Operations Management

Chapter 5 –
Product Design

PowerPoint presentation to accompany

Heizer /Render, Operations Management, 12 h Ed.

Product Decision

How should products/services be designed?

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 Design

Major factors in product design

First of all tie the design strategy with the organizational strategy and operation strategy.

- Cost
- Quality
- Time-to-market
- Customer satisfaction
- Competitive advantage.

Product Design

What is product design ?

Product design is the process of developing a usable product that meets customer's needs by defining the users' problems and finding creative solutions for these problems.

Product design is the process designers use to blend user needs with business goals to help brands make consistently successful products.

Product Design

Reasons for product or service design

Organizations become involved in product or service design for a variety of reasons.

- ✓ An obvious one is to be competitive by offering new products or services.
- ✓ When productivity gains result in the need for fewer workers, developing new products or services can mean adding jobs and retaining people instead of letting them go.

Product Design

Reasons for product or service design

Sometimes product or service design is actually redesign.

- ✓ This, too, occurs, for a number of reasons such as customer complaints, accidents or injuries, excessive warranty claims, or low demand.
- ✓ The desire to achieve cost reductions in labor or materials can also be a motivating factor.

Product Design

Trends in product and service design

Over the last few years, the designing, of products and services has increased emphasis on a number of aspects of design.

- ✓ Increased emphasis on **customer satisfaction** and increased pressure to be competitive.
- ✓ **Total quality management** programs, which have customer satisfaction as their primary focus, contribute to this.

Product Design

Trends in product and service design

- ✓ Increased emphasis on **reducing the time** needed to introduce a new product or services.

- ✓ Greater attention to **environmental concerns**, including waste minimization, recycling parts, and disposal of worn-out products.

Product Design

Objectives of product and service Design

Primary Focus

Customer Satisfaction

Secondary focus

- Function of product/ service
- Quality
- Cost
- Profit
- Appearance
- Ease of production/assembly

Product Design

There are various approaches to product design, including product life cycles.

Product life cycles

- shows the stages that products go through from development to withdrawal from the market
- The course of a product's sale and profit over its lifetime.

Product Design

When an item is first introduced, demand is generally low because potential buyers are not yet familiar with the item.

With the passage of time, production and design improvements usually create a more reliable and less costly product. Demand then grows for these reasons and because of increasing awareness of the product or service.

Product life cycles

- At the next stage in the life cycle, the product reaches maturity: there are few, if any design changes, and demand levels off.
- Eventually, the market becomes saturated which leads to a decline in demand.
- product life cycles may be any length from a few hours to decades

- The operations function must be able to introduce new products successfully

Product life cycles

- Consider the products in various stages of the life cycle in the music industry:

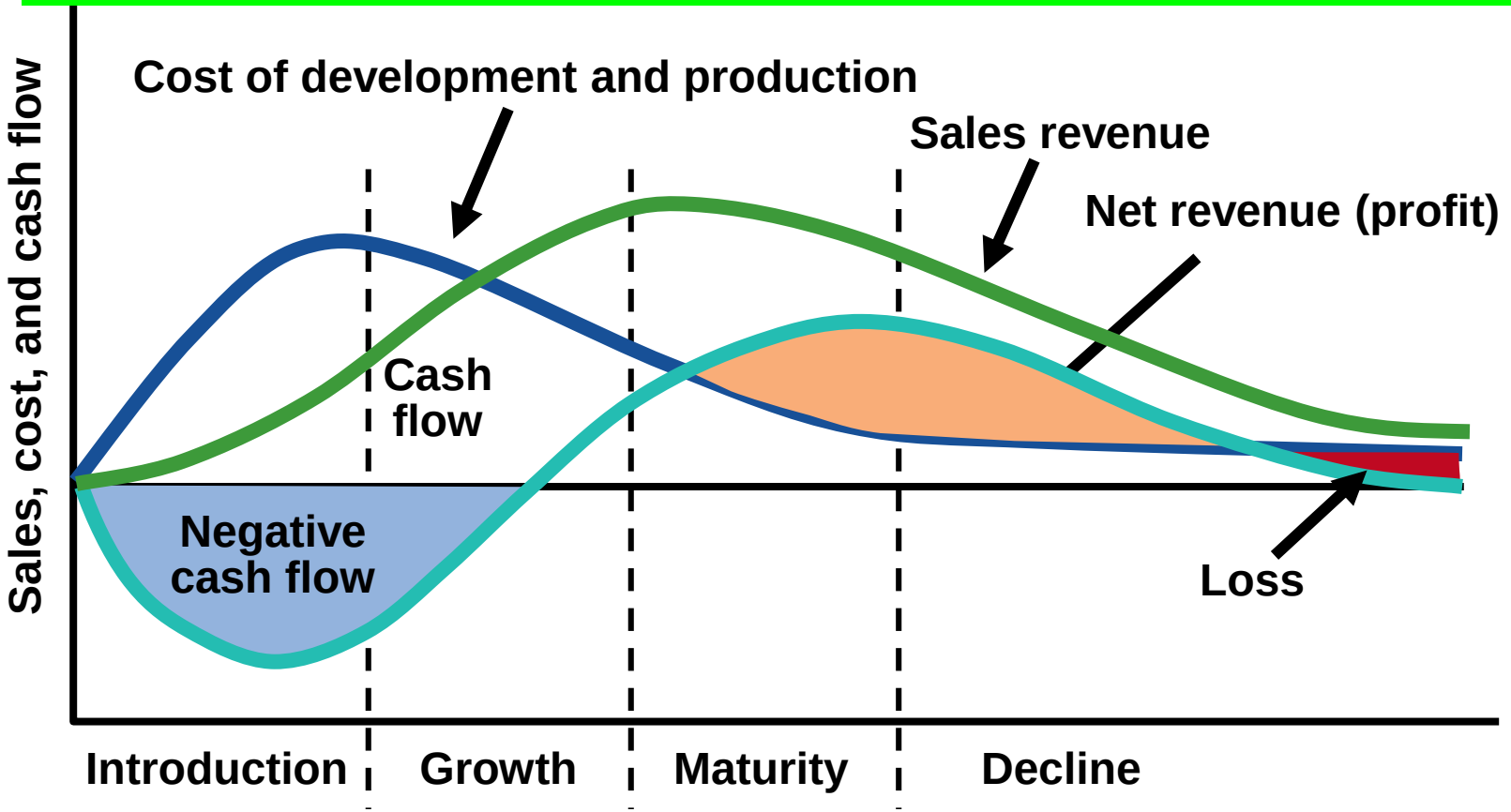
  - Digital audio tapes are in the introductory stage,
  - compact disks are in the growth stage,
  - cassettes are in the decline stage.

