Unit# 6

Product Design

OBJECTIVES

- Product Development Process
- Economic Analysis of Development Projects
- Designing for the Customer
- Design for Manufacturability
- Measuring Product Development Performance

Typical Phases of Product Development: Example of Marketing Function

- **Planning**
  - **Articulate market opportunities**
  - **Define market segment**
- **Concept Development**
  - **Collect customer needs**
  - **Identify lead users**
  - **Identify competitive products**
- **System-Level design**
  - **Develop plan for product options & extended product family**
  - **Set target sales price points**
- **Design Detail**
  - **Develop marketing plan**
- **Testing and Refinement**
  - **Develop promotion & launch materials**
  - **Facilitate field testing**
- **Production Ramp-up**
  - **Place early production with key customers**

Economic Analysis of Project Development Costs

- Using measurable factors to help determine:
  - Operational design and development decisions
    - should we outsource in order to save time?
  - Go/no-go milestones
    - should we develop to address new mkt opportunity?

- Building a Base-Case Financial Model
  - Estimating time & amount of cash flow to determine Net Present Value of the cash flow
  - A financial model consisting of major cash flows
    - e.g costs: development, marketing & unit production
  - Sensitivity Analysis for “what if” questions
    - Calculate changes in NPV vs. changes in factors in model

Product Development System

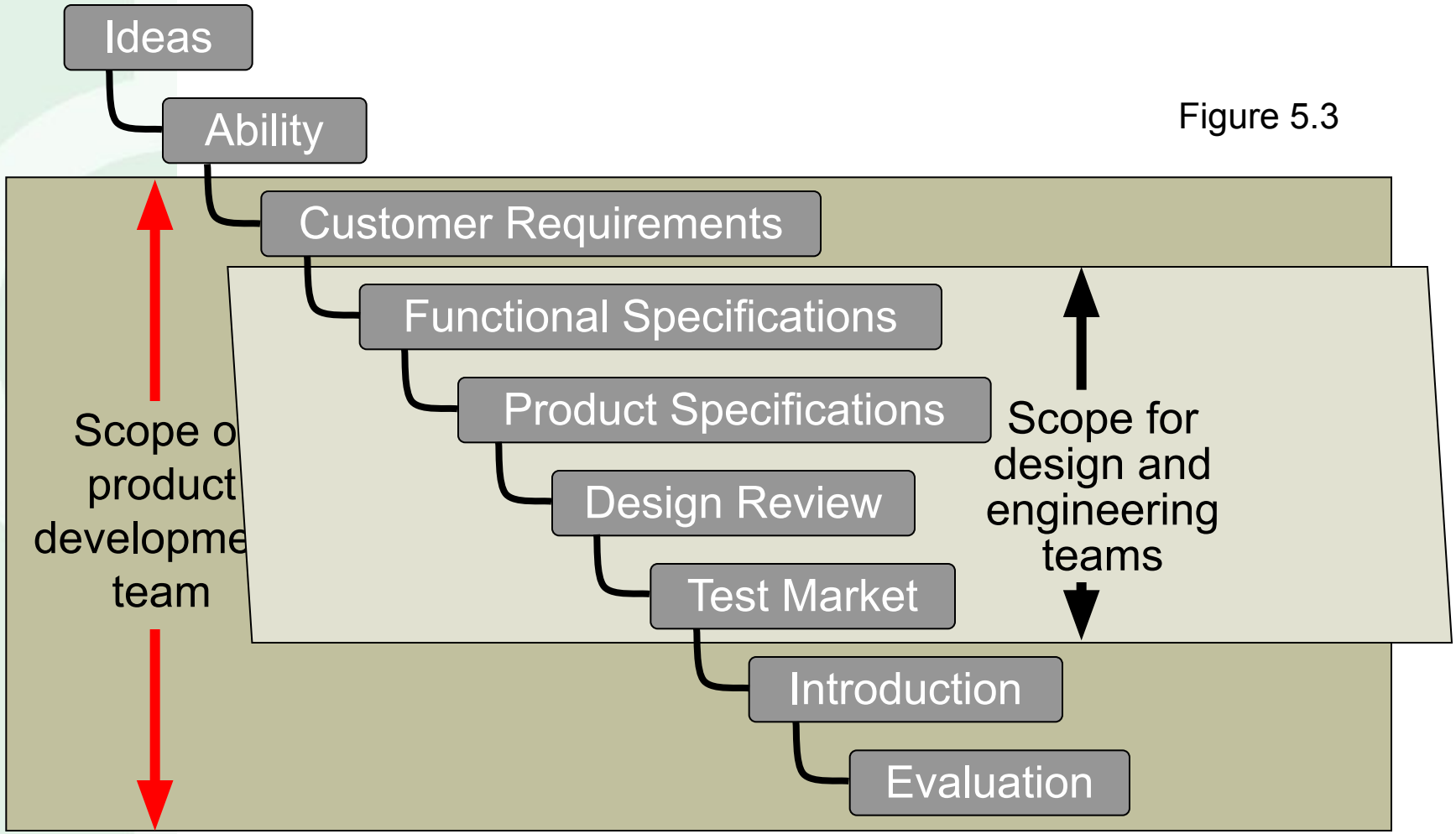
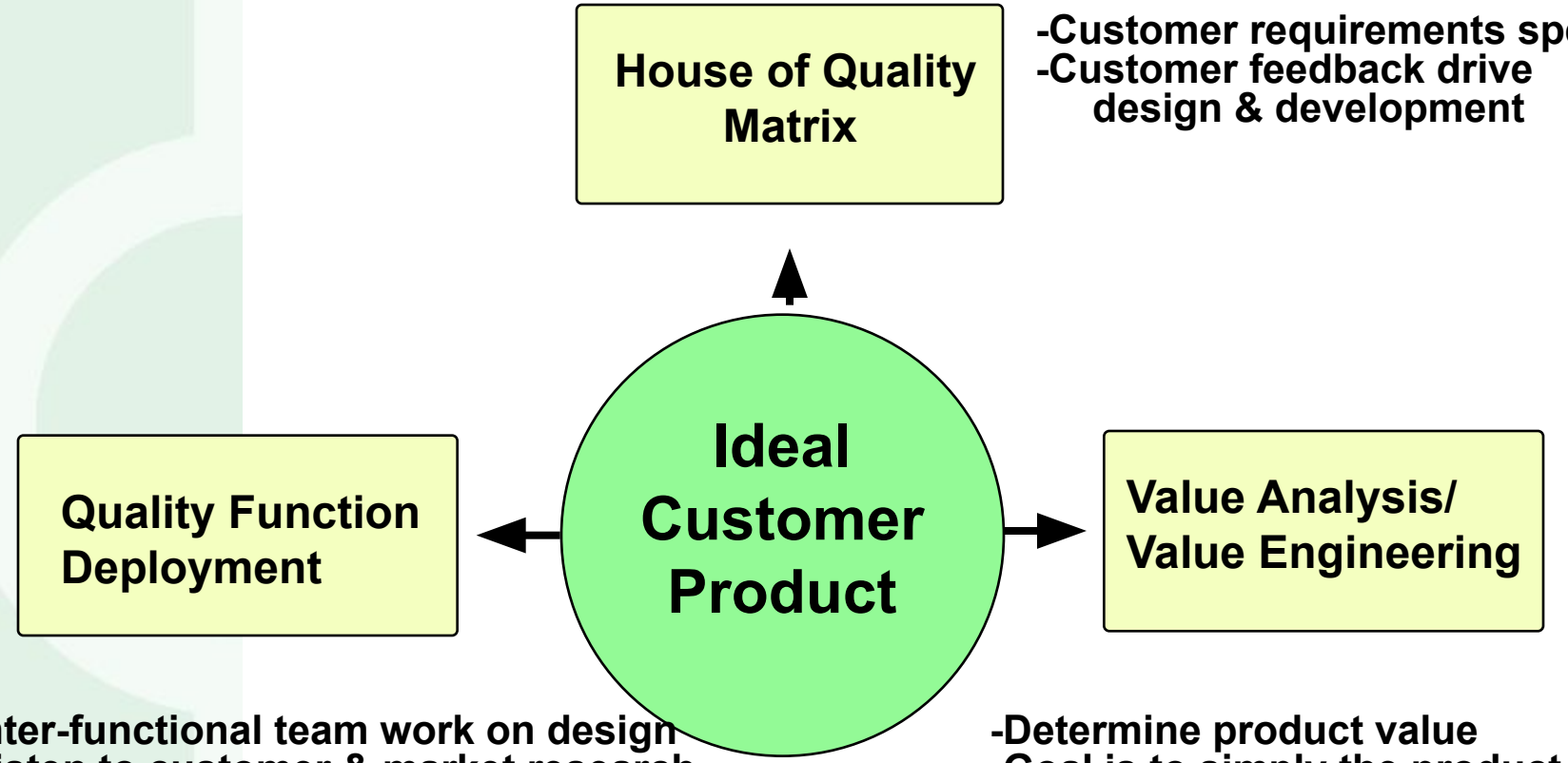


