Chapter 5

From Brainstorming to Structuring to Evaluation and Choice

Brainstorming

Abandoning the bogsat[1] for compensatory[2] decision-making with AHP is sometimes too big a first step for some organizations. Instead, a series of small steps might be easier to implement. An easy and prductive first step is to encourage the seeking out of several alternative solutions to a problem or opportunity rather than settling on the first one that seems feasible. Since most people don't like problems, they usually react by taking the first way out they can find. Having only one idea or course of action open to you is quite risky in a world where flexibility is a requirement for survival. If you have only one idea, you have nothing to compare it to. The French philosopher Emile Chartier said "Nothing is more dangerous than an idea when it's the only one you have." Nobel Prize winning chemist Linus Pauling expressed a similar thought – "The best way to get a good idea is to get a lot of ideas."[2]

Brainstorming is a technique that is useful in identifying alternative solutions to a problem. The main point of the initial phase of brainstorming is to generate as many alternatives as possible. Criticism of people's contributions must be avoided as should intimidation of some group members by the more competitive, verbal members of the group. The following are some typical brainstorming 'rules' and techniques:

- Everyone can (must) contribute.
- Let imaginations run wild. Quantity not quality of ideas is sought during the initial phase of brainstorming.

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[1] See page 5.
[2] Von Oech, Roger *A., Whack on the Side of the Head: How You Can Be More Creative*, Warner Books, Inc., New York, N.Y., 1990, p 24.

- There is no such thing as a bad idea. Do not be judgmental at the beginning. Make absolutely no judgments about your own or anyone else's ideas or suggestions.
- Think about the ideal or the perfect situation. Push extremes. Look for opposites. Think about unlikely as well as likely situations. Utilize free-form word associations. Go off on tangents. Look for combinations of words or ideas.

Creativity

Creativity is an important part of brainstorming. Doug Hall, after reading many insightful books on creativity and thinking from numerous authors[3], provides an interesting perspective on how to increase creativity in brainstorming[4]. Hall found that providing stimuli is the key to increasing creativity. In the vast majority of brainstorming sessions people use their brains primarily as encyclopedias, digging deep-down into memory to root out ideas. As the ideas are extracted, the well begins to go dry – a process he calls brain-draining. In contrast, if provided with adequate stimuli, people can use their brains not just to withdraw ideas from their brains, like encyclopedias, but more like computers to generate ideas as combination of other ideas. Stimuli are anything takes you out of your normal frame of reference that spurs the brain to make new connections, new associations. Stimuli can be anything you see, hear, smell, taste, or touch. The ideas you hear from others in a brainstorming session are, in fact, one form of stimuli. The use of Hall's multidimensional stimuli approach to excite and agitate original thoughts has led to some impressive results – Dr. Arthur VanGundy of the University of Oklahoma experimented with groups of four college students to see how many ideas for snack food they could think of in 45 minutes. The average was 29.7 ideas per group without stimuli and 310.8 with stimuli such as product samples, magazine photos, and a spontaneous environment with loud music, good food, and Nerf guns.

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[3] From authors including Tony Buzan, Edward de Bono, Betty Edwards, Benjamin Franklin, Guy Kawasaki, Alex Osborn, Arthur VanGundy, Joyce Wycoff.
[4] Hall, Doug, *Jump Start Your Brain,* Warner Books, Inc., New York, N.Y., 1995.

Narrowing Down

During the initial phase of brainstorming criticism is ruled out, but after the initial phase it's time to narrow down the ideas. Doug Hall puts it this way:

> …you were sworn to respect the newborns. Now it's time for mercy killing. It's time to be tough on yourself. Time to weigh your musings against reality. Time to pick nits.

Consideration of practicalities, feasibilities, and costs will help in eliminating a few, or perhaps many of the ideas that were generated. Those that are left can be evaluated using techniques ranging from simple voting methods to a full blown AHP compensatory tradeoff analysis. There is a delicate balance between eliminating too many or too few alternatives at this stage as opposed to a later stage. Being ruthless and eliminating all but the seemingly best alternatives will make subsequent evaluations easier and faster, but also increases the chance of eliminating an alternative that, when all factors are considered, might have turned out to be the best choice.

Categorizing and Combining

Following the weeding out of impractical alternatives, it is often helpful to categorize the remaining ideas. Some ideas might pertain to problems other than the one under consideration, in which case they can be set aside and saved for future consideration. Some ideas might pertain to only one aspect of the problem under consideration in which case they must be combined with other ideas to form holistic alternatives, or alternatives that provide a total solution. For example, some ideas might pertain to products, others to marketing, others to an intended market segment, and so on. One alternative solution could be a combination of a product idea with an idea for a market segment with an idea for a marketing channel. Several alternative solutions should be designed for subsequent evaluation. This can be done quickly, without much detail, or carefully, considering all important tradeoffs. The quality of the evaluation should be commensurate with the importance of the problem or decision.