Product life cycles

- Some products do not exhibit life cycles: wooden pencils, knives, forks, and spoons, drinking glasses, …….. However, most new products do.

- Wide variations exist in the amount of time a particular product takes to pass through a given phase of its life cycle: some products pass through various stages in a relatively short period; others take considerably longer.

Product Life Cycles



Product Life Cycles

Introduction Phase

- This stage of the cycle could be the most expensive for a company launching a new product.
- The size of the market for the product is small, which means sales are low.

Growth Phase

- The product life-cycle stage in which a product's sales start climbing quickly.

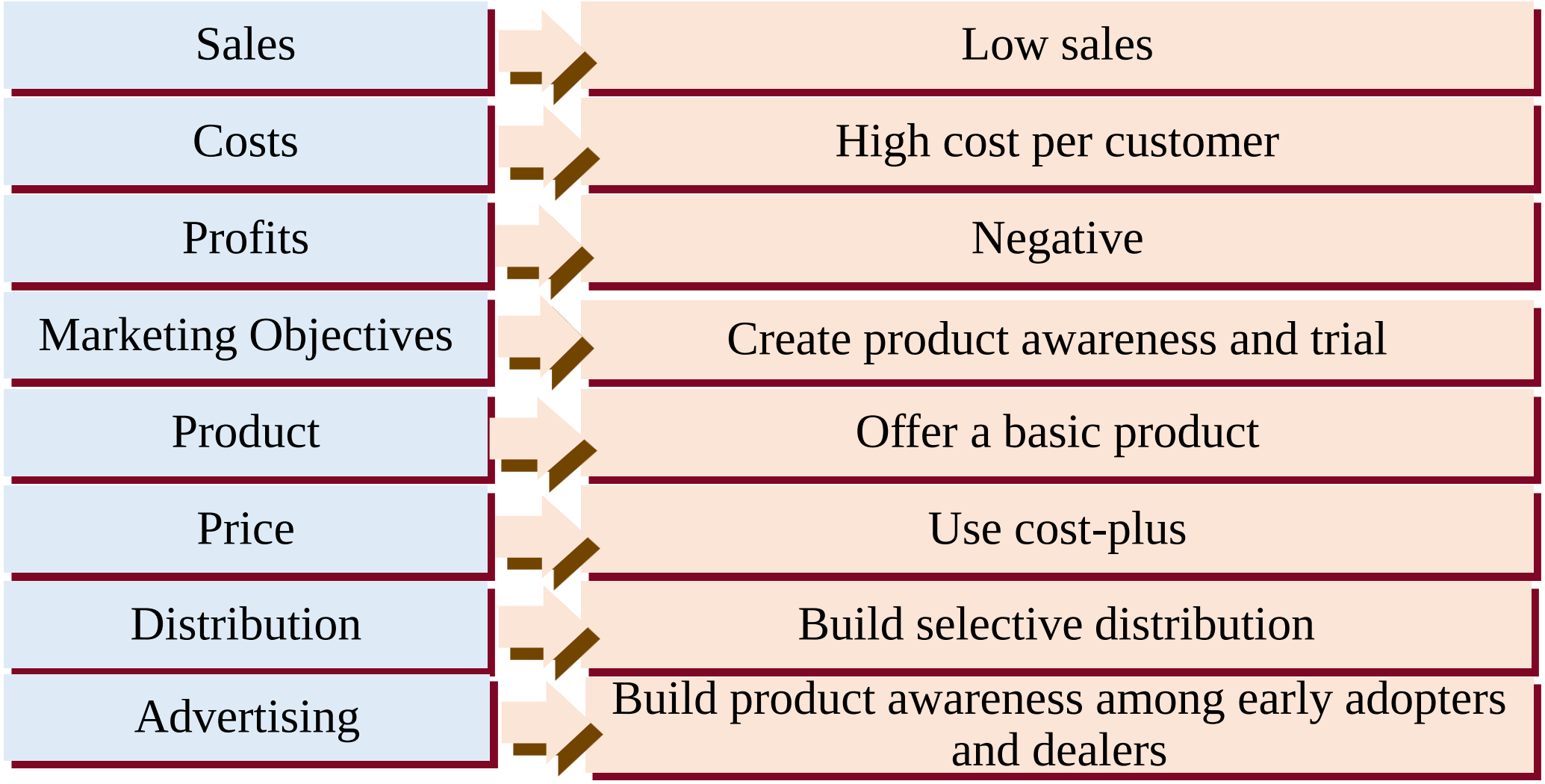
Maturity Phase

- The stage in the product life cycle in which sales growth slows or levels off.
- Modify the market, the product, and the marketing mix.

