Chapter 9: Creativity Tools

Key points of chapter

This is the second of the four tools chapters. See comments in the foreword to the book. Tools included are: several variations of brainstorming, several variations of cause effect analysis, checklists, attribute listing, morphological analysis, catalog technique, artificial intelligence, and several others.

Answers to Study Questions

1. See pages 110-112.
2. See pages 112 & 135.
3. See page 115.
4. They both depend on finding good checklists and catalogs. If you can't find good ones, the technique can't work.
5. Attribute listing forces separations, where morphological analysis forces combinations.
6. Mainly, it requires a computer (other tools don't). Actually the Decision Tables (see handouts) is kind of a manual form of artificial intelligence.

Answer to Exercise

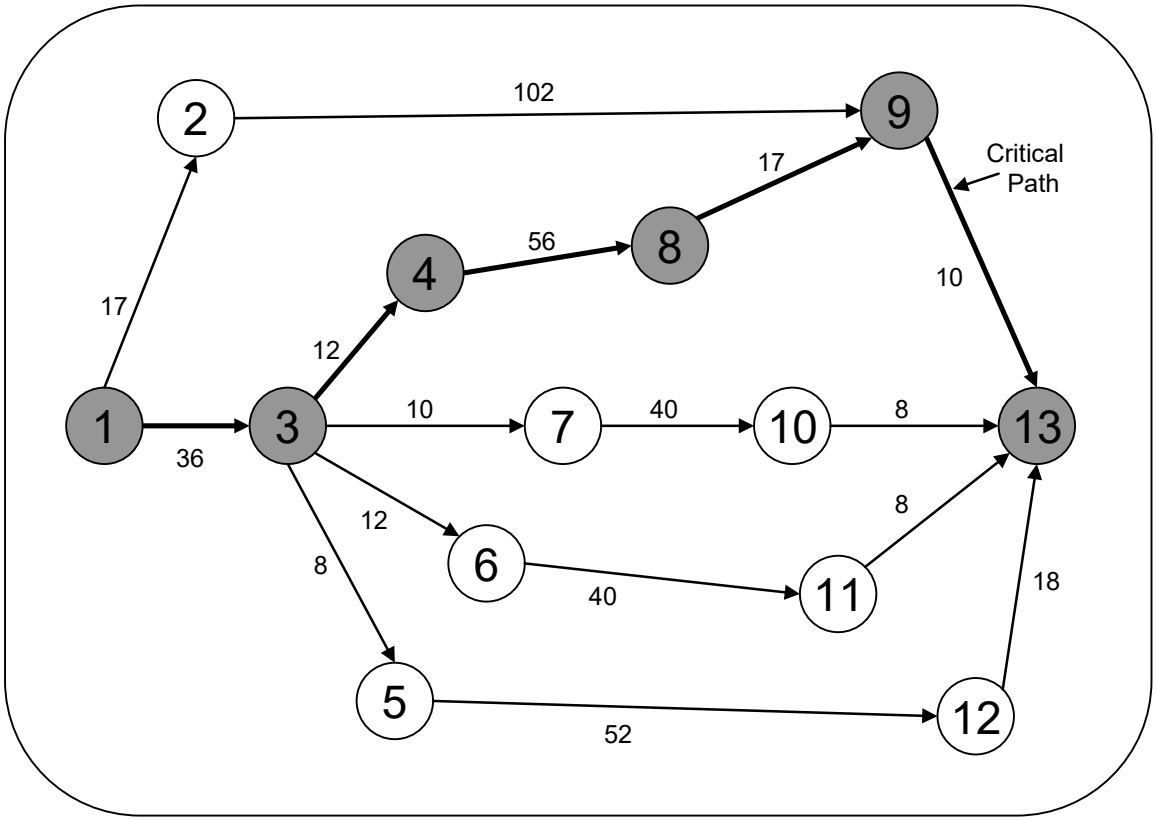
Problem #	Probably Works	Probably Doesn't Work
1	C D G	A B E F
2	A B C D G	E F
3	A B C D E F G	
4	D E F	A B C G
5	A C D E	B F G

Other Materials

- The answer to the exercise in the supplemental material for Chapter 8.
- A description of an actual *Delphi* case.
- A summary of how Expert Systems (a sub-category of artificial intelligence) work and when they might be adopted by an organization, along with a simple example.