We will now illustrate a range of evaluation techniques, starting with simple voting and progressing to a full-scale compensatory evaluation using AHP.

Voting

Voting is a popular and relatively easy procedure. Voting can take many forms, including yes/no, multiple choice and rating.

Multiple Choice

Two of the simpler forms are voting yes or no on an issue or for a candidate and selecting one from a set of choices (multiple choice).

What is a good work schedule for 'our' organization

What is your preferred work schedule arrangement

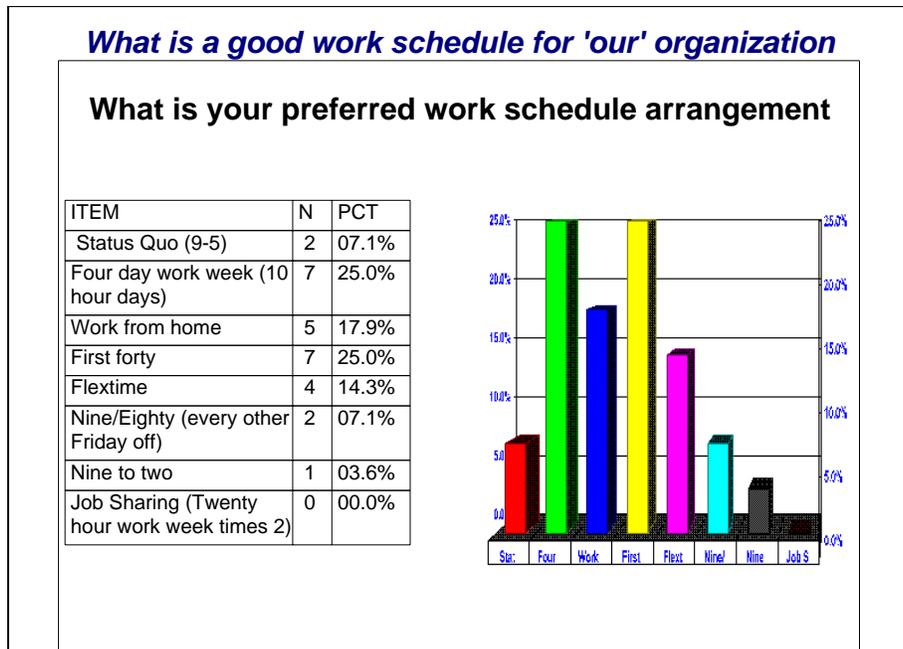| ITEM	N	PCT
Status Quo (9-5)	2	07.1%
Four day work week (10 hour days)	7	25.0%
Work from home	5	17.9%
First forty	7	25.0%
Flextime	4	14.3%
Nine/Eighty (every other Friday off)	2	07.1%
Nine to two	1	03.6%
Job Sharing (Twenty hour work week times 2)	0	00.0%

Figure 1 – Multiple Choice Voting

Suppose an organization is considering the adoption of a work schedule alternative to the typical nine to five arrangement. During a brainstorming

session with Team Expert Choice, the alternatives in Figure were proposed and voted on in a multiple choice (forced choice) format.

The quality of the information from such voting is minimal at best. Participants are allowed to vote for only one of the alternatives and are unable to express how strongly they feel about their choice.

Rating

We can improve the quality of the results by allowing participants to rate each of the alternatives, say on a scale from 1 to 10. We can then calculate the average rating for each of the alternatives. In order for this to be a meaningful average, however, the participants' ratings must be at least an interval measure[5]. This is not always the case. When rating gymnasts in an Olympic event, for example, judges may view the interval between 9.9 and 10.0 as being (much) greater than the interval between 9.0 and 9.1. We cannot guarantee that each participant will provide interval judgments, but we can increase the likelihood that they will do so by providing instructions such as the following:

> Please rate the alternatives such that, according to your understanding, corresponding intervals are equivalent. For example, the interval between 1 and 2 is equal to the interval between 4 and 5 or the interval between 9 and 10.

