

# decisions, decisions

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ONE OF THE MOST UNIVERSAL but difficult tasks that managers have is selecting optimal decisions from sets of complete, thoroughly-considered alternatives. To compound this problem, most procedures that have been designed to help managers make decisions are so hard to understand, difficult to apply, or time-consuming that the average manager is forced to rely on little more than educated guesses.

But no longer. Here is a procedure that will help you to make more-accurate decisions in a shorter period of time. Called a "Matrix Priority Rating System," the technique systematically develops decision priority ratings, using a matrix of adjustable rows and columns. The basic idea is not new. This form, however, is new and is an improvement on similar but far-more-complicated systems devised and presented elsewhere.

This technique is based on the assumption that:

- A variety of criteria are usually used to judge the success or efficacy of a decision's outcome.

- Some criteria are more important than others.

For example, the decision to buy stock in a firm can be based on the firm's net worth, receivables turnover, operating margin, or any number of other criteria. Usually, however, the most-important factor is the firm's ability to return something on the owner's investment.

The Matrix Priority Rating System provides a method whereby all important criteria bearing on a decision can be considered, while at the same time giving the more critical criteria more weight in making the decision. This is accomplished by assigning numerical weights to the criteria: the higher the number, the more important the criterion.

The fact that a decision needs to be made

implies that there are two or more choices or alternatives open to the decision maker. If there were no choices, no decision would be required.

We are concerned about making decisions that select the best of several established alternatives. This is accomplished by rating the performance of the alternatives in certain criteria on a scale of one to ten. The better alternative will receive higher ratings.

Multiplying each alternative's *performance rating* by each criterion's *importance weighting* will yield a score which generates a total value for the alternative. The alternative with the highest total value is the one that performs best against the stated criteria. The following paragraphs more clearly describe this procedure.

The only tools required to utilize this system are a pencil and two sheets of paper. There are five simple steps:

- List the alternatives to be evaluated in a column in a matrix.

- Determine and list the criteria that will be used to judge the alternatives.

- Weigh the *importance* of each *criterion* by using a scale of 1 to 10, or a constant sum (of, say, 100 points) and allocate the points across the criteria according to their relative importance.

- Rate the *performance* of each *alternative* for every criterion on a scale of 1 to 10.

- Multiply the performance ratings by the criteria weights and add the products across each alternative.

Two examples will be used to illustrate the process: The first example is a simple one. The second is a real situation at Dow Corning.

Lucy, (with apologies to Peanuts' Schulz), desiring to make a little spending money, decides to sell oranges, eggs, or rocks to be thrown at members of opposing baseball teams. Because of her limited resources (fi-

nancial and mental) she decides that she can effectively market only one type of missile: oranges, or eggs, or rocks. Which product will bring the greatest return?

Following our steps, she draws a matrix and lists her alternative products in the proper column:

Oranges							
Eggs							
Rocks							

Across the top she lists the criteria that she thinks will be important in determining which missile to sell. She then weights their relative importance by dividing 100 points among the criteria according to each criterion's importance in her decision. (She could use any convenient sum—50, 500, 1,000—whatever is easiest to work with.)

	Unit Cost	Unit Selling Price	No. Units Sold	Shelf Life	Effect on Victims	Total Score
	25	25	25	10	15	
Oranges						
Eggs						
Rocks						

Then on another sheet of paper, she develops a guide to determine how she will rate the alternatives' performance with respect to each criterion (unit cost, selling price).

Criterion	Ranges of Ratings for Alternatives	
	Give a Score of "10" if . . .	Give a Score of "1" if . . .
Unit Cost	Is less than 1c each	Is more than 10c each
Unit selling price	Is more than 10c each	Is less than 1c each
No. units that will be sold	Is more than 50 units	Is less than 5 units
Shelf life	Is more than 30 days	Is less than 3 days
Effect on victims	Is highly humiliated	Is injury will result

Next, Lucy rates the performance of the alternatives against each criterion (using the guide just developed) and places each rating in the upper portion of the square at the junction of the alternative and each criterion.