Decline Phase

- The product life cycle stage in which a product's sales decline

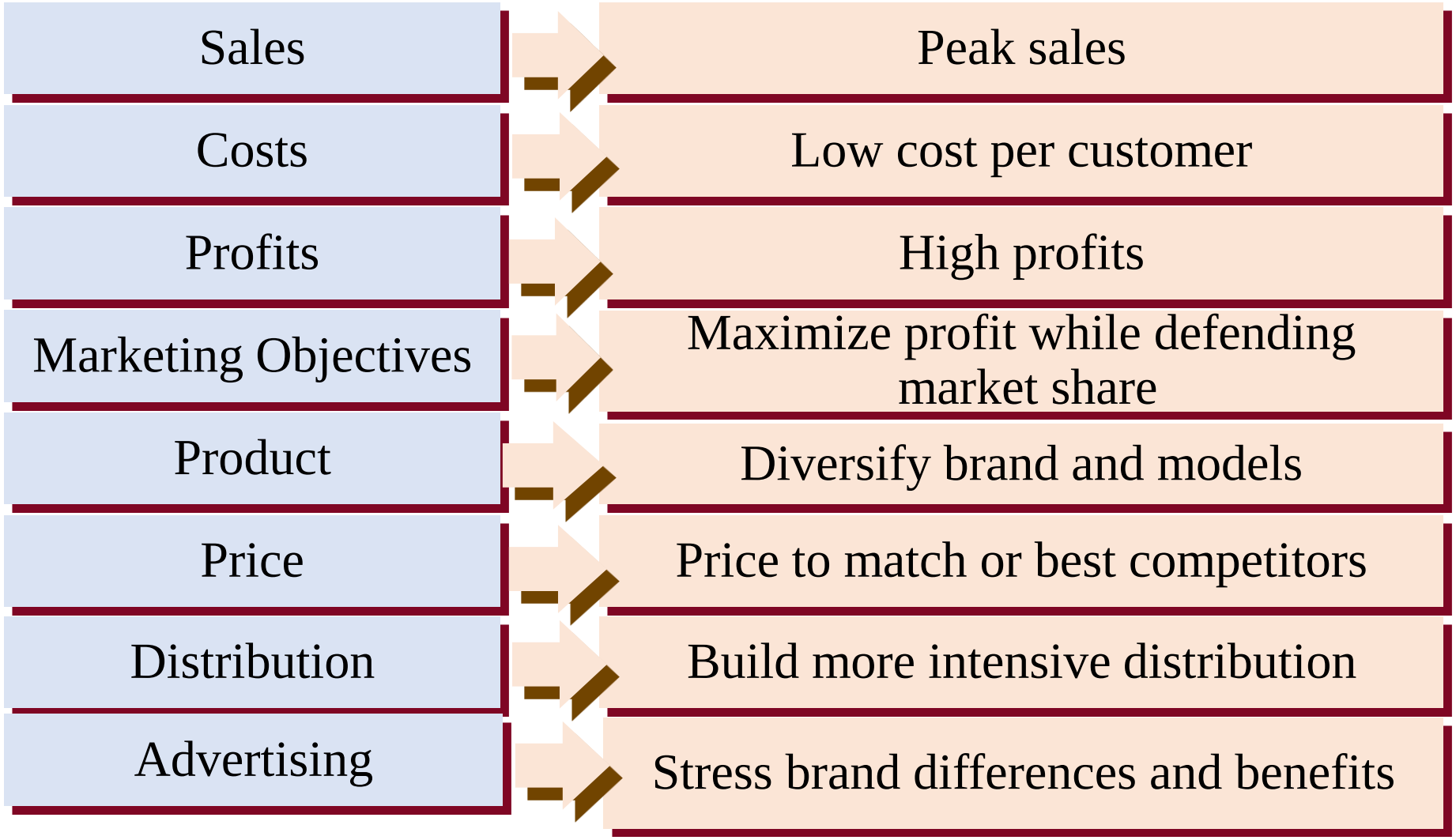
Introduction Stage of the PLC



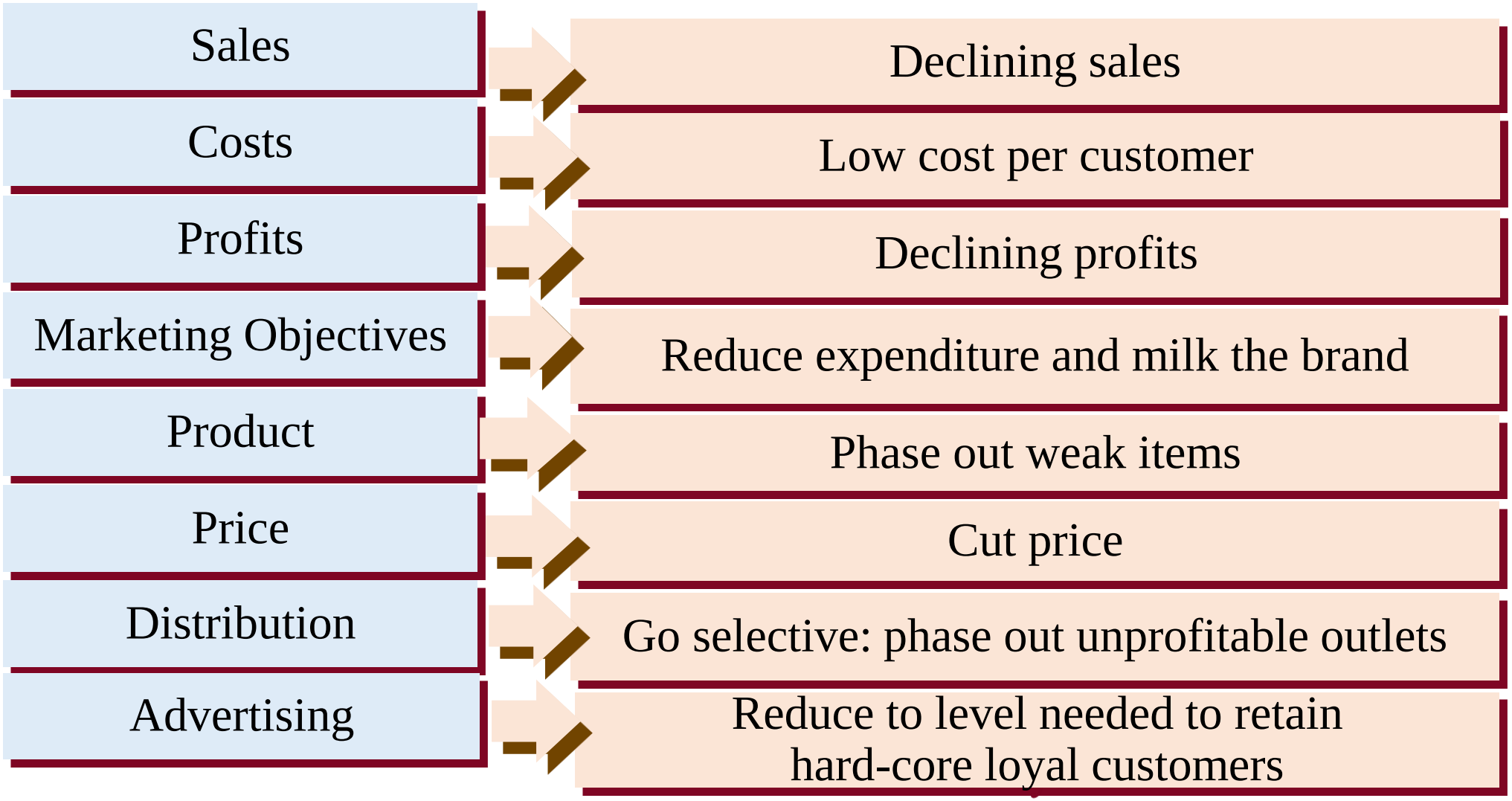
Growth Stage of the PLC

Sales	Rapidly rising sales
Costs	Average cost per customer
Profits	Rising profits
Marketing Objectives	Maximize market share
Product	Offer product extensions, service, warranty
Price	Price to penetrate market
Distribution	Build intensive distribution
Advertising	Build awareness and interest in the mass market