Figure 5.3

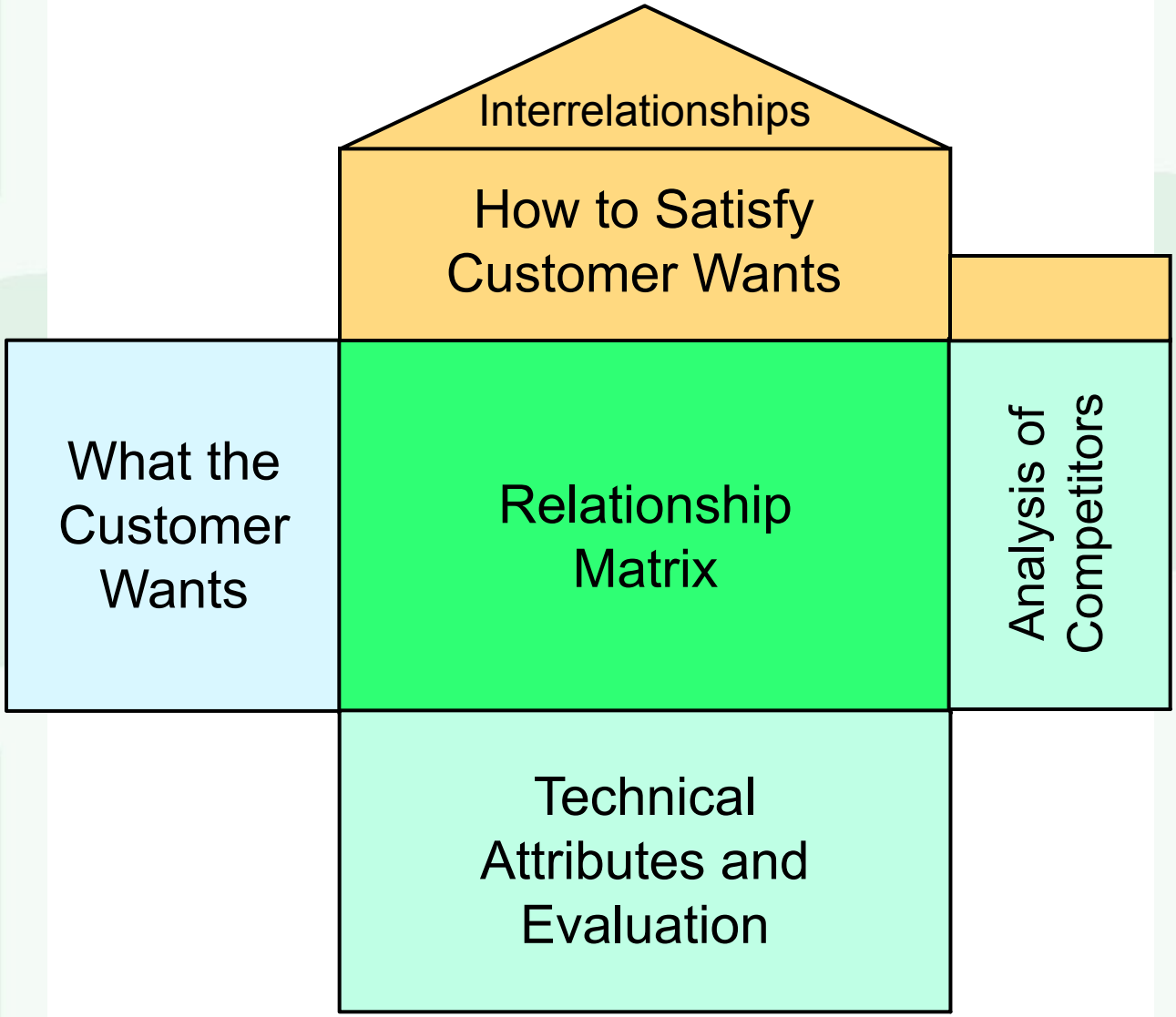
Quality Function Deployment

- Identify customer wants
- Identify how the good/service will satisfy customer wants
- Relate customer wants to product hows
- Identify relationships between the firm's hows
- Develop importance ratings
- Evaluate competing products

Designing for the Customer