	Unit Cost	Unit Selling Price	No. Units Sold	Shelf Life	Effect on Victims	Total Score
	25	25	25	10	15	
Oranges	3	10	2	5	6	
Eggs	7	5	4	2	10	
Rocks	10	2	5	10	1	

Lucy now multiplies the performance ratings by the criteria weights, writes the products in the lower portion of each box and sums the products across each alternative.

	Unit Cost	Unit Selling Price	No. Units Sold	Shelf Life	Effect on Victims	Total Score
	25	25	25	10	15	
Oranges	3	10	2	5	6	515
Eggs	7	5	4	2	10	570
Rocks	10	2	5	10	1	540

The alternative with the highest total score is the most feasible alternative. In this case the alternative that best meets Lucy's requirements is "eggs," based on the criteria she chose and with her current knowledge. (If she were going to spend a lot of money on this project she might want to do some marketing research to verify her performance ratings.)

Leaving Lucy and her eggs, the next example illustrates how the Matrix Priority

**PROJECT MANAGER**  
 wanted inputs  
 from all of his  
 management team,  
 then assembled  
 composite  
 screening sheet  
 to select top three  
 products to develop.

Project 1300 Screening Sheet

Evaluator: All

Product Alternatives  
 Weights \*

	6	9	1	7	6	1	1	6	6	7	1	7	8	7	4	8	7	6	8		
	First Year's Sales	Fifth Year's Sales	Patent Position	New Material Position	Plant Facility	Product Life	Affect on Present Product	Fit In Prod. Mfg. Mix	Product Competition	Selling & Distribution Needs	Technical Development Needs	Market Service Needs	Stability of Market Price	Stability of Demand	Manufacturability	Transfer Costs	5th Year, 100% Sales	Return on Sales at 5th Year	Total	Rank	
Product P	7	10	5	9	9	6	8	8	6	4	5	2	9	4	5	9	8	2	6		
	42	90	5	63	54	6	8	48	36	28	5	14	72	28	30	72	56	12	48	707	1
Product A	2	8	2	10	10	6	5	9	4	4	5	4	6	4	4	10	8	3	5		
	12	72	2	70	60	6	5	54	24	22	5	28	48	28	16	80	56	18	40	652	2
Product C	2	7	4	8	6	6	2	6	6	4	5	2	7	4	5	8	8	4	6		
	12	63	4	56	36	6	2	36	36	28	5	14	56	28	20	64	56	24	48	594	4
Product M	3	8	7	10	2	6	2	9	7	3	5	1	8	8	5	4	8	2	6		
	18	72	7	70	12	6	2	54	42	21	5	7	64	56	20	32	56	12	48	604	3
Product H	5	5	3	10	6	6	7	5	6	3	5	1	5	3	4	5	8	4	5		
	30	45	3	70	36	6	7	30	36	21	5	7	40	21	16	40	56	24	40	533	
Product V	4	7	2	10	8	6	7	5	5	2	5	1	7	4	4	8	6	2	6		
	24	63	2	70	48	6	7	30	30	14	5	7	56	28	16	64	42	12	48	572	
Product O	2	5	4	9	2	6	7	5	5	5	5	1	6	7	3	3	8	4	7		
	12	45	4	63	12	6	7	30	30	35	5	7	48	49	12	24	56	24	56	525	
Product E	2	3	1	9	-	6	7	3	2	4	5	1	4	5	2	-	5	3	5		
	12	27	1	63	0	6	7	18	12	28	5	7	32	35	8	0	35	18	40	354	

\*The weights have been changed to avoid revealing company strategy and philosophy.



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conceived notions. This defeats the usefulness of the entire procedure.

The use of a large number of closely related criteria (such as marketing-related criteria), is an implicit weighting and gives more importance to that category of criteria.

The system can be used more effectively if one realizes that the ratings may change as more information is developed. It is therefore accurate only until further knowledge requires changes in the evaluations.

Scores from different rating sessions are comparable only if the same criteria and weightings have been used in all sessions. For example, an alternative with a score of 500 judged from one set of criteria is not comparable to another alternative scoring 500 judged from a different set of criteria.

The matrix should be limited to one sheet, if possible. Although it can be seen that any number of alternatives may be judged using any number of criteria, keeping the matrix to one sheet will eliminate complications and promote understanding and usage.