Answer to PERT Exercise from previous chapter

1. Order Program Start
2. Begin engine purchase (17)
3. Develop Plans & Specs (36)
4. Complete fuselage drawings (12)
5. Submit orders for accessories (8)
6. Award Tail assembly contract (12)
7. Award Wings assembly contract (10)
8. Complete manufacture of fuselage (56)
9. Complete assembly of fuselage/engine (17 from #8) (102 from #2)
10. Receive wings from subcontractors (40)
11. Receive tail assembly from subcontractors (40)
12. Receive accessories (52)
13. Complete assembly of total aircraft (10 from #9) (8 from #10)
    (8 from #11) (18 from #12)



Delphi Technique

Delphi was developed by Dalkey and others in 1950 at the Rand Corporation's think tank. It is named after the Greek Oracle Delphi. It works as follows:

- A panel of experts is formed, but the members are not in face to face interaction with each other. The expenses of bringing a group together (time, etc.) are eliminated.
- Each member is asked to make anonymous predictions or input into the problem or decision the panel is faced with.
- Each panel member receives composite feedback from what the others have inputted. When appropriate, reasons for input are also fed back, but usually just a composite figure is used.
- On the basis of the feedback, another round of anonymous inputs is made. These iterations take place for a predetermined number of times or until the composite feedback remains the same, which means everyone is sticking with his or her position.
- A major key to this process is the anonymity which allows panel members more flexibility and eliminates the need for saving face. It avoids some of the negative group dynamics which may occur in traditional group decision making.

Example of a case:

Background:

- A study team was tasked to provide a recommendation to the Board of a professional group on a cost structure for persons who attend professional meetings and who also participate in the development or operation of that meeting or program.

Existing practice:

- Key speakers at monthly meetings are not charged for their attendance; all others presumably are paying full member/guest cost.
- Support people at the meetings receive, at the end of the program year, a given number of coupons for free admission to programs for the following year.
- As a volunteer organization, people are expected to make personal contributions to the good of the organization. However there is today much less corporate support for dues and meeting fees than there has been in the past, and the costs of participation are up significantly.

Round 1

The task force was sent (via e-mail, fax or mail) the following questions:

1. Mission. How would you modify this statement?

The ad hoc task force is charged with determining a fair and equitable process for recognizing members' contribution to development and or operation of any [association] meeting or special event for which an attendance fee is charged.

No Modification
As Follows:

2. Technique. Do you agree that the Delphi technique is an acceptable methodology with which to approach this issue?

YES NO

3. Initial Consensus Test. As an initial testing of the consensus, please choose ***one*** number from the following continuum which reflects your position:

0. No recognition at all
1. Continue coupons after the fact

3. Significant participation earns reduced price; no later coupons
5. Significant participation earns reduced price; coupons also
7. Significant participation earns free attendance up to a set level; no later coupons
9. Significant participation earns free attendance regardless of price
11. Significant participation earns free attendance plus token compensation

4. Comments. In bullet point form, include any comments you feel appropriate to share with the rest of the task force.

Round 1 results; Round 2

- One minor change to the mission statement.
- All agreed to at least try the technique.
- Responses to item 3 were an average of 6.8, with a standard deviation of 2.9.
- Ten comments were received, edited, and shared in round two.

Round two asked for a –3 (completely disagree) to +3 (completely agree) response to 11 questions such as:

1. Recognition coupons at the end of the program year are a good idea.
2. Persons who provide significant work in preparation of a program should attend free.
5. There should be a limit to the amount of free participation a person can earn
7. Allowing committee members to solicit "in-kind" donations should be a factor in whether or not they pay.
8. Coupons or credit should ONLY be for future programs, and not used concurrently.
9. The responsible Board member should determine who in his/her group has "participated" adequately.