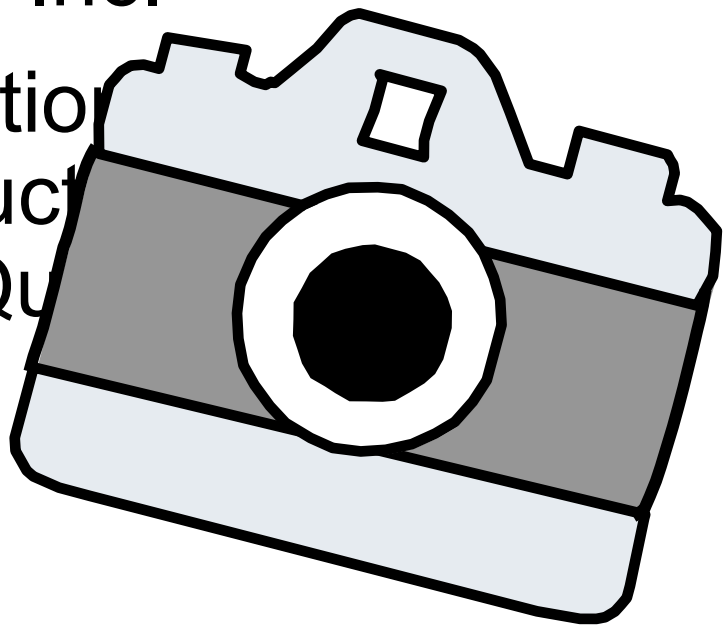
QFD House of Quality



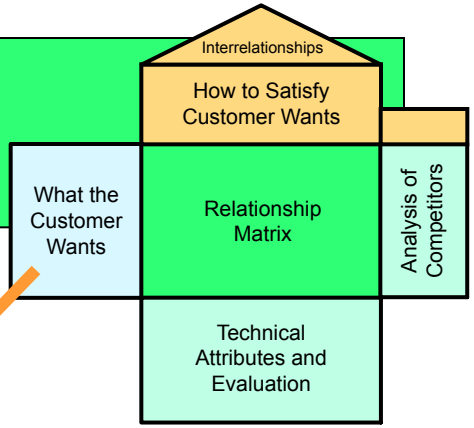
House of Quality Example

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

The first actio
to construct
House of Qu



House of Quality Example



What the customer wants

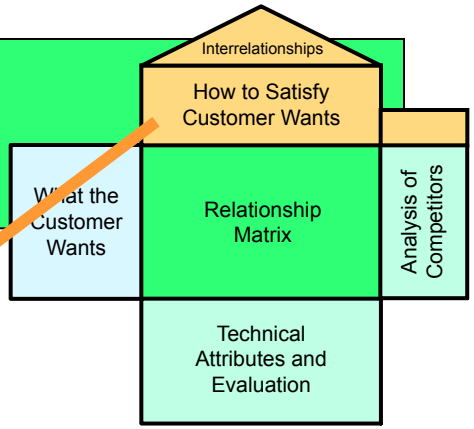
Customer importance rating (5 = highest)