The Matrix Priority Rating System is a direct and effective method of arriving at accurate decisions. It is flexible, allowing wide variation in alternatives and judgement criteria, and it allows the incorporation of expert opinion from many sources. The system is simple, so as to be easily understood, but versatile enough to be used in a wide variety of decision-making situations. ■

**REFERENCES**

1. Churchman, C. Ackoff, R. L., and Arnoff, L., Introduction to Operations Research, John Wiley Sons Inc., 1957, 130-145.
2. Churchman, C. W. et al, "New Product Feasibility Screening," American Management Association.
3. Currin, G., "5 by 5 Rating Procedure for New Product Concepts," unpubl. monograph dev. for Dow Corning Corp.
4. O'Meara, T. Jr., "Selecting Profitable Products," Harvard Business Review, Jan.-Feb. 1961, 83-89.

Rating System was used to help a Dow Corning project team decide which of eight possible projects offered the greatest potential for development. Their problem was much the same as Lucy's. They felt they could feasibly develop only three or so of the eight projects because of the money and manpower restraints they were under. Which projects should they concentrate on?

In this case, the project manager wanted the inputs of all of the team members, rather than just his own, so each one completed the procedure. This, of course, generated several different evaluations.

Using the evaluation of the team member most-knowledgeable in each criterion. (for example, the economic evaluator's opinion to rate transfer costs and return on sales), the project manager effectively employed everyone's knowledge to arrive at an optimal solution.

In this example the Matrix Priority Rating System procedure yielded these benefits:

- Based on current knowledge, the three or four potentially most profitable of eight projects were clearly shown.

- Inputs from all qualified sources were utilized.

- The process took a minimum amount of time. (Most persons were able to complete the 152 required evaluations in less than 45 minutes.)

- The project manager was provided with a concise summary of each project team member's personal evaluation of each project under consideration.

- Areas where information was lacking were spotlighted for further research.

Of course, there always are differences in opinion to contend with, and it is the manager's prerogative to use not only his own numbers to weigh the importance of each criterion but to employ the ratings of others for the evaluations of the alternative's performance in each criterion.

Notwithstanding the advantages of the Matrix Priority Rating System decision-making procedure, such as speed, simplicity, and versatility, it has at least one disadvantage. It doesn't explicitly incorporate the concept of probability. Probability techniques were not incorporated into this procedure to keep it simple (although probabilities are somewhat implicit in each rating). It is felt that simplicity and speed are the major advantages of this system and that these advantages needed to be retained at the expense of sophistication.

#### Be a weight watcher

If you want to use this procedure you should pay attention to the suggestions:

The criteria weights must be examined for consistency and accuracy. (One should ask himself questions like, "Is 'raw material position' with an importance weighting of 'ten' really twice as important as 'patent position' which rates a 'five'?" and so forth.) This will help to insure the validity of the procedure.

The evaluator should be honest with himself and not try to make the system generate answers which are contrived to fit any pre-

**THIS PRIORITY ranking system is similar to the one used by Dow Corning to select products for development.**

Priority Rating System Project Data	Ranking Ranges (Extremes Only)	
	Score "10" If	Score "1" If
First year's sales	> \$1,000,000	< \$100,000
Fifth year's sales	> \$20,000,000	< \$1,000,000
Patent Position	Complete coverage	Very little protection
Raw material position	Fully integrated Dow Corning supply	Limited outside supply
Plant facility	Idle Dow Corning plant	Extensive new plant required
Product life	> 12 years	< 2-3 years
Effect on present products	Negligible replacement	Replaces > 40% of a product line
Fit in product marketing mix	Complements a product line	Fits no product line
Product competition	Nearly impossible for competitors to produce similar products	Many companies compete directly
Market development needs	Little dependent on new customers	Extensive selling of new technology
Selling & Distribution costs	Low (below average)	High (above average)
Technical services needs	Negligible	Extensive
Market trend	Good-new potential	Declining
Market price	Highly stable	Possible price sweeping
Stability of demand	Highly stable	Highly variable - no pattern
Manufacturability (process)	Proven process technology	Completely new technology
Transfer costs	< 50c per pound	> \$2.50 per pound
Price per pound at fifth year (100% sales)	< \$1.00 per pound	> \$1.00 per pound
Return on sales at fifth year	> 50%	< 5%