Analytical Hierarchical Process

For multiple-criteria decision making

Analytical Hierarchical Process

- Choosing which criteria is more more important in multi-criteria decision making.

- Process for choosing the lead concept among alternatives.

#1 How Does AHP work?

- Identifying CTQ's of your customers

CTQ: critical-to-quality attributes of a product

Possible CTQ's.

- Material
  - cost
  - availability
  - transportation
- Process
  - mfg cost
  - embodied energy
  - employee conditions
- Assembly
  - product-parts
  - ease
  - in-situ
- Durability
  - repairability
  - resistance to weathering

#2

Criteria Comparison Matrix

	Material Cost	Manufacturing Cost	Production Time
Material Cost	1		
Manufacturing Cost		1	
Production Time			1

Criteria Comparison Matrix

	Material Cost	Manufacturing Cost	Production Time
Material Cost	1		
Manufacturing Cost		1	
Production Time			1

Pair-wise comparison

A. 1 means that criteria A and B are equally important.
B. Three means that A is thought to be moderately more important than B
C. 5 means that A is thought to be strongly more important then B
D. 7 means that A is thought to be, or has been demonstrated to be, much more important then B
E. 9 means A has been demonstrated to have much more important then B

A > B

9 1/9

3 1/3

5 1/5

#3

Criteria Comparison Matrix

	Material Cost	Manufacturing Cost	Production Time
Material Cost	1	0.33	0.14
Manufacturing Cost	3	1	3
Production Time	5	0.33	1

#4 Criteria Comparison Matrix [c]

	Material Cost	Manufacturing Cost	Production Time
Material Cost	1	0.33	0.20
Manufacturing Cost	3	1	3
Production Time	5	0.33	1
Sum	**9**	**1.66**	**4.14**

#5

Criteria Comparison Matrix

	Material Cost	Manufacturing Cost	Production Time
Material Cost	1/9 1 0.11	0.33 0.19	0.20 0.04
Manufacturing Cost	3/9 3 0.33	1 0.60	3 0.72
Production Time	5/9 5 0.55	0.33 0.19	1 0.25
Sum	**9**	**1.66**	**4.14**

Normalizing means dividing each element in every column by the sum of that column.

Criteria Comparison Matrix

	Material Cost	Manufacturing Cost	Production Time	Row Average / Criteria weights (W)
Material Cost	0.11	0.19	0.04	0.31
Manufacturing Cost	0.33	0.60	0.72	1.17
Production Time	0.55	0.19	0.25	0.82
Sum	**9**	**1.66**	**4.14**	

$$\lambda_{max} = 3.27$$

Consistency Index :

$$C.I = \frac{\lambda_{max} - n}{n-1} = \frac{3.27 - 3}{3-1}$$

$$= 0.135$$