Lightweight	3	
Easy to use	4	
Reliable	5	
Easy to hold steady	2	

No double exposures

1

House of Quality Example



Low electricity requirements

Aluminum components

Auto focus

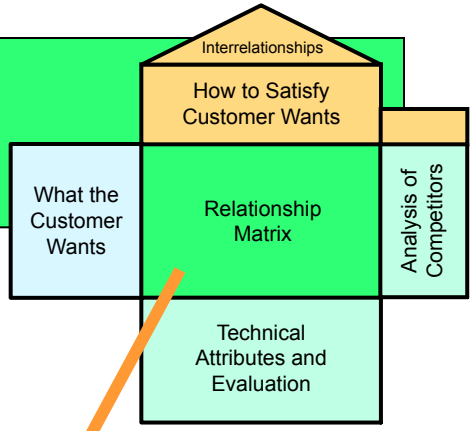
Auto exposure

Auto film advance

Ergonomic design

How to Satisfy Customer Wants

House of Quality Example



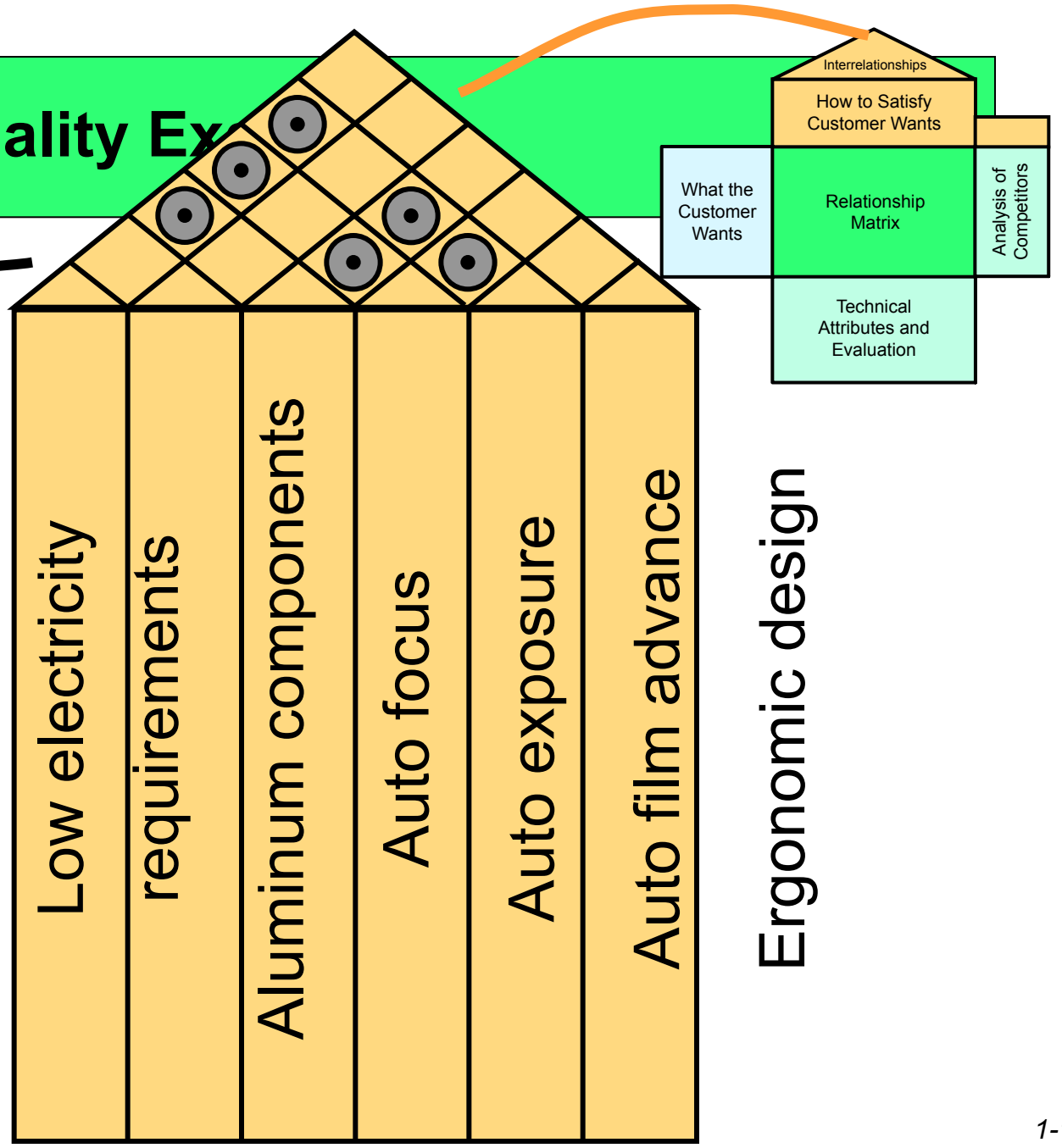
- High relationship
- Medium relationship
- Low relationship

