

Matrix Diagram

There are many types of **matrix diagrams**, depending on the number of items to be compared. The variables are listed down the left column and across the top row. Symbols are used to identify the strength of the relationship between items.

A matrix can be used to determine the presence and strength of relationships between items. It can be used to organize work by assigning responsibility to organizations and individuals.

Example. This matrix shows the tasks accomplished by members of some of the Army branches. It is obvious to see those tasks that are accomplished by several branches, and those that are unique to certain branches.

Tasks: first aid, personal weapons qualifications, drill, physical training, map reading, radio maintenance, Morse code, radio maintenance, tank maintenance, set up fire control center, read flight instruments

Branch: Signal, Infantry, Armor, Artillery, Aviation, Special Forces

Branch \ Tasks	Physical Training	first aid	personal weapons qual.	drill	map reading	radio maintenance	morse code	tank maintenance	set up fire control ctr.	read flight instruments
Signal	◆	◆	◆	◆	◆	◆	◆			
Infantry	◆	◆	◆	◆	◆					
Artillery	◆	◆	◆	◆	◆				◆	
Armor	◆	◆	◆	◆	◆			◆		
Aviation	◆	◆	◆	◆	◆					◆

Decision Matrix

This type of **matrix** evaluates and weighs several alternatives in order to choose the best item or alternative, or to narrow down options to a reasonable number. Each item is compared to others using specific and defined criteria. The type and design of the matrix will depend on the number of alternatives being compared and the type and number of criteria. Raw data criteria may be used to compare alternatives, but it has to be in a uniform scale of measurement, or it will have to be converted to a single scale.

To begin:

List alternatives or courses of actions (set of problem areas or set of potential solutions).

Brainstorm the "selection criteria."

Example of a Raw Data Matrix.

This matrix is designed to evaluate the options for a new spreadsheet software program. The selection criteria for evaluation are listed across the top. The companies selling the software program (or courses of action) are listed down the left column.

Raw Data Matrix

	\$\$	Megabytes	Consumer Reports Ranking	Days
Criteria COA	Cost	Memory	User Friendly	Training Required
ABX, Inc	5,000	32 Mb	3	15
ISS	9,000	128 Mb	5	5
Software, Inc	5,250	32 Mb	1	8
Numbers Are Us	7,000	64 Mb	2	10
SoftSpread	10,000	256 Mb	4	14
	< is better	> is better	> is better	< is better

You should always have at least three courses of action (COA) and three criteria. At the bottom of the matrix itself, you may place a notation describing the values as "larger is better" or "smaller is better." This is a tool to focus you

on remembering when you assign relative values, that the lowest \$ cost would be assigned a relative value of “1” while the highest Consumer Reports' ranking would also be assigned a relative value of “1.”

This Raw Data Matrix should be the basis for the development of the three remaining matrices: Relative Value or Prioritization Matrix, Weighted Value Matrix, and the Multiplication Matrix.

Example of a Relative Value or Prioritization Matrix.

Each company is ranked (prioritized) according to how it meets each criterion, from 1 (best) to 5 (worst). Thus, within each column, we assign a relative value to each piece of data with the better value being assigned a value of 1. The total for each company is determined, and the lowest number wins.

Relative Value or Prioritization Matrix

	\$\$	Megabytes	Consumer Reports Ranking	Days	
Criteria	Cost	Memory	User Friendly	Training Required	Total Points
COA					
ABX, Inc	1	4.5	3	5	13.5
ISS	4	2	1	1	8
Software, Inc	2	4.5	5	2	13.5
Numbers Are Us	3	3	4	3	13
SoftSpread	5	1	2	4	12

In this case the relative values should always add up to 15. If we have four COA the relative value totals should add up to 10, if we have 6 COA the total should be 21, etc.

Note that in the criteria of "memory" we have a tie. In this case we add the relative value (4 plus 5) and average them arriving at a 4.5. Each of the COA would have a relative value of 4.5.

In this case, the lowest number, 8, indicates that ISS wins.

Example of a Weighted Relative Value Matrix.

Using your Relative Values Matrix as a basis, you can develop a Weighted Relative Value Matrix.

In the Weighted Relative Value Matrix, you subjectively assign a weight to one of the criterion. In this particular matrix, we determined that memory is more important than the other three and arbitrarily assigned a weighting of 2. We now multiply the weight times the relative value within that column. The next step is to add the relative values across the table and total them. Remembering that **lowest is best**, you would select ISS.

Weighted Relative Value Matrix

Weight	1	2	1	1	
Criteria	Cost	Memory	User Friendly	Training Required	Total Points
COA					
ABX, Inc	1	(4.5 x 2) 9	3	5	18
ISS	4	(2 x 2) 4	1	1	10
Software, Inc	2	(4.5 x 2) 9	5	2	18
Numbers Are Us	3	(3 x 2) 6	4	3	16
SoftSpread	5	(1 x 2) 2	2	4	13

Example of a Multiplication Matrix

Using your Raw Data Matrix as a basis, you can develop a Multiplication Matrix.

The multiplication matrix is the most precise of the three matrices. Returning to the Raw Data Matrix, you will multiply the values across using raw data and get a meaningful mathematical total that you can compare. However, all raw data numbers must reflect that the lower number is better. Thus, when you have Megabytes (memory) and *Consumer Reports* ranking (user friendly) having the higher number as better, you must invert each of those numbers in order

to arrive at a meaningful "lower number is better" formula. This "lower number is better" is achieved by placing the raw data number in a 1/raw data number. Next, complete the mathematical computation by multiplying across the table. Again, the **lowest number is the best**, so you should select ISS.

Multiplication Matrix

	\$\$	Megabytes	Consumer Reports Ranking	Days	
Criteria COA	Cost	Memory	User Friendly	Training Required	Total Points
ABX, Inc	5,000	$\frac{1}{32}$	$\frac{1}{3}$	15	781.25
ISS	9,000	$\frac{1}{128}$	$\frac{1}{5}$	5	70.3
Software, Inc	5,250	$\frac{1}{32}$	$\frac{1}{1}$	8	1312.5
Numbers Are Us	7,000	$\frac{1}{64}$	$\frac{1}{2}$	10	546.9
SoftSpread	10,000	$\frac{1}{256}$	$\frac{1}{4}$	14	136.72
	< is better	> is better	> is better	< is better	