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Evaluating Alternatives Rubric Example

EXAMPLE: Team Superengineers is comprised of four students. They are designing a scooter for children. The team followed the engineering analysis process below to evaluate their best design alternatives.

Step 1: List Criteria

a) Team Superengineers came up with the following four design criteria:

- safety
- appearance
- ease of use
- cost to produce

Step 2: Assign Priority Values to Criteria

a) The team completed the *interaction matrix* (page 2) by listing the criteria both in rows down the left and columns across the top.

b) The team chose a facilitator to poll the entire team for their opinion of the relative importance of one criterion over another. The results were:

- All team members ranked ***safety*** over ***appearance***, ***ease of use***, and ***cost of production***.
- One team member ranked ***appearance*** over ***ease of use***
- Two team members ranked a***ppearance*** over ***cost of production***
- Three team members ranked ***ease of use*** over ***cost of production***

c) Next, the team added the numbers across the rows for each criterion and wrote these numbers in the "ROW TOTAL" cell.

d) Then they added the "ROW TOTAL" numbers down the column to find the "COLUMN TOTAL."

Step 3: Normalize the Priority Values

a) Lastly, the team divided each "ROW TOTAL" by the "COLUMN TOTAL" to find the "NORMALIZED VALUES."

b) Notice how the sum of the "NORMALIZED VALUES" (0.5 + 0.125 + 0.125 + 0.25) equals 1.

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Criteria	Criterion 1 Safety	Criterion 2 Appearance	Criterion 3 Ease of Use	Criterion 4 Cost of Production	ROW TOTAL	NORALIZED VALUE
Criterion 1 Safety		4	4	4	12	12/24 = 0.5
Criterion 2 Appearance	0		1	2	3	3/24 = 0.125
Criterion 3 Ease of Use	0	3		3	6	6/24 = 0.25
Criterion 4 Cost of Production	0	2	1		3	3/24 = 0.125
				Column Total	24	

Make sure you understand Steps 1-4 before moving on!

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Step 4: Compare Alternative Designs

a) The team ordered the normalized criteria values from largest to smallest and wrote these values in the *decision matrix* (page 4).

b) Now for the fun part; the team evaluated their design alternatives. So far, the team has three alternatives for their scooter design:

Play-It-Safe Scooter	Stylish Scooter	Teeny-Tiny Scooter
This scooter has an extra set of brakes, wider tires for extra balance, and detachable scooter training wheels.	This scooter glows in the dark and has blinking lights powered by the motion of the wheels!	This scooter is constructed of thin metal materials and can fold up to fit inside a small backpack.

c) Using a 0–5 scale (0 meaning that the design concept does not meet the criterion at all), they ranked each alternative design concept according to how well they felt the concept could satisfy each of the design criteria they identified.

d) Write these ranked values in the gray cells below each design alternative.

e) Multiply each ranked value by the normalized criterion value and write this number to the right of the ranked value for each design alternative.

f) Sum these multiplied values and write them in the corresponding “TOTAL” cell.

Step 5: Analyze Results

a) The design alternative with the highest value (as shown in the “TOTALS” row) is the alternative that best meets the selected criteria. Design alternatives with significantly lower values can be discarded. The design alternative with the highest score may be selected, or you can select the alternative that received the highest score for the majority of the categories.

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Decision Matrix

Criteria (ranked by normalized criteria value)	Normal Priority Value	Design Alternative #1 Play –It-Safe Scooter		Design Alternative #2 Stylish Scooter		Design Alternative #3 Teeny-Tiny Scooter	
Safety	0.5	5	2.5	2	1	3	1.5
Ease of Use	0.25	4	1	3	0.75	5	1.25
Appearance	0.125	2	0.25	5	0.625	4	0.5
Cost of Production	0.125	2	0.25	2	0.25	5	0.625
Totals			4		2.625		3.875

b) The design alternative with the highest value (as shown in the "TOTALS" row) turned out to be the "Play-It-Safe" Scooter. Team Superengineers decided to proceed with this idea!