Chapter 6: Barriers to Innovation

Introduction

The characteristics, processes, attitudes, and behaviours in organizations that have hypothesized to impede innovation have received extensive attention in the literature. If barriers offer sufficient resistance, then innovations are not likely to be adopted or implemented. However, barriers can be a positive feature of the innovation process, since they often force innovators to plan ahead adequately and thus can help insure successful adoption and implementation.

Most of the barriers described next relate to bureaucratic disfunctions. Some will stick to certain stages of the innovation process, while others have significance throughout the process. Although many others could have been included, the ones chosen are fairly representative.

Gundy has organized the barriers into five categories: *(1) Structural, (2) Social/Political, (3) Procedural, (4) Resource and (5) individual.* Many of the barriers within these categories are interrelated. Consequently, the categories should be considered only rough approximations. As with most research, cause and effect determinations are difficult to make in innovation studies. For example, it is hard to tell if social norms "cause" structural arrangements or if structural arrangements cause social norms.

Structural
Barriers

6.1 Structural Barriers

Major barriers in this category include: *(1) Stratification, (2) Formalization, (3) Centralization, and (4) Specialization.* In most cases, the extent to which a structural barrier will impede innovation depends upon the innovation stage involved. For example, some barriers may be problematic during the proposal stage, but not during implementation.

Stratification has been described in terms of distribution of rewards throughout an organization (Hage & Aiken, 1970) and degree of status, congruence and ease of intra organizational mobility. **Reasons for this inhibition have been attributed to:** (1) a preoccupation with status differences that diverts attention and energy from idea proposals, (2) perceived status differences create insecurity which reduces willingness to take risks, (3) an idea proposal may suggest reducing a status differential and would be resisted by those in high status positions, and (4) upward communication will be decreased due to fear of evaluation.

Formalization can be defined as, *"the degree to which an organization emphasizes following rules and procedures in the role performance of its members".* It is thought that formalization is detrimental to initiation of innovations, but favourable to adoption of innovations. If organizational members are expected to behave in prescribed ways and innovation is not prescribed, fewer idea proposals will be generated. However, the singleness of purpose that accompanies formalization can make it easier to adopt and implement new ideas.

The concentration of power and authority and their effect on participation in decision making will influence the degree to which an organization is centralized. Although there are some contradictory research results, **centralization** may be negatively related to idea proposals and positively related to adoption. The more that power is concentrated and the less the amount of lower-level participation, the fewer will be the number of ideas that trickle up. If too many high-powered individuals attempt to negotiate adoption, consensus is not likely to be achieved. Thus, centralization may inhibit initiation, but facilitate adoption. Moreover, centralization may encourage implementation.

Specialization (sometimes referred to as differentiation or complexity) typically is defined in terms of the degree of occupational variability that exists within an organization. When specialization is high **(and thus diversity and cross-fertilization of ideas should be high),** initiation of idea proposals and idea adoption will be facilitated. However, implementation may be inhibited due to potential conflicts, although there is some disagreement on this.

Social/politic al Barriers

6.2 Social/Political Barriers

These barriers pertain mostly to norms and power-related influences within organizations. Although accepted standards of behaviour and power may influence many organizational processes positively, some norms and power can have an influence upon innovation.

For example, many organizations have norms that reinforce conformity and engender a reluctance to **"rock the boat".** Other norms include such things as a tendency to minimize conflict (which often is required to develop new ideas), an attitude of secrecy and a reluctance to share ideas, a generalized fear of criticism, an attitude that entrepreneurial types don't fit in the organization, a fear that any major innovation will result in elimination of jobs, and a belief that an innovation would alter a perceived uniqueness about an organization ("we're already pretty special, so why should we change?").

Power influences that might negatively affect innovation include a general overemphasis on power relationships and status differentials (i.e., the organization as a political system), a reward system that discourages idea champions to help facilitate idea adoption and implementation, and a lack of professionalism at lower organizational levels.

Procedural
Barriers
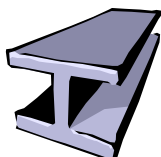
6.3 Procedural Barriers

Procedural barriers generally refer to policies, procedures, and regulations that often inhibit innovation. Also included in this category are certain procedures or managerial philosophies that, although not officially codified, nevertheless can exert a powerful negative influence.