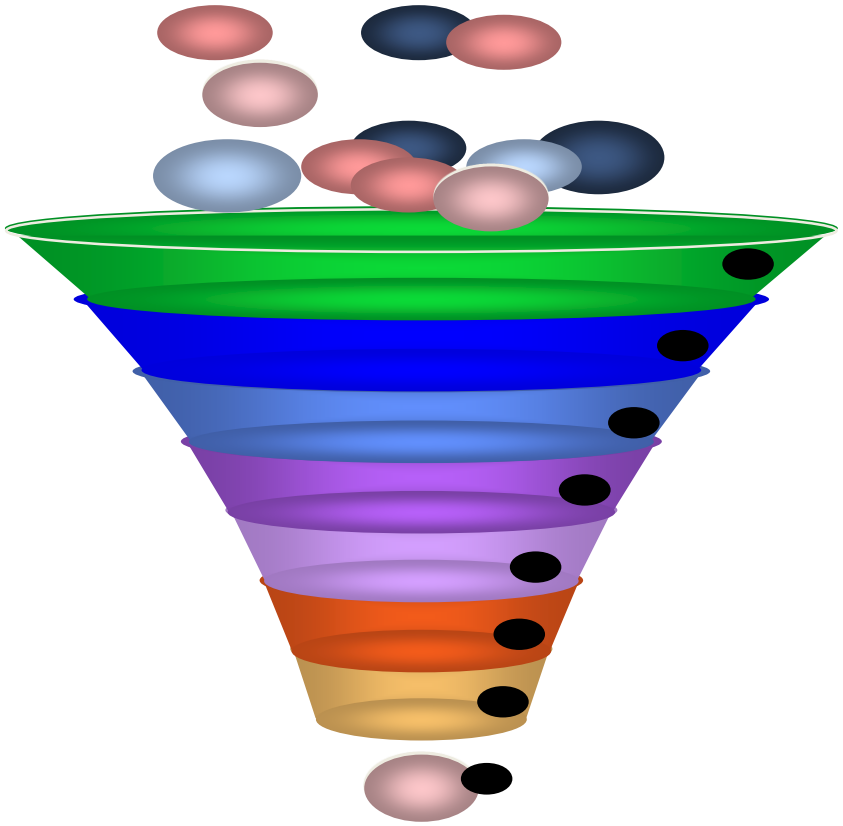
Maturity Stage of the PLC



Decline Stage of the PLC



New-Product Development Process



New-Product Strategy

Idea Generation

Idea Screening

Business Analysis

Development

Test Marketing

Commercialization

New Product

New-Product Development Process

Idea Generation

New idea generation is the systematic search for new product ideas

Sources of new-product ideas

- Internal
- External

New-Product Development Process

Idea Generation

Internal sources refer to the company's own formal research and development, management and staff, and intrapreneurial programs

External sources refer to sources outside the company such as customers, competitors, distributors, suppliers, and outside design firms

New-Product Development Process

Idea Screening

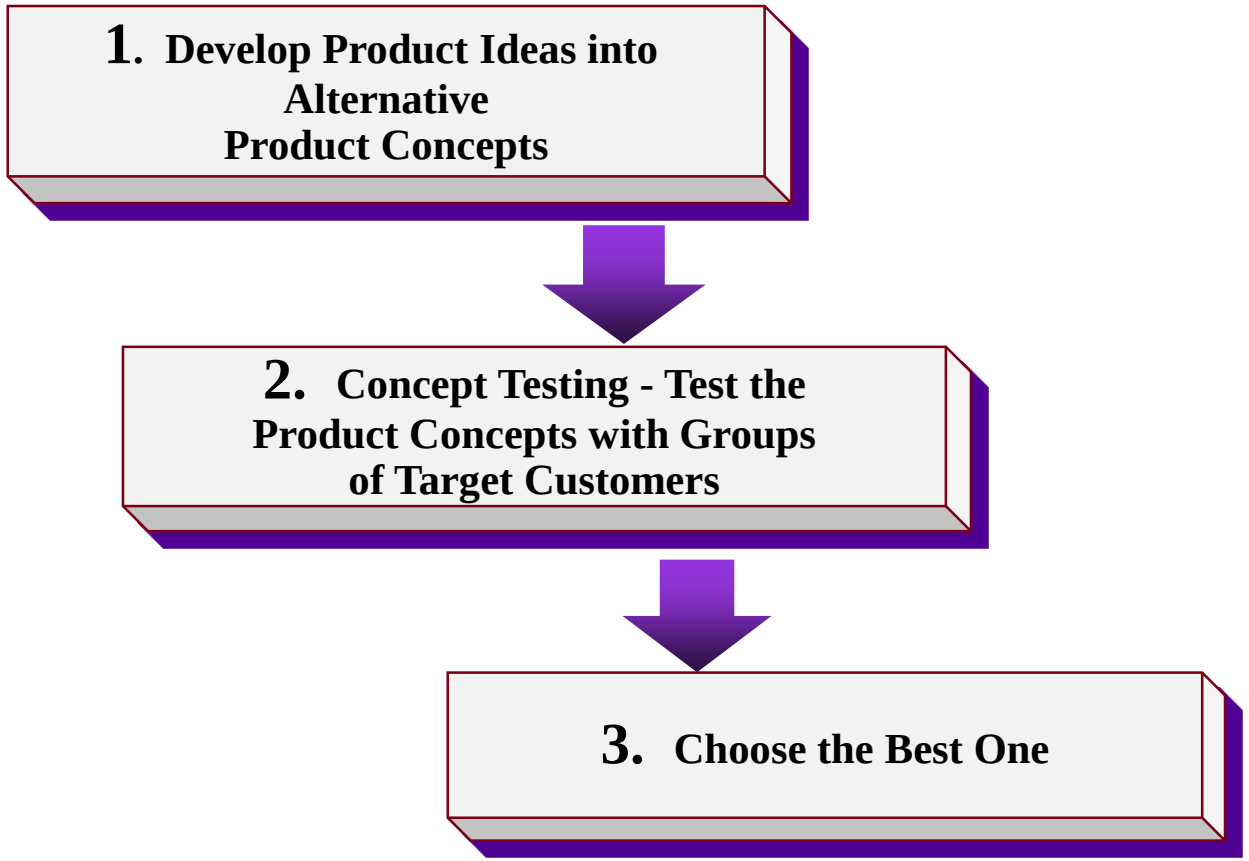
Idea screening refers to reviewing new-product ideas in order to drop poor ones as soon as possible

The first filter in the product development process, which eliminates ideas that are inconsistent with the organization's new product strategy or are inappropriate for some other reason.

New-Product Development Process

Concept Development & Testing

A test to evaluate a new-product idea, usually before any prototype has been created.



