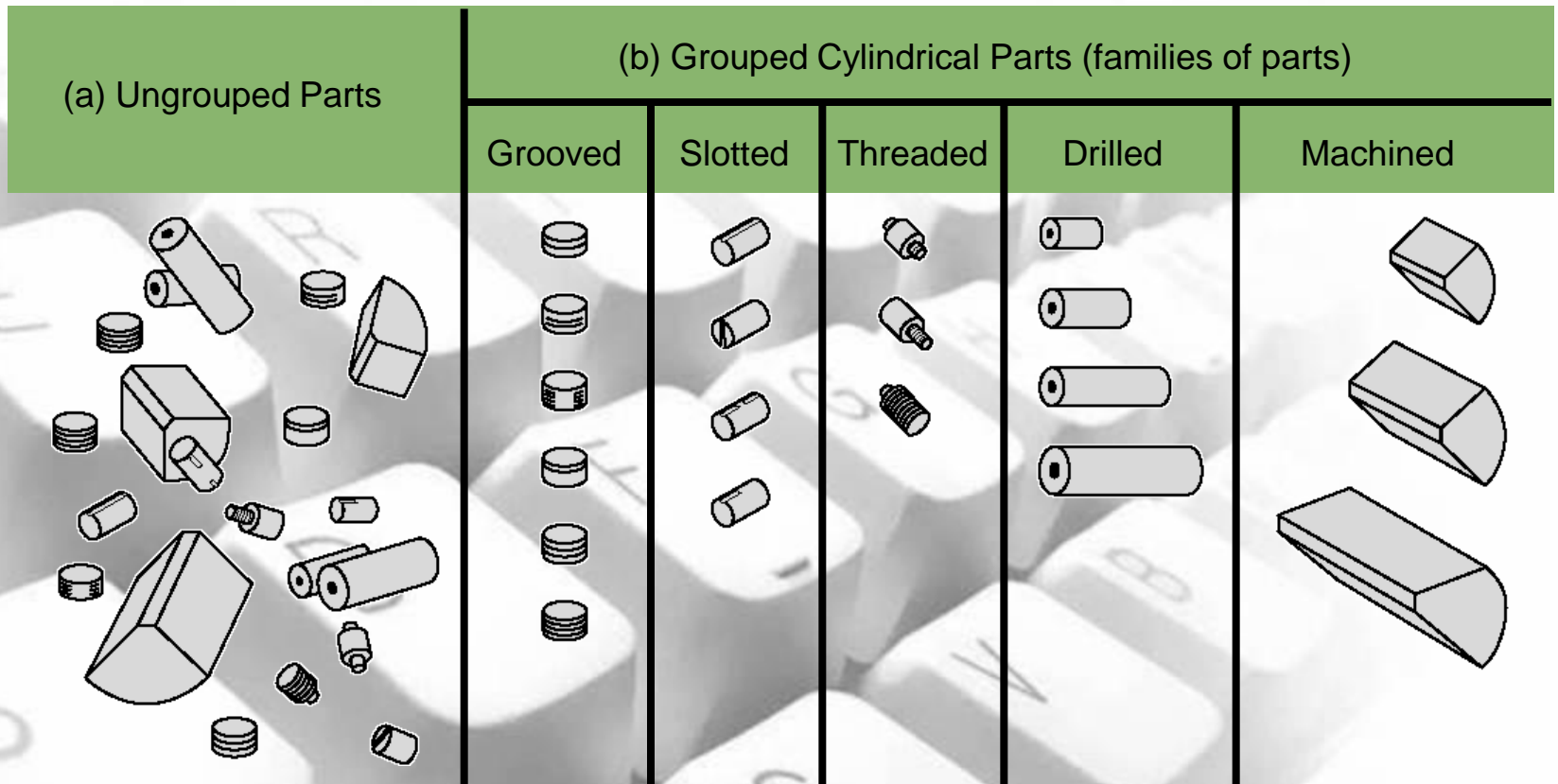


Figure 5.10

# Group Technology Benefits

1. Improved design
2. Reduced raw material and purchases
3. Simplified production planning and control
4. Improved layout, routing, and machine loading
5. Reduced tooling setup time, work-in-process, and production time