Some examples of barriers in this category include: (1) promoting executives on the basis of their analytical skills rather than their ability to build a creative climate, (2) emphasis on short-term planning, (3) a desire to avoid expenditures without a short-term payback, (4) an innovation that appears in conflict with existing laws, (5) a desire to protect the status quo, to not do things differently, (6) an overemphasis on an external reward system rather than internal commitment, (7) expecting/demanding orderly advance during the innovation process and emphasizing planning tactics more than the innovation, (8) exerting detailed control too early in the innovation process (Quinn, 1979) and (9) using unfamiliar jargon with decision makers.

Resource
Barriers

6.4 Resource Barriers

These barriers **apply to such things as people, time, money supplies, and information.** It is generally accepted that innovation will not prosper if resources are in short supply innovation requires a certain amount of slack resources beyond those needed for routine functioning. However, resources can act as a barrier even when some slack exists. Implementing an innovation frequently requires that resources be shifted from one area to another. This shifting can, in some cases, result in internal conflicts that can be very disruptive to the innovation process.

Individual/
Additional
Barriers

6.5 Individual/Attitudinal Barriers

These barriers **reside within individual organizational members**, but also may stem, in part, from the organization's climate. **Fear of risk and failure and intolerance of uncertainty and ambiguity** are commonly-cited examples of these barriers. **Other barriers in this**

category would be individual characteristics that have the potential to create conflicts, thus stifling adoption or implementation. Basic differences in needs, values and perceptions would be typical examples. For instance, **Hage and Dewar (1973)** found that values of organizational elites who favor an innovation are predictive of innovation than are organizational structural variables.

An Organizing Framework

6.5.1 An Organizing Framework

As **Becker and Whisler** note, the innovation literature seems to be organized along the lines of simple systems elements: inputs, outputs, and processes. Inputs are variables that predispose organizations to innovate; outputs are types of innovations adopted and/or implemented; processes are sets of activities used to transform inputs into outputs.

The **inputs of structure, people, and information flow are somewhat analogous** to the open systems perspectives of structural design, human, and work flow. All three of these perspectives are interrelated such that a change in one can affect either of the other two perspectives. Gundy added the Environment input to reflect the dependency of organizations upon their environments and the crucial role that both internal and external environmental factors can have upon innovation.

Level or Style? (Kirton Theory)

6.6 Level or Style? (Kirton Theory)

Previous studies in the fields of decision-making and creative thinking have been dominated by concern with efficiency in solving problems and with the frequency with which effective ideas are produced: in other words, with the level of the intellectual process. Less attention has been paid to the different ways in which individuals approach problems or the strategies which consciously or unconsciously are adopted: in other words, to the style of problem-solving. It may be that a main reason for the continued domination of level over style has been that the two concepts have not been sufficiently separated and fit into an adequate theoretical framework. This accounts for, among other things, a plethora of terms but a lack of consistent expected relationships between measures and between measures and correlates.

For Cattell in his 16 Personality Factors, creativity (unspecified as to level or style) is a higher order factor, made up of a number of factors which relate to and correlate with style; however, he also includes an estimate of intelligence (Factor B) with double weighting for good measure. Surely IQ should be regarded as a correlate of level. His creativity factor correlates poorly with the adaptation-innovation inventory, and so, to almost exactly the same degree, does Jackson's Personality Inventory measure of Creativity.

Torrance's Right-Left Brain Hemispheric Preference conversely correlates highly with adaptation-innovation (nearly as highly as Myers-Briggs S-N and J-P combined). There seems no good reason why Hemispheric Preference should relate to IQ.

The adaptation-innovation theory proposed by **Kirton** does distinguish between level and style. If only by purporting to be solely concerned with style and unrelated to level.