New-Product Development Process

Marketing Strategy Development

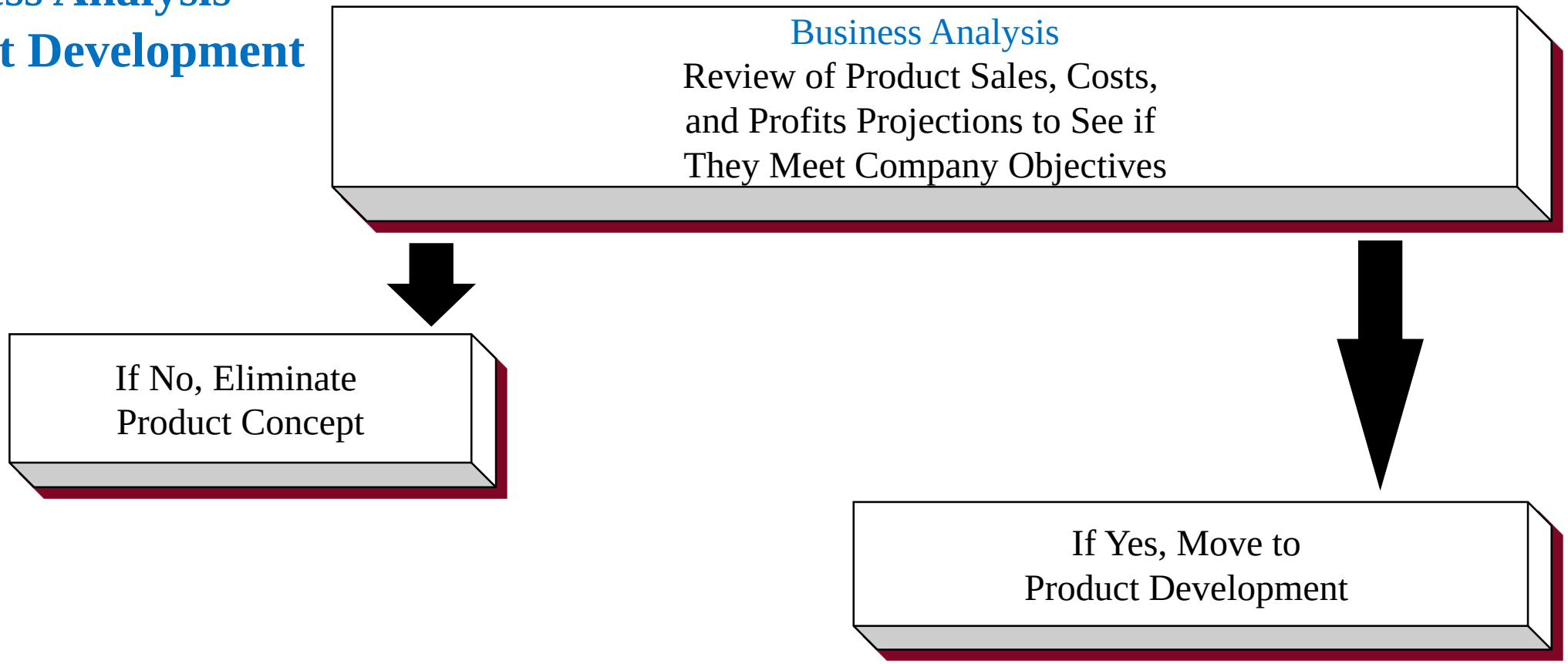
Part One - Overall:
Target Market
Planned Product Positioning
Sales & Profit Goals
Market Share

Part Two - Short-Term:
Product's Planned Price
Distribution
Marketing Budget

Part Three - Long-Term:
Sales & Profit Goals
Marketing Mix Strategy

New-Product Development Process

Business Analysis
Product Development



Quality Function Deployment (QFD)

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 importance ratings
6. Evaluate competing products
7. Compare performance to desirable technical attributes

Quality Function Deployment (QFD)

Aim: Set targets for the engineering characteristics of a product, to satisfy customer requirements.

1.Identify customer requirements in terms of product attributes. It is important that 'the voice of the customer' is recognized, and that customer requirements are not subject to reinterpretation by the design team.

2. Determine the relative importance of the attributes. Techniques of rank-ordering or points-allocation can be used to help determine the relative weights that should be attached to the various attributes. Percentage weights are normally used.

Quality Function Deployment (QFD)

3. Evaluate the attributes of competing products. Performance scores for competing products and the design team's own product (if a version of it already exists) should be listed against the set of customer requirements.

4. Draw a matrix of product attributes against engineering characteristics. Include all the engineering characteristics that influence any of the product attributes and ensure that they are expressed in measurable units.

5. Identify the relationships between engineering characteristics and product attributes. The strength of the relationships can be indicated either by symbols or numbers; using numbers has some advantages, but can introduce a spurious accuracy.

Quality Function Deployment (QFD)

6. Identify any relevant interactions between engineering characteristics. The roof matrix of the house of quality provides this check, but may be dependent upon changes in the design concept.

7. Set target figures to be achieved for the engineering characteristics. Use information from competitor products or from trials with customers.

Quality Function Deployment and the House of Quality

QFD: A system for translating customer requirements into appropriate company requirements at each stage from research and product development to engineering and manufacturing to marketing/sales and distribution

- QFD: The process of
  - Determining what are the customer “requirements” / “wants”, and
  - Translating those desires into the target product design.

- House of quality: A graphic, yet systematic technique for defining the relationship between customer desires and the developed product (or service)

Quality Function Deployment and the House of Quality

What is the purpose of QFD?