# PRODUCT LIFE-CYCLE MANAGEMENT (PLM)

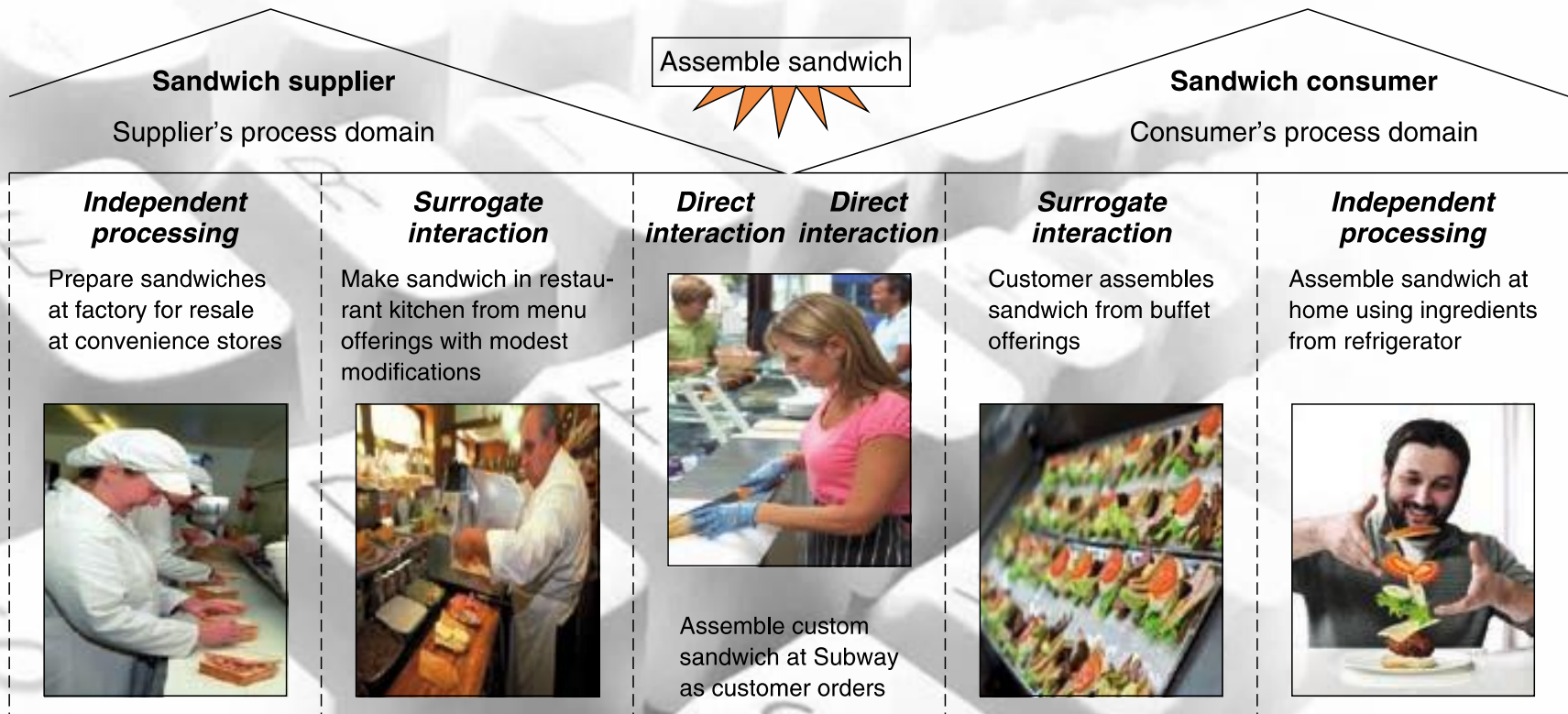
Integrated software that brings together most, if not all, elements of product design and manufacture

- Product design
- CAD/CAM, DFMA
- Product routing
- Materials
- Assembly
- Environmental

# SERVICE DESIGN

- ❑ Service typically includes direct interaction with the customer
- ❑ **Process – chain – network (PCN)** analysis focuses on the ways in which processes can be designed to optimize interaction between firms and their customers