Lightweight	3						
Easy to use	4						
Reliable	5						
Easy to hold steady	2						

No double exposures

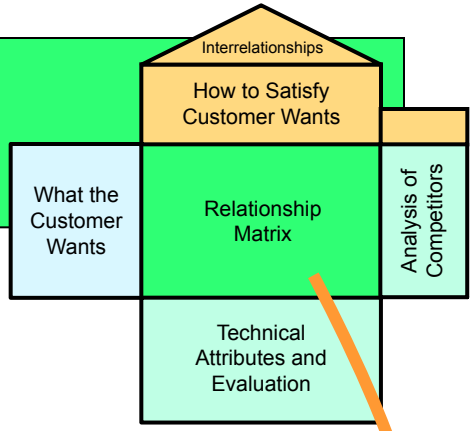
1 Relationship matrix

House of Quality Ex

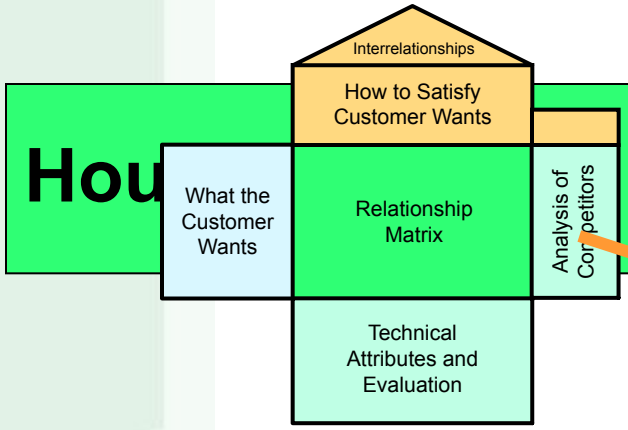


Relationships between the things we can do

House of Quality Example



Lightweight	3		●	◎				●
Easy to use	4		●		◎	◎	◎	◎
Reliable	5		◎		◎	◎	◎	
Easy to hold steady	2							◉
							◉	
Our importance ratings			22	9	27	27	32	25
		1						
		Weighted rating						



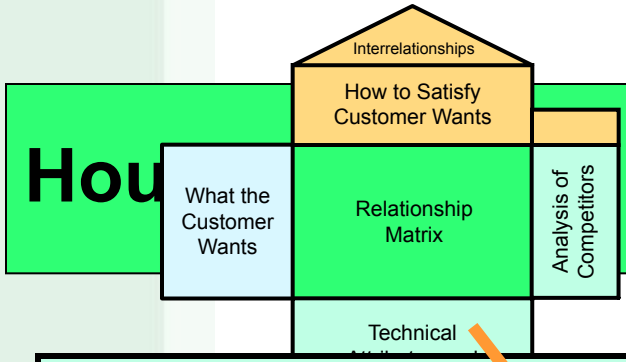
Hou Example

How well do competing products meet customer wants

					Company A	Company
Lightweight	3		•	•	G	P
Easy to use	4		•	○	G	P
Reliable	5		○		F	G
Easy to hold steady	2				G	P
Our importance ratings		22	5		P	P