Round 2 results; Round 3

- Five of the 11 questions had substantial agreement.
- For the other six, pros and cons were listed for each position, along with the previous average scores and standard deviation.
- Another input was requested for those 6 questions, allowing people to see the cumulative results of the previous responses.

Round 3 results; Final recommendation

Positions became more solid (averages stronger, standard deviations reduced), to the point that a final recommendation was compiled. Where there was still strong disagreement, that was noted.

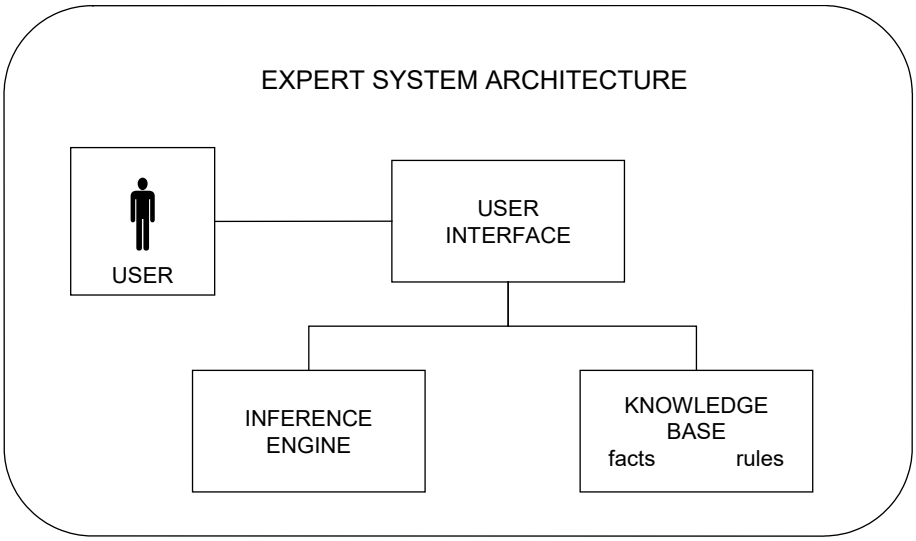
Expert Systems

Definitions:

Expert Systems are computer programs which give the appearance of human-like reasoning for problems ordinarily requiring expertise. Common examples are the installation and problem solving wizards common in Microsoft and other computer software.

Knowledge consists of facts, and understanding of the relationships between the facts, and their implications.

Reason is the ability to draw deductions and inferences from knowledge with the purpose of achieving a goal or solving a problem.



Example of a Knowledge Base

Facts:

John is a certified public accountant.
John has four years' accounting experience.
John has a computer science degree.
John is familiar with the tax laws of UK.

Rules:

1. If an employee is a certified public accountant and has more than three years' accounting experience,
   then he/she is qualified as an auditor.

2. If an employee is qualified as an auditor and is familiar with the tax laws of UK, then he/she can be assigned to audit a UK subsidiary's accounts.

3. If an employee has a degree in computer science,
   then he/she is qualified as a system analyst.

4. If an employee is qualified as an auditor and as a system analyst,
   then he/she is qualified as an EDP auditor.

Economic Considerations in Choosing an Expert Systems Topic

- Does the knowledge provide a Competitive advantage?
- Are workers bogged down doing trivial or repetitive tasks?
- Are costly mistakes made?
- Is a more consistent decision-making process needed?
- Is there a need for training an expert system might meet?
- Would the company benefit from a better understanding of the problem?
- Can the system become a centralized repository for knowledge?

Expert Need Considerations in Choosing an Expert Systems Topic

- Is there a large difference between best and worst performers?
- Is the problem poorly structured?
- Is non-expert performance inadequate?
- Are a few key individuals in short supply?
- Is an expert available?

Considerations for Evaluating the Suitability of the Topic

- Is the domain well-defined?
- Is the problem's solution dependent on common sense?
- Does solving the problem depend on sense data?
- Is the domain stable?
- Are performance standards realistic?
- Does solving the problem rely more on heuristics than algorithms?
- Does the expert deal more in symbols than in numbers?
- Can results be evaluated?

(Special thanks to Susan Vaughn for developing the information on Expert Systems.)