Although not necessary for calculating a meaningful average, it may be desirable to ask participants to try to provide ratio level judgments as well as interval judgments. Ratio judgments are necessary if we want to be able to interpret the ratios of the resulting averages as representing ratios of the average participant preference. For example, if the average rating of one alternative is 7, and another is 3.5, then we could say that on average, the participants preferred the former twice as much as the latter. We can increase the likelihood that participants will provide ratio judgments by providing instructions such as the following:

Please rate the alternatives such that, according to your understanding, the ratios of your ratings correspond to the ratios of your preferences. For example, a rating of 10 for one alternative and a 5 for another means that

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[5] See page 32.

you prefer the former twice as much as the latter; similarly, a rating of 8 for one alternative and two for another means that you prefer the former four times as much as the latter.

Figure 2 contains a plot of the average ratings of a group of participants for the same alternatives shown in Figure .
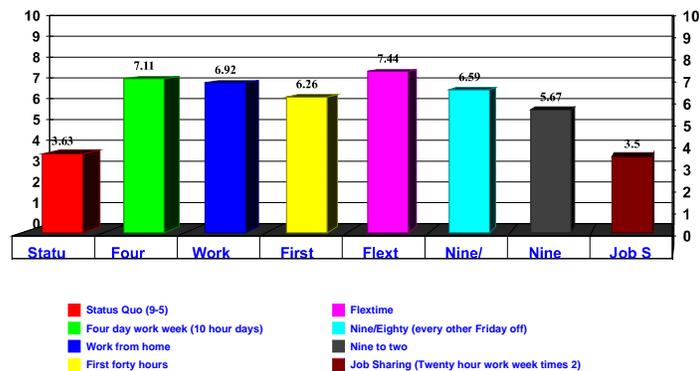

Figure 2 – Average Ratings

Comparing the multiple choice and rating results, we can see significant differences. For multiple choice voting, Flextime ranked fourth (receiving just a bit more than half the number of votes as the top two alternatives). But when participants were given the opportunity to rate each of the alternatives, Flextime was the most highly rated alternative! The differences (intervals) between Flextime and some of the alternatives in Figure 2 are rather small so we cannot say that Flextime is clearly preferred. More importantly, we haven't yet considered objectives or specific pros and cons of the alternatives.

Considering Multiple Objectives

To summarize, we increased the quality of information by going from a multiple-choice question to rating each of the alternatives. This, however, is still not adequate when considering important, or 'crucial' decisions. We should ascertain *reasons* by asking 'why is one alternative preferred to

another?' What are the pros and cons of each of the alternatives. What are the objectives in making the decision? How important are the objectives, and how well does each alternative help to achieve each of the objectives? We are now in a position to answer these questions using AHP. As previously discussed, AHP is a compensatory evaluation methodology in which alternatives that are deficient with respect to one or more objectives can compensate by their performance with respect to other objectives. In other words, we can evaluate the alternatives using a reasoned approach entailing an evaluation of the relative importance of objectives, as well as an evaluation of the relative preference for the alternatives with respect to each of the objectives.

Our work schedule evaluation example has only eight alternatives, although in general we may have tens or hundreds of alternatives. We can begin structuring a decision hierarchy by sorting the alternatives rated and considering only those with the highest average ratings. Looking at the intervals between the average ratings in Figure 2, we might consider extracting the top six for a more detailed evaluation. However, it is usually advisable to include the status quo as one of the alternatives under consideration for a baseline. We will extract the top seven alternatives for subsequent evaluation in a decision hierarchy of objectives.[6]

Structuring

We can construct a decision hierarchy using either a top down (strategic) or bottom up (tactical) approach. Both strategy and tactics are instrumental to a well conceived business plan or military plan. It is difficult to plan good strategy without a fairly good knowledge of tactics – the design of a strategy that is tactically impossible to implement is useless. Similarly, brilliant tactics that do not achieve strategic objectives are misguided and perhaps useless.

A top down construction of a decision hierarchy focuses first on the identification and organization of objectives. A bottom-up approach focuses first on the alternatives – identifying pros and cons each alternative. These

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[6] The Brainstorming module of TeamEC has a command for extracting alternatives from a Brainstorming file and automatically entering them in a Structuring file.

pros and cons will be of help in identifying objectives. If the decision maker(s) have a good understanding of their objectives then a top down approach is recommended. Otherwise a bottom up approach should be used. In practice a little top down structuring can be followed by some bottom up structuring, followed by more top down, and so on.

Top Down Structuring

Top down structuring begins with members of the group identifying objectives, such as those shown in Figure 3. As additional objectives are identified, they can be clustered (for example by using the 'Clusterview of Objectives' window in the Structuring module of Expert Choice and TeamEC) into major objectives, sub-objectives, sub-sub-objectives and so on. Instead of following this path, we will, for illustrative purposes, switch to a 'bottom up' approach.