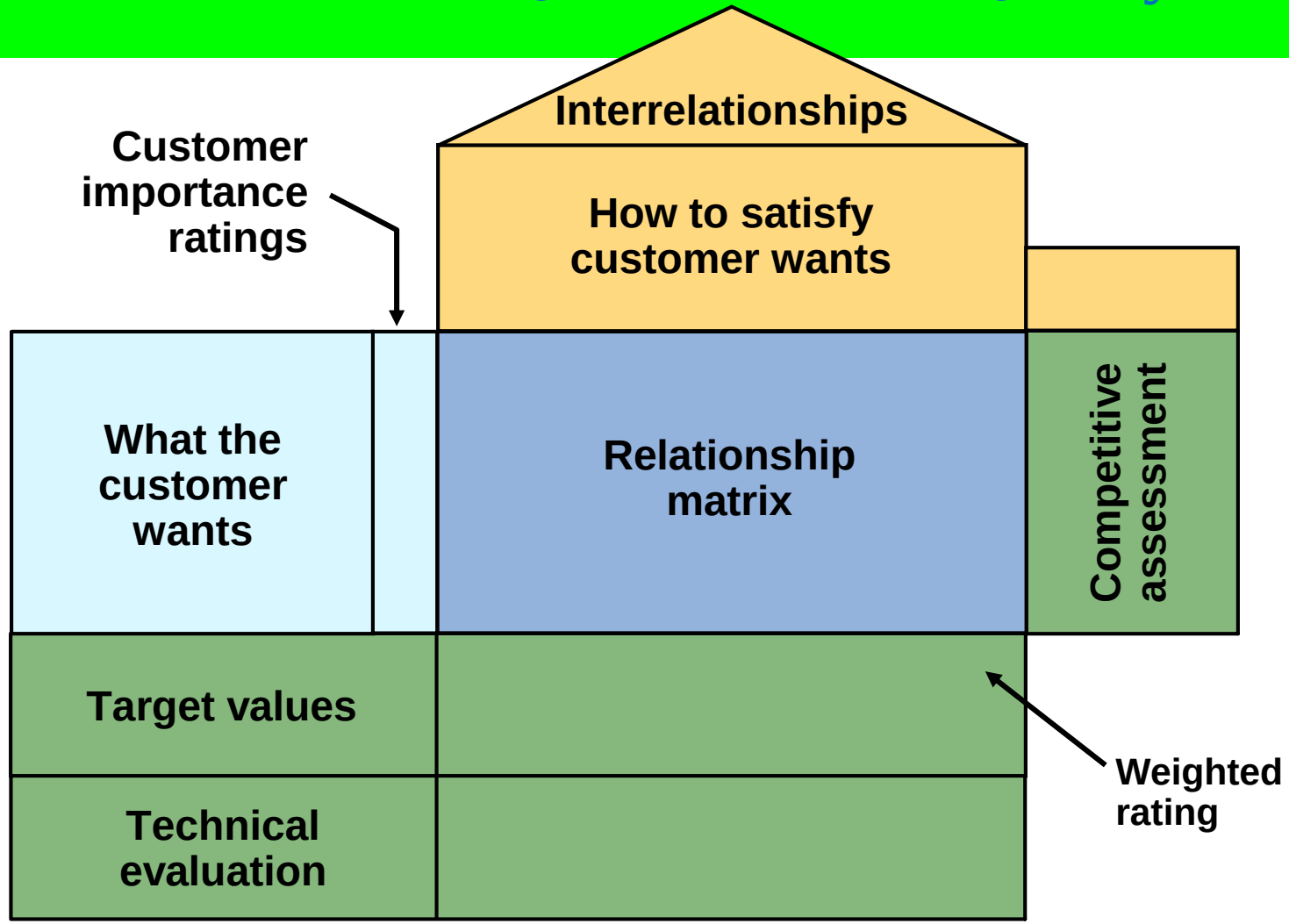
- Improve quality
- Reduce manufacturing costs
- Increase organizations capabilities

Quality Function Deployment and the House of Quality

What are the benefits of QFD?