No double exposures

1

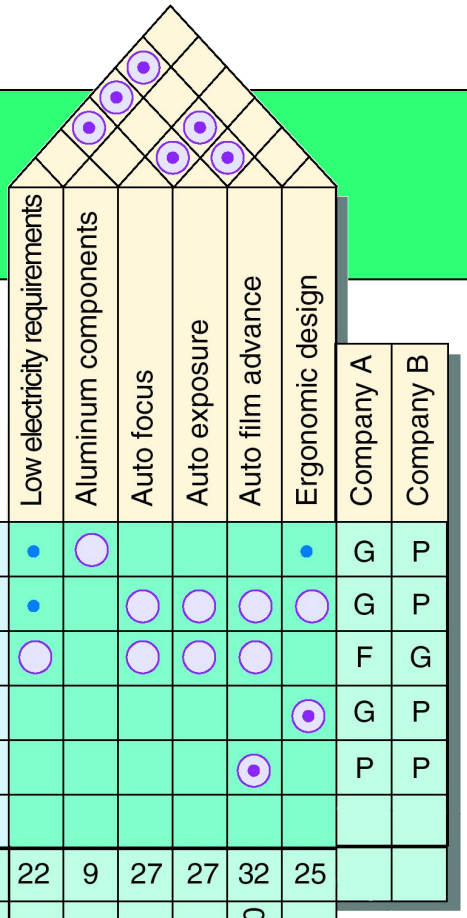


Hou Example

Technical attributes	0.5 A	75%	2' to ∞	2 circuits	Failure 1 per 10,000	Panel ranking
Company A	0.7	60%	yes	1		
Technical evaluation	ok G					
Company B	0.6	50%	yes	2		
	ok F					