Figure 3 – Top down identification of objectives

Bottom Up Structuring

A 'bottom up' approach focuses on the alternatives and their pros and cons. For example, pros for the Flextime alternative (see Figure 4) include flexibility for employees to schedule outside appointments and reduced commute time. Office coverage was a con for the Flextime Alternative. The Nine to Two alternative (Figure 5) would help attract better people (for example some very qualified professional women who were leaving the workforce to attend to their families), but had cons of decreased office coverage, increased overhead cost per person, and less pay for some employees.

Figure 4 – Pros and Cons for the 1st alternative – Flextime
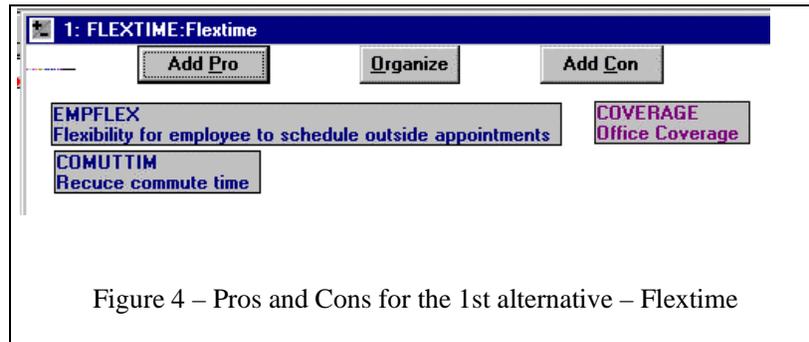
A pro for one alternative can be a con for another alternative. For example, cost might be a pro for an inexpensive alternative and a con for an expensive alternative.

Figure 5– Pros and Cons for the 6th alternative – Nine to Two
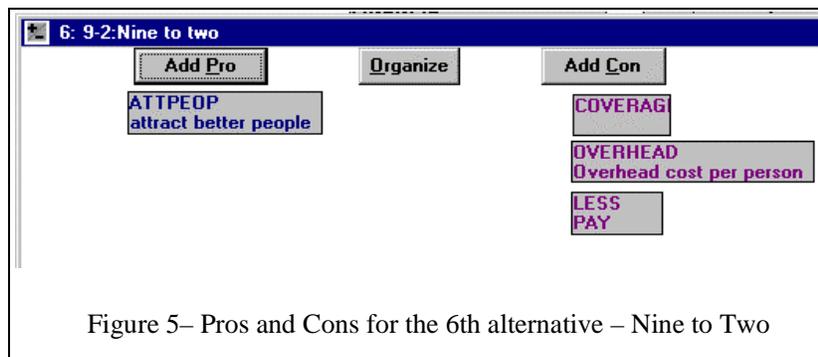
It is not necessary to develop an exhaustive pro/con list for each alternative. The pros and cons serve mainly to help identify objectives. (It may be desirable, however, to develop an exhaustive pro/con list for each alternative for documentation purposes and to defend any subsequent recommendation from adversaries who claim that some considerations were omitted from the evaluation.)

From Pros/Cons to Objectives

A consolidated listing of the pros/cons from all of the alternatives is shown at the top of Figure 7. The objectives identified from the top-down approach appear at the bottom of Figure 7. Each of the pros/cons will help identify (point to) one (or more) objectives. This cannot be done automatically[7] because the decision maker(s) must think of the objective(s) pointed to by the pro/con and rephrase it, when necessary in the form of an objective. Rephrasing is usually necessary for cons. For example, the EMPFLEX pro does not require rephrasing, but LESS PAY does. In fact, LESS PAY might 'point' to two objectives: (1) Employee compensation, (which might subsequently be clustered under 'employee objectives') and (2) Reducing business expenses (which might subsequently be clustered under 'business objectives').

If a new objective is identified, it can be added to the bottom of Figure 7. The objectives can also be clustered into levels and additional objectives

	PC Abbrev	Description
1	EMPFLEX	Flexibility for employee to schedule outside appointments
2	COVERAGE	Office Coverage
3	COMUTTIM	Recuce commute time
4	LESS PAY	Less pay
5	COVERAGE	Coverage
6	OVERHEAD	Overhead cost per person
7	LESS PAY	Less pay

	Level 1	Level 2	Level 3	Level 4	Level 5	
1	TRAFFIC					Less traffic
2	PRODCTVT					Productivity
3	OFFICE C					office coverage
4	ATTPEOP					attract better people
5						
6						
7						