- Improve customer satisfaction
- Reduce implementation time
- Promotes teamwork

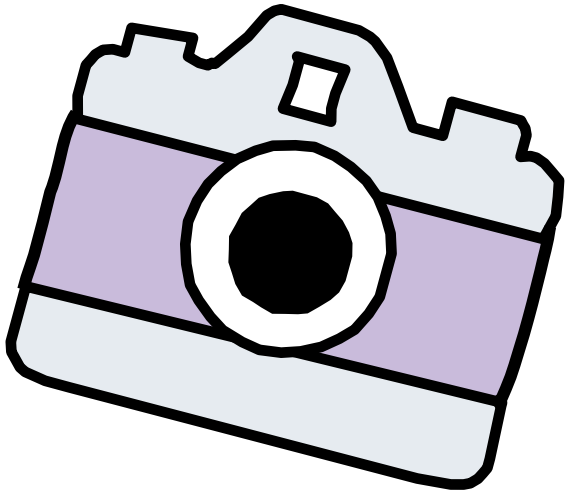
QFD House of Quality



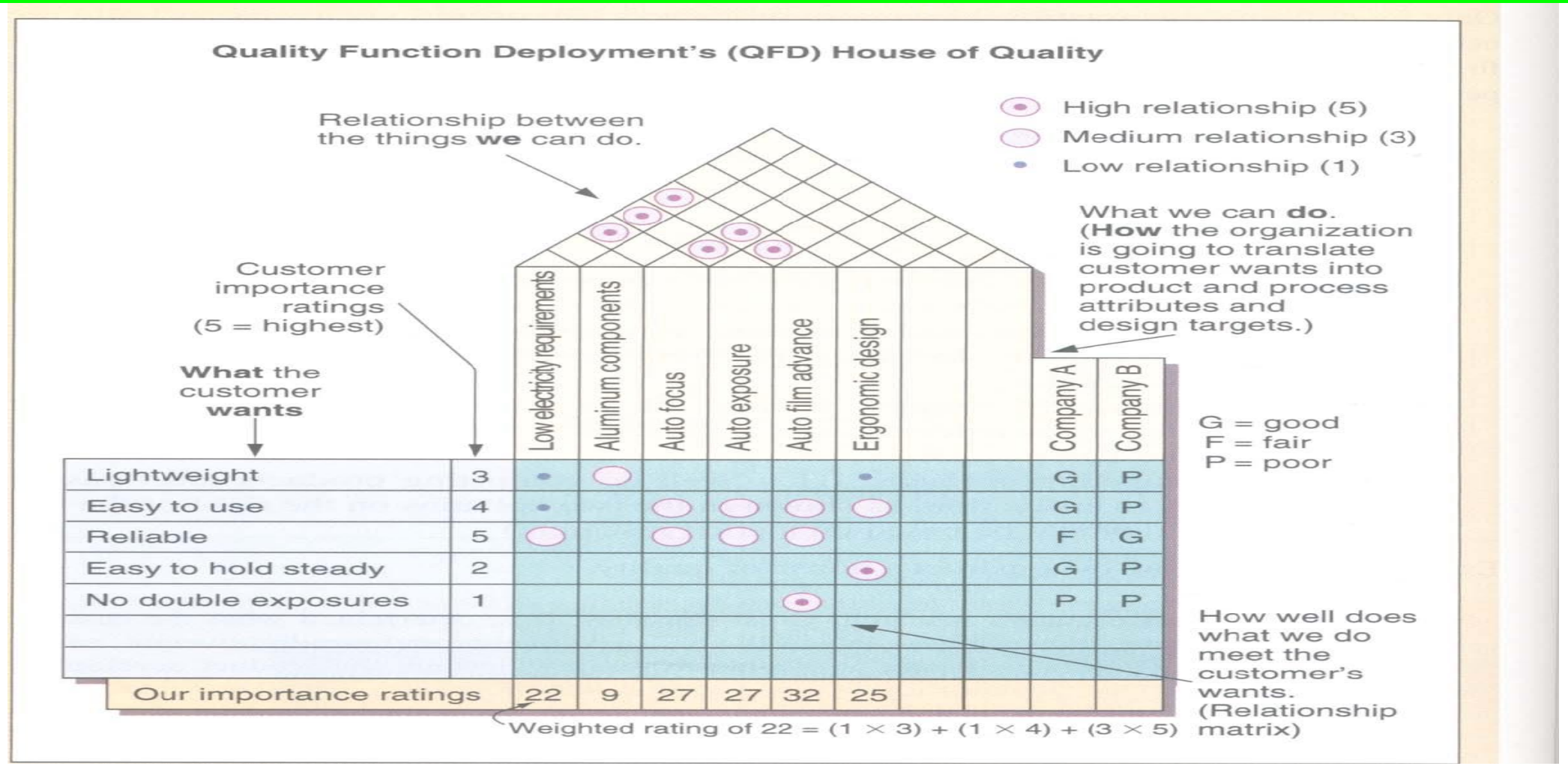
House of Quality Example

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

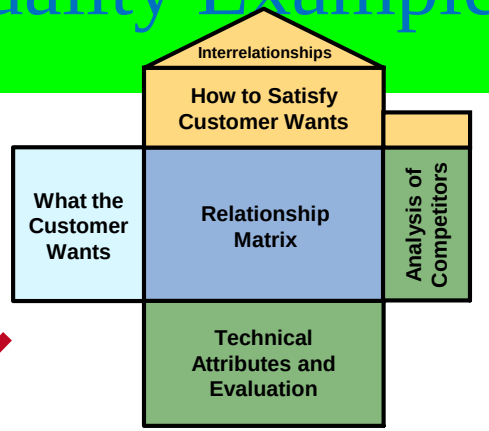
The first action is
to construct a
House of Quality



House of Quality Example



House of Quality Example

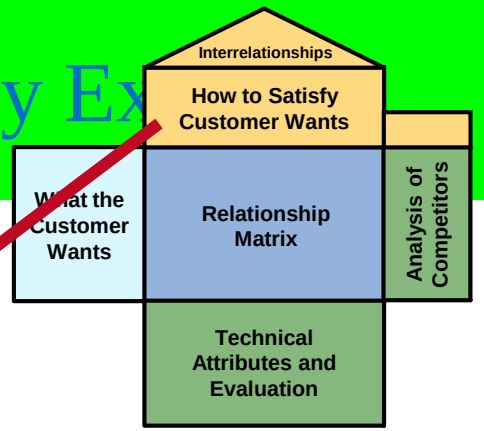


What the customer wants

Customer importance rating (5 = highest)