Terminology

6.6.1 Terminology

Adaptation

Adaptation: Adaptation is **the characteristic behaviour of individuals** who, when confronted with a problem, **turn to the conventional rules, practices and perceptions of the group to which they belong** (which, may be, a working group, a cultural group or a professional or other occupational group), and derive their ideas towards the solution of the problem from these established procedures. When there is no ready made answer provided by the repertoire of conventional responses, then the adaptor will seek to adapt or stretch a conventional response until it can be used in the solution of the problem. Thus much of the behaviour under this heading is seen as making improvements on existing methods, or as Drucker puts it **"doing better-what is done already-a strategy which tends to dominate management."**

Innovation

Innovation: Innovation is the characteristic behavior of individuals who, when confronted with a problem, **attempt to reorganize or restructure the problem, and to approach it in a new light, free from any of the customary perceptions or presuppositions** which would be the conventional starting-point for its solution. Innovators thus produce answers which are less predictable and thereby sometimes less acceptable to the group; see Table 6.1. This approach can be described as "doing things differently" in contrast to the Adaptor's "doing things better. "

Table 6.1: Behavior descriptions of adaptors and innovators.

Adaptor	Innovator
Characterized by precision, reliability, efficiency, methodicalness, prudence, discipline, conformity.	Seen as undisciplined, thinking tangentially, approaching tasks from unsuspected angles.
Concerned with resolving problems rather than finding them.	Could be said to discover problems and discover avenues of solution.
Seeks solutions to problems in tried and understood ways.	Queries problems' concomitant assumptions; manipulates problems.
Reduces problems by improvement and greater efficiency, with maximum of continuity and stability	Is catalyst to settled groups, irreverent of their consensual views; seen as abrasive,

Seen as sound, conforming, safe, and dependable.	creating dissonance?
Liable to make goals of means.	Seen as unsound, impractical; often shocks his opposite.
Seems imperious to boredom. Seems able to maintain high accuracy in long spells of detailed work.	In pursuit of goals treats accepted means with little regard.
Is an authority within given structure.	Capable of detailed routine (system maintenance) work for only short bursts. Quick to delegate routine tasks.
Challenges rules rarely; cautiously, when assured of strong support.	Tends to take control in unstructured situations.
Tends to high self-doubt. Reacts to criticism by closer outward conformity. Vulnerable to social pressure and authority; compliant.	Often challenges rules, has little respect for past custom.
Is essential to the functioning of the institution all the time, but occasionally needs to be "dug out" of his systems.	Appears to have low self-doubt when generating ideas, not needing consensus to maintain certitude in face of opposition.
	In the institution is ideal in unscheduled crises, or better still to help to avoid them, if he can be controlled.
When collaborating with innovators: supplies stability, order and continuity to the partnership.	When collaborating with adaptors: supplies the task orientations, the break with the past and accepted theory.
Sensitive to people, maintains group cohesion and cooperation.	Insensitive to people, often threatens group cohesion and cooperation.
Provides a safe base for the innovator's riskier operations.	Provides the dynamics to bring about periodic radical change, without which institutions tend to ossify.

Innovators and Adaptors in Organizations

6.6.2 Innovators and Adaptors in Organizations

Organizations in general and especially organizations which **are large in size and budget have a tendency to encourage bureaucracy and adaptation in order to minimize risk.** It has been, **said by Weber**, **and Parsons** that *the aims of a bureaucratic structure are precision, reliability and efficiency and that the bureaucratic structure exerts constant pressure on officials to be methodical, prudent and disciplined, and to attain an unusual degree of conformity.* These are the qualities that the adaptation-innovation theory attributes to the **'adaptor'** personality. For the marked adaptor, the longer an institutional practice has existed, the more he feels it can be taken for granted. So *when confronted by a problem, he does not see it as a stimulus to question or change the structure in which the problem is embedded, but seeks a solution within that structure, in ways already tried and understood-ways which are safe, sure and predictable.* He can be relied upon to carry out a thorough, disciplined search for