Figure 6 – From Pros/Cons to Objectives

added directly to the list. A tree view of the resulting objectives hierarchy is shown in Figure 6 and a clusterview is shown in Figure 8. The top level

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[7] The Structuring module of Expert Choice prompts the decision-maker for the desired phrasing when pros/cons are dragged from the pro/con list and dropped into the objectives hierarchy.
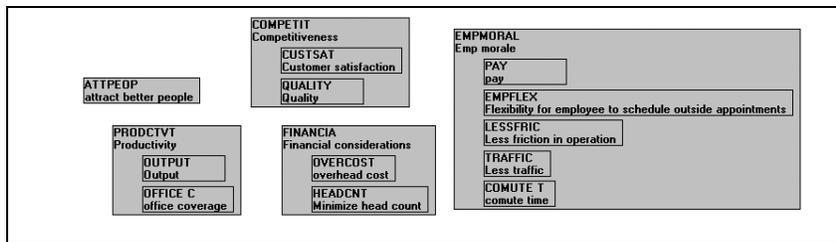
Figure 7 – Treeview of Objectives Hierarchy

Figure 8 – Clusterview of Objectives Hierarchy

objectives include employee morale, productivity, attracting better employees, financial considerations, and competitiveness. The resulting Expert Choice Evaluation and Choice model[8] is shown in Figure 9.

Evaluation and Choice

From this point on, a full compensatory evaluation can be performed including making pairwise comparisons to derive priorities (see page 78), synthesizing priorities (see page 78), and performing sensitivity analyses (see page 79). With Team Expert Choice, individual decision makers can each enter their judgments using either radio frequency keypads, or remotely

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[8] The Expert Choice Structuring module command File Build EC model automatically creates the Evaluation and Choice model by appending the alternatives to the bottom of the objectives hierarchy.

What is most preferred work schedule?

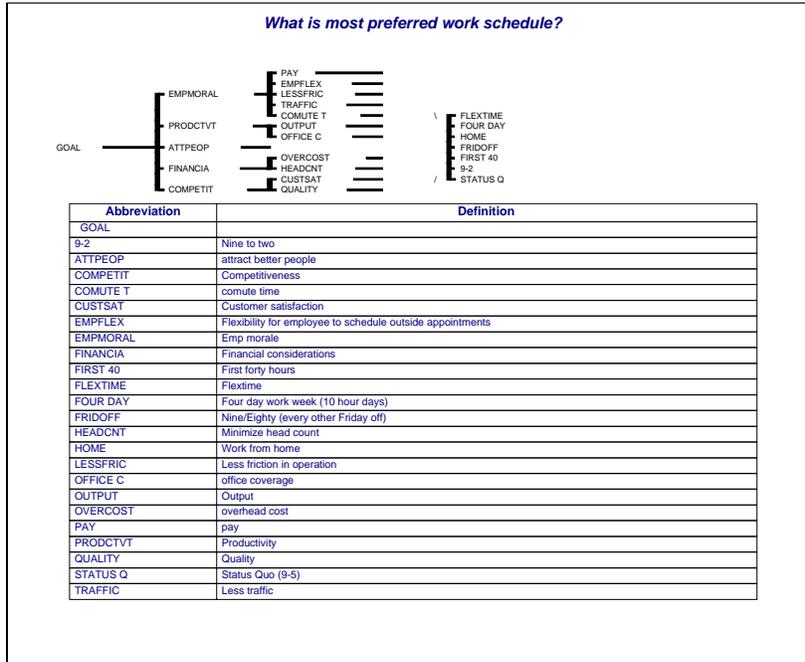| Abbreviation	Definition
GOAL	
9-2	Nine to two
ATTPEOP	attract better people
COMPETIT	Competitiveness
COMUTE T	comute time
CUSTSAT	Customer satisfaction
EMPFLEX	Flexibility for employee to schedual outside appointments
EMPMORAL	Emp morale
FINANCIA	Financial considerations
FIRST 40	First forty hours
FLEXTIME	Flextime
FOUR DAY	Four day work week (10 hour days)
FRIDOFF	Nine/Eighty (every other Friday off)
HEADCNT	Minimize head count
HOME	Work from home
LESSFRIC	Less friction in operation
OFFICE C	office coverage
OUTPUT	Output
OVERCOST	overhead cost
PAY	pay
PRODCTVT	Productivity
QUALITY	Quality
STATUS Q	Status Quo (9-5)
TRAFFIC	Less traffic

Figure 9 – Evaluation & Choice model

use the Internet. Then individual judgments can be transmitted for aggregation and dissemination.