# PROCESS-CHAIN-NETWORK (PCN) ANALYSIS



# PROCESS-CHAIN-NETWORK (PCN) ANALYSIS

- ❑ Direct interaction region includes process steps that involve interaction between participants
- ❑ The surrogate (substitute) interaction region includes process steps in which one participant is acting on another participant's resources
- ❑ The independent processing region includes steps in which the supplier and/or the customer is acting on resources where each has maximum control

# PROCESS-CHAIN-NETWORK (PCN) ANALYSIS

- ❑ All three regions have similar operating issues but the appropriate way of handling the issues differs across regions
- ❑ Service operations exist only within the area of *direct* and *surrogate interaction*
- ❑ PCN analysis provides insight to aid in positioning and designing processes that can achieve strategic objectives



# Adding Service Efficiency

- ❑ Service productivity is notoriously low partially because of customer involvement in the design or delivery of the service, or both
- ❑ Complicates product design

# Adding Service Efficiency

- Limit the options
  - ▶ Improves efficiency and ability to meet customer expectations
- Delay customization
- Modularization
  - ▶ Eases customization of a service

# Adding Service Efficiency

- Automation

Reduces cost, increases customer service

- Moment of truth

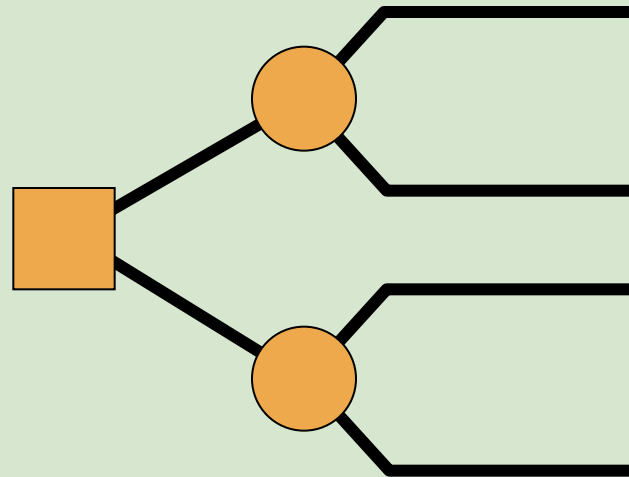
Critical moments between the customer and the organization that determine customer satisfaction

# Documents for Services

- High levels of customer interaction necessitates different documentation
- Often explicit job instructions
- Scripts and storyboards are other techniques

# Application of Decision Trees to Product Design

Particularly useful when there are a series of decisions and outcomes which lead to other decisions and outcomes