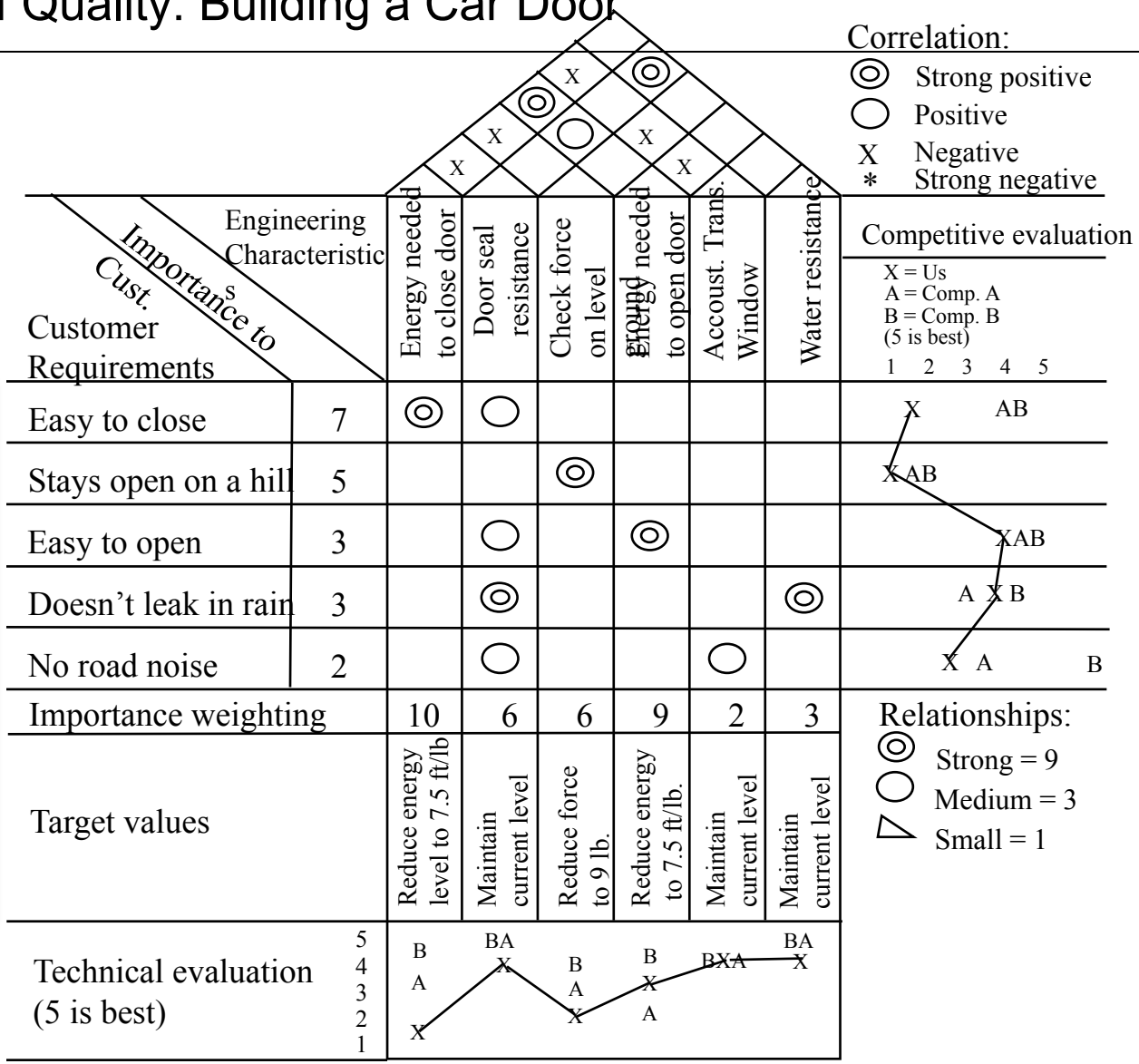
House of Quality Example

Completed House of Quality



		Low electricity requirements	Aluminum components	Auto focus	Auto exposure	Auto film advance	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
No double exposures	1					◎		P	P
Our importance ratings		22	9	27	27	32	25		
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		

Designing for the Customer: The House of Quality: Building a Car Door



Customer requirements information forms the basis for this matrix, used to translate them into operating or engineering goals.

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

Product-by-Value Analysis

Sam's Furniture Factory

	Individual Contribution ($)	*Total Annual Contribution ($)*
Love Seat	***$102***	***$36,720***
Arm Chair	***$87***	***$51,765***
Foot Stool	***$12***	***$6,240***
Recliner	***$136***	***$51,000***

New Product Opportunities

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

Brainstorming is a useful tool

Designing for the Customer: Value Analysis/Value Engineering

Achieve equivalent or better performance at a lower cost while maintaining all functional requirements defined by the customer

- **Does the item have any design features that are not necessary?**
- **Can two or more parts be combined into one?**
- **How can we cut down the weight?**
- **Are there nonstandard parts that can be eliminated?**

Design for Manufacturability

- **Traditional Approach**
  - **– “We design it, you build it” or “Over the wall”**
- **Concurrent Engineering**
  - **– “Let’s work together simultaneously”**

Design for Manufacturing and Assembly

Greatest improvements related to DFMA arise from simplification of the product by reducing the number of separate parts:

1. **During the operation of the product, does the part move relative to all other parts already assembled?**
2. **Must the part be of a different material or be isolated from other parts already assembled?**
3. **Must the part be separate from all other parts to allow the disassembly of the product for adjustment or maintenance?**

Designing Service Products

Unlike manufacturing products, service products involves customer directly and can be complicated during its process, impacting both time and knowledge to serve customer

Factors affecting service design:

- **Service Experience Fit**: New service fit into currently provided services. E.g. Movie & Selling Pop-corns
- **Operational Fit**: Collaborate with other operational skills in to service customer. E.g. Retail store & Home Delivery
- **Financial Fit**: Is it financially justified? May be necessary to retain customer.

Measuring Product Development Performance

Performance Dimension	Measures
Time-to-market	•Freq. of new products introduced •Time to market introduction •Number stated and number completed •Actual versus plan •Percentage of sales from new products
Productivity	•Engineering hours per project •Cost of materials and tooling per project •Actual versus plan
Quality	•Conformance-reliability in use •Design-performance and customer satisfaction •Yield-factory and field

End of Unit# 6