Lightweight	3
Easy to use	4
Reliable	5
Easy to hold steady	2
Color correction	1

House of Quality Ex



Low electricity requirements

Aluminum components

Auto focus

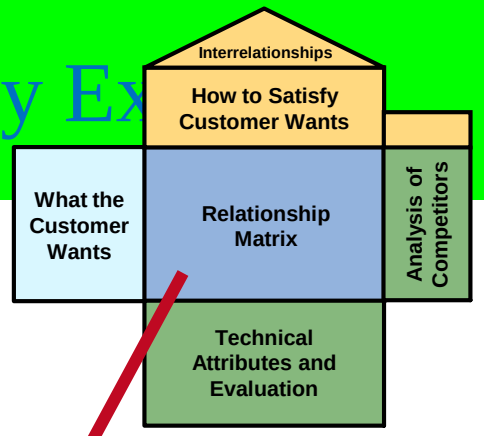
Auto exposure

Paint pallet

Ergonomic design

How to **Satisfy Customer Wants**

House of Quality Ex

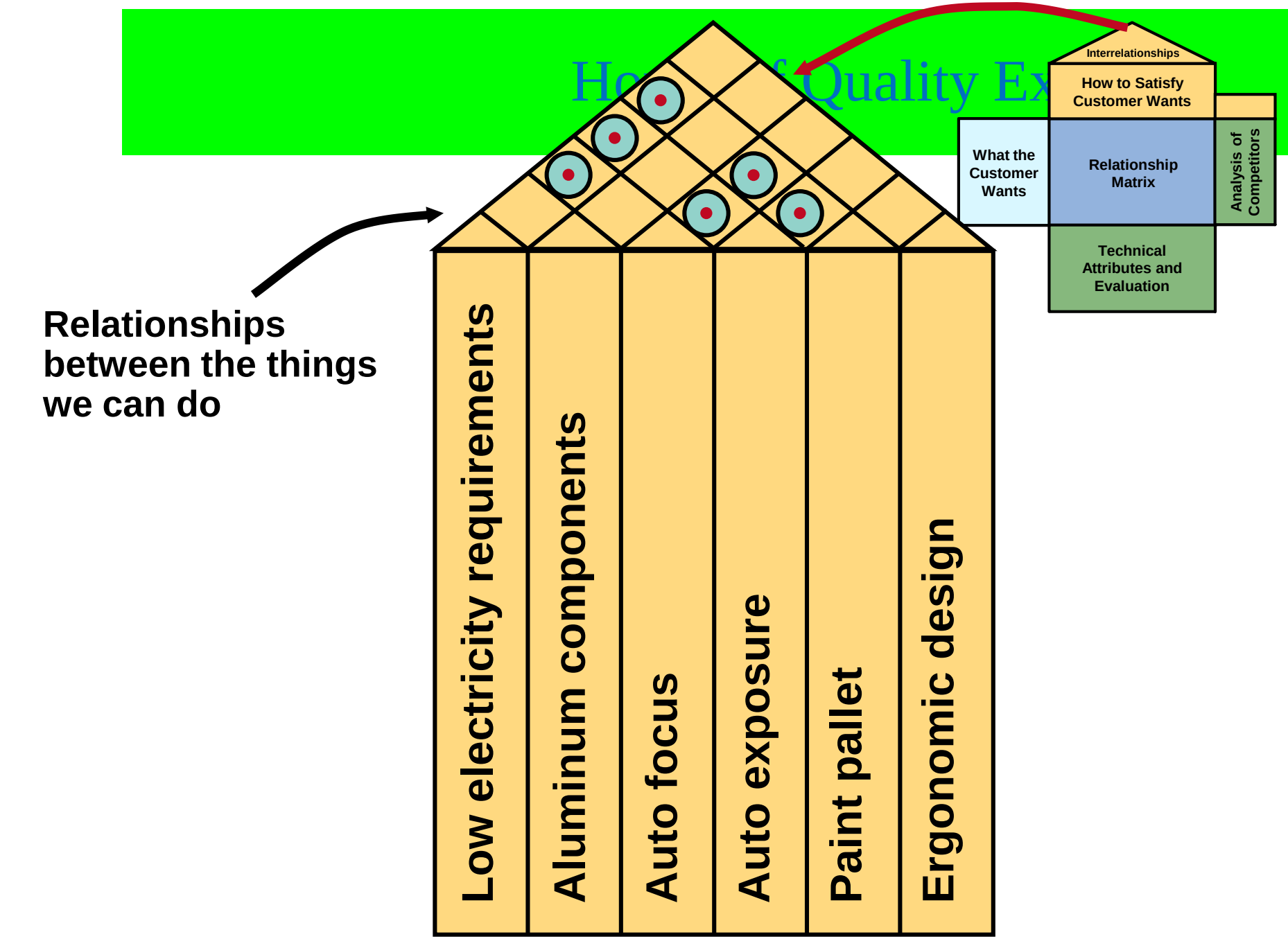


- High relationship
- Medium relationship
- Low relationship

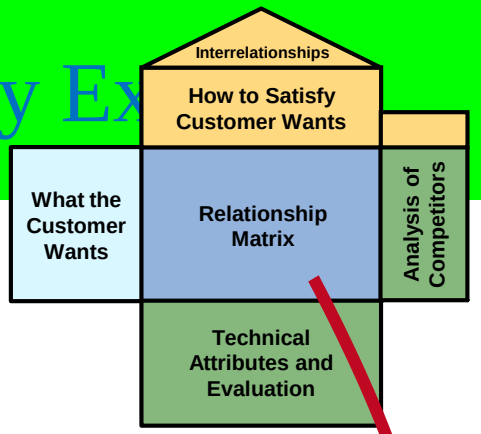
Lightweight	3	•	○				•
Easy to use	4	•		○	○	○	○
Reliable	5	○		○	○	○	
Easy to hold steady	2						◉
Color corrections	1					◉	

Relationship matrix

House of Quality Ex



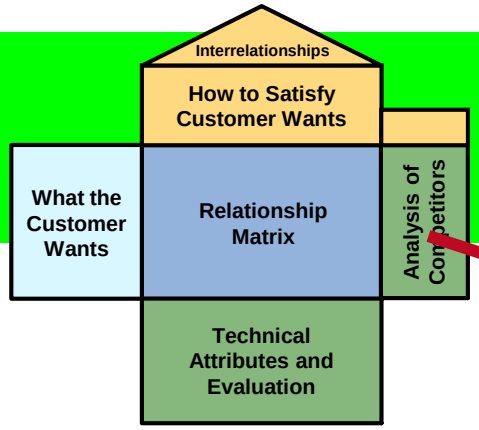
House of Quality Ex



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

Weighted rating

House of Quality Example



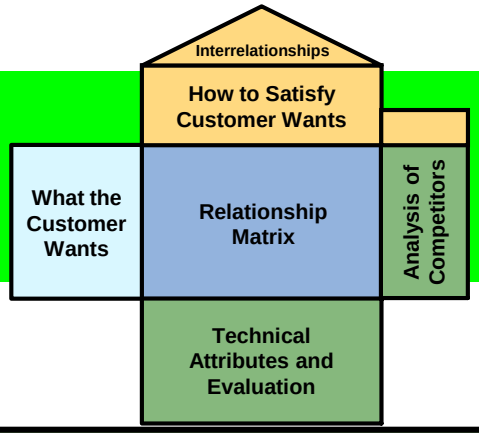
G= good

F= fair

P= poor

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
Color corrections	1			P	P
Our importance ratings		22	5		

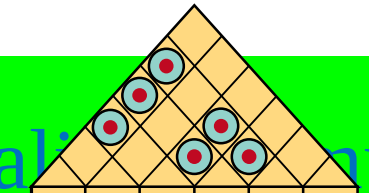


House of Quality Example

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 Example

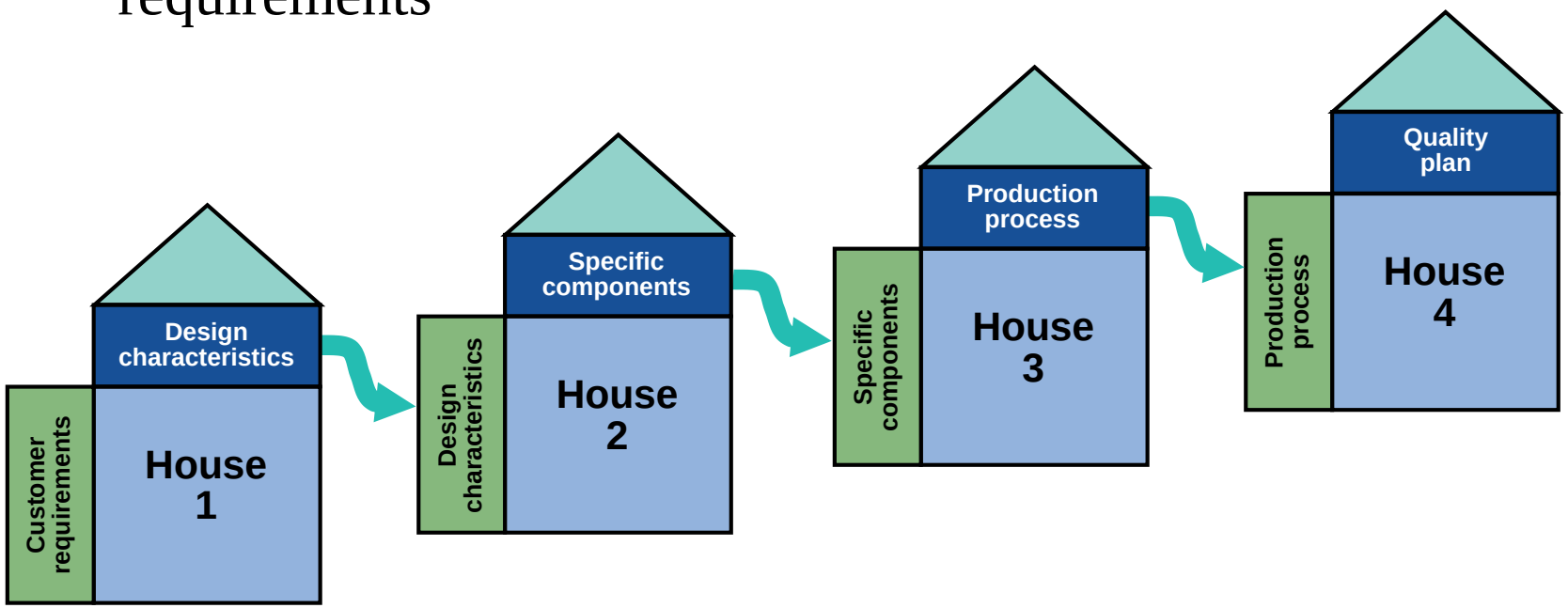
Completed House of Quality



		Low electricity requirements	Aluminum components	Auto focus	Auto exposure	Paint pallet	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
Color correction	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



House of Quality Sequence indicates how to deploy resources to achieve customer needs