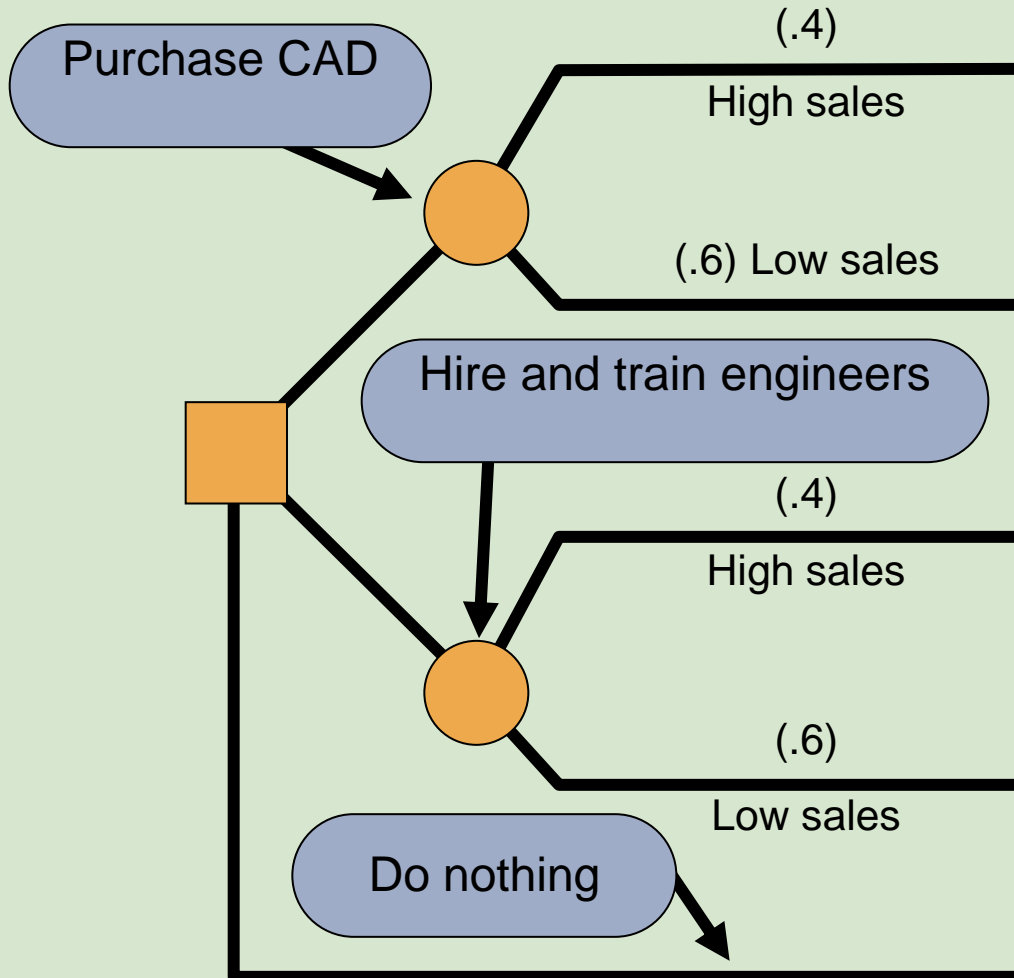


# Application of Decision Trees to Product Design

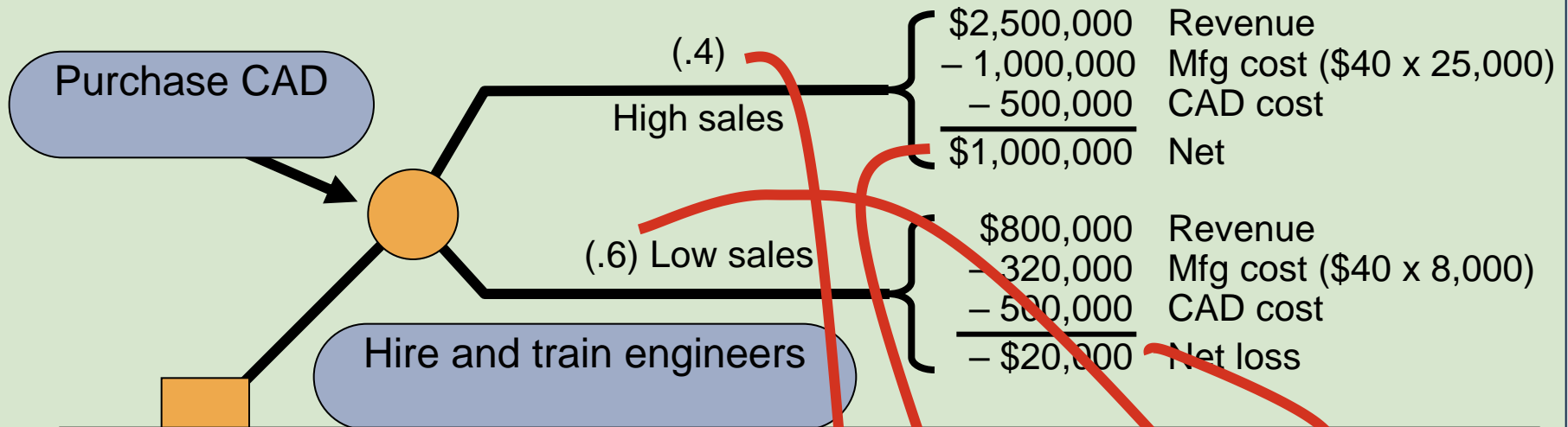
## Procedure

1. Include all possible alternatives and states of nature - including “doing nothing”
2. Enter payoffs at end of branch
3. Determine the expected value of each branch and “prune” the tree to find the alternative with the best expected value

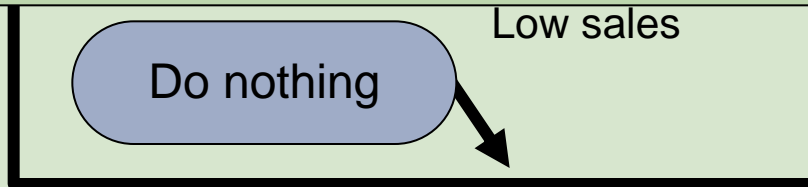
# Decision Tree Example



# Decision Tree Example



$$\text{EMV (purchase CAD system)} = (.4)(\$1,000,000) + (.6)(-\$20,000)$$





# Decision Tree Example

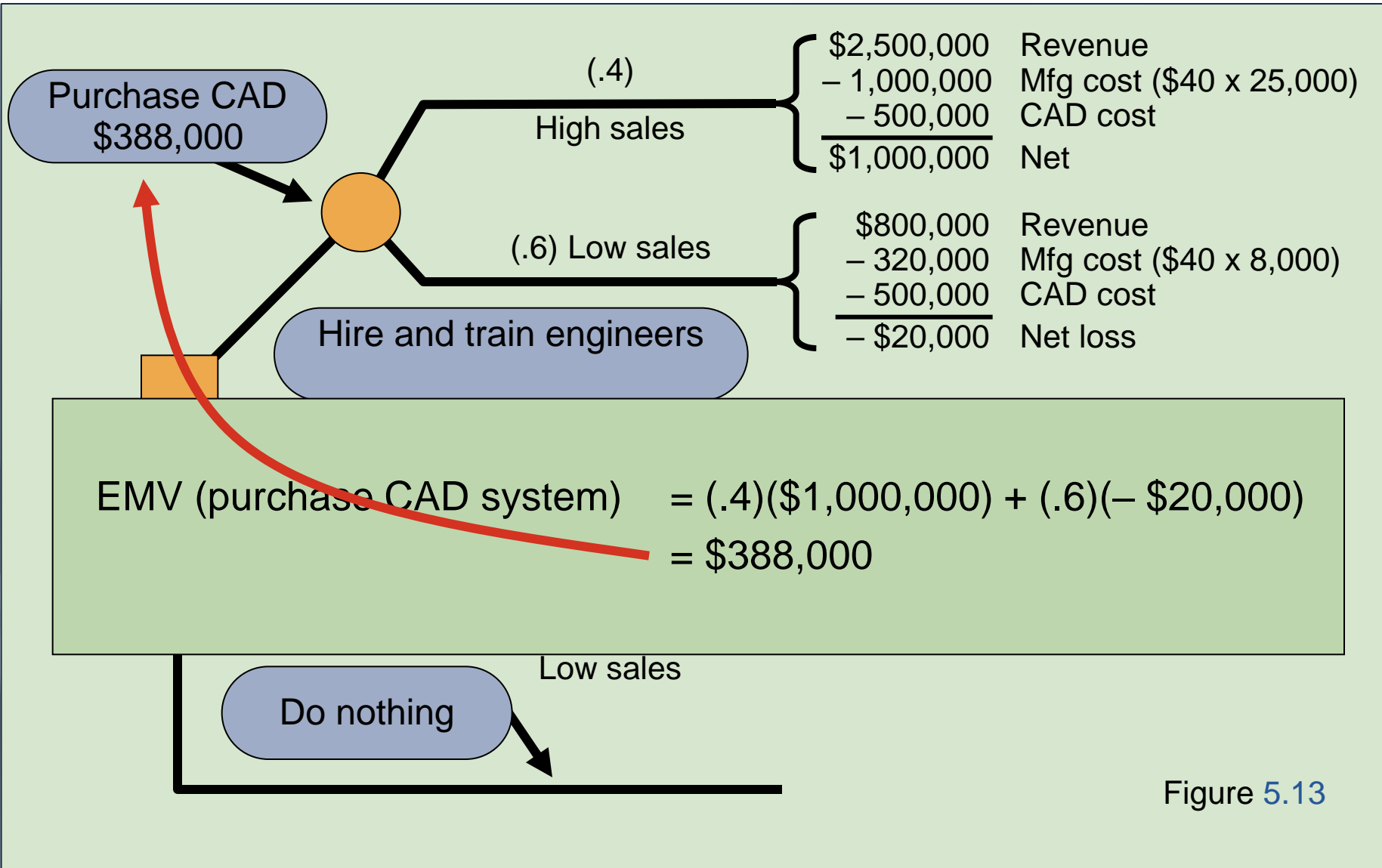


Figure 5.13

# Decision Tree Example

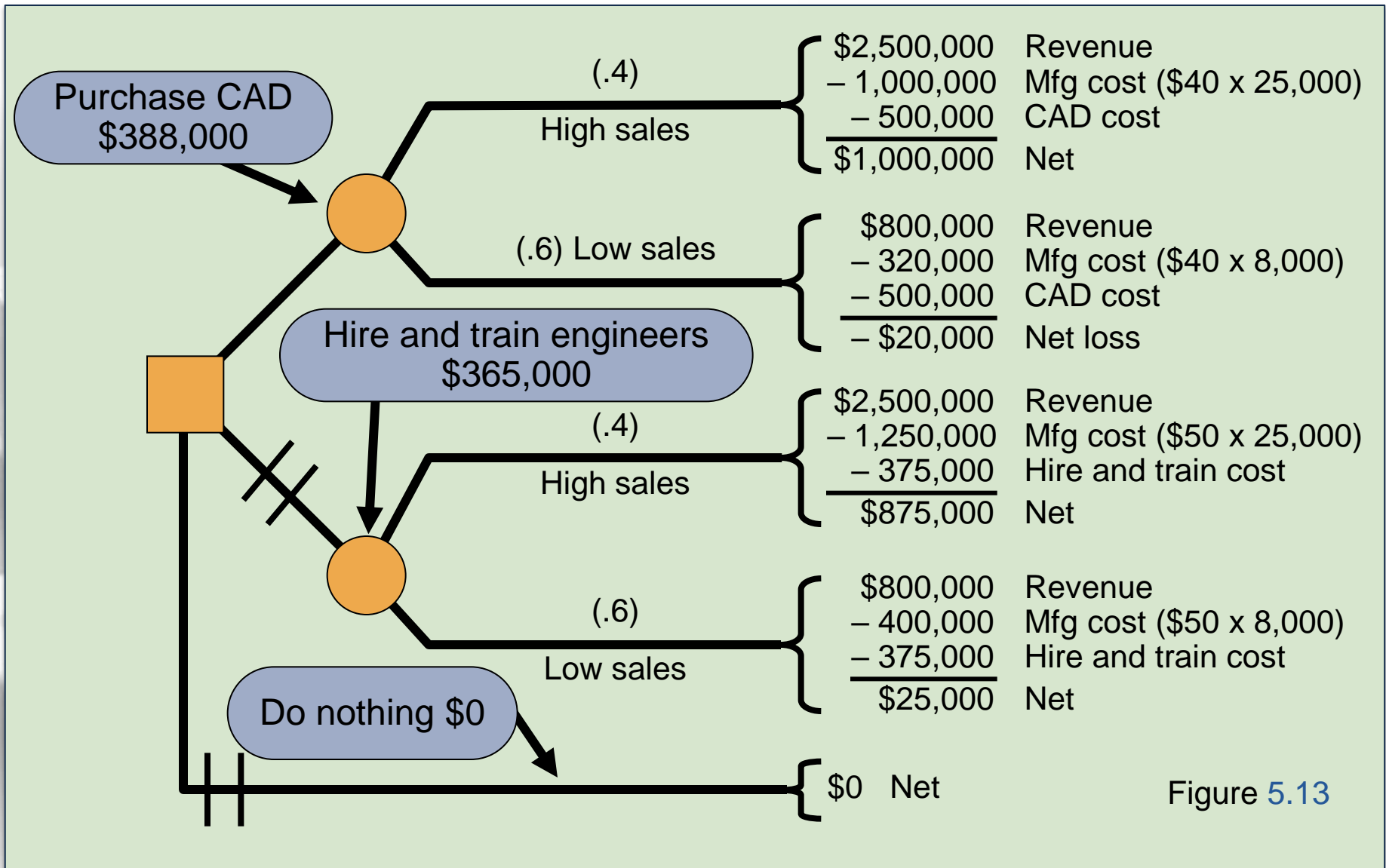


Figure 5.13