ways to eliminate problems by 'doing things better' with a minimum of risk and a maximum of continuity and stability. This behaviour contrasts strongly with that of the marked innovation. The latter's solution, because it is less understood, and its assumptions untested, appears more risky, less sound, involves more "Ripple-effect" changes in areas less obviously needing to be affected; in short, it brings about changes with outcomes that cannot be envisaged so precisely. This diminution of predictive certainty is unsettling and not to be undertaken lightly, if at all, by most people-but particularly by adaptors, who feel not only more loyal to consensus policy but less willing to jeopardize the integrity of the system, or even the institution. **The innovator in contrast to the adaptor** *is liable to be less concerned with the views of others, more abrasive in the presentation of his solution, and more at home in a turbulent environment.* He is liable to be seen as less oriented towards company needs (since his perception of what is needed may differ from that of the adaptors) and less concerned with the effect on other people of the methods by which he pursues his goals than adaptors find tolerable. Tolerance of the innovator is at its lowest end when adaptors feel pressure from the need for quick and radical change. Yet it is the innovators' least acceptable features which make them as necessary to healthy institutions as the adaptors' more easily recognized virtues make them necessary.

6.6.3 Relationships between Innovators and Adaptors

Problems of fruitful collaboration between innovators and adaptors are not infrequently based on the colored and often inaccurate perceptions which each group has of the other. Innovators tend to be seen by adaptors as abrasive, insensitive and disruptive, unaware of the havoc they are causing. Adaptors are seen by innovators on the other hand, as stuffy and unenterprising, wedded to systems, rules and norms of behavior which **(in the opinion of the innovators)** are restrictive and ineffectual. Consequently, disagreement and conflict are likely to arise when the more extreme types of innovator and adaptor come into working contact. Innovators are prone to overlook the extent to which the smooth running of any operation depends on a high degree of adaptiveness in the group but will be intensely aware of, and critical of the features of adaptiveness which limit long-term effectiveness: lack of enterprise, inflexibility of the system and preoccupation with detail.

It must be emphasized that **the agent for change may be either an innovator or an adaptor.** In a predominantly innovator group the agent of change will be an adaptor, and vice versa. This discovery overthrows traditional assumptions that heralding and initiating change is the prerogative of the type of person to whom the term innovator is now applied. A precipitating event may require either an innovative or an adaptive solution; whether it is generally expected or not depends on the original orientation of the group and the nature of

its task. An example in which an adaptor is an agent for change in a team of innovators is provided by the case, in which the precipitating event takes the form of a bank's refusal to extend credit as support to further new enterprise in a company that has cash flow problems. At this point the adaptor, who has been anticipating the event for months, is at hand with facts, figures and a contingency plan neatly worked out, and becomes a potential agent for change. This can be transformed into action if the change-agent has the personal qualities of competence, status and ability to influence others.

Creative
Problem
Solving
Techniques

6.7 Creative Problem Solving Techniques

Problem solving is an integral part of organizational life. Every time a manager or leader directs people in producing a product or service, problems are being solved, decisions made. Every time any member of an organization thinks of a new way to reduce costs, invents a new product or service, or determines how to help the organization function better in some way, problem solving is taking place. But, whether the problem solving occurring in these situations is truly creative is another question, one that deserves a closer look.

For individuals, the development of creative problem-solving skills is a necessity, not a luxury. Because organizations too must solve problems, the development of these skills in their members is also a necessity. The most innovative individuals and organizations are the ones most likely to survive and prosper.

Creative
Problem
Solving:
Higgin's
Techniques

6.8 Creative Problem Solving: The Higgin's Technique

Not too many years ago, problem solving was defined largely as a **'rational effort'**. As scientists and management researchers tried to improve the problem-solving process, they focused on analysis and quantitative factors. But in recent years we have come to realize that a strictly rational approach misses the whole point of problem solving. Creativity is vital to successful problem solving. The problem-solving process therefore has come to be referred to as the creative Problem-solving, process or CPS.

According to James M. Higgins, there are **eight basic stages in the creative problem solving process:** *analyzing the environment, recognizing a problem, identifying the problem, making assumptions, generating alternatives, choosing among alternatives, implementing the chosen solution, and control*.

These stages are shown in **Figure 6.1**. The middle four of these stages are shown in the more detailed diagram presented in. This

figure provides more detail on these four stages primarily to show how the decision maker goes from problem identification and the selection of criteria to the actual choice of a decision. The following paragraphs briefly examine these stages from the practical viewpoint of problem solving within an organization. Personal, non-work-related problem solving would follow the same stages. Both analytical and creative processes are applicable to all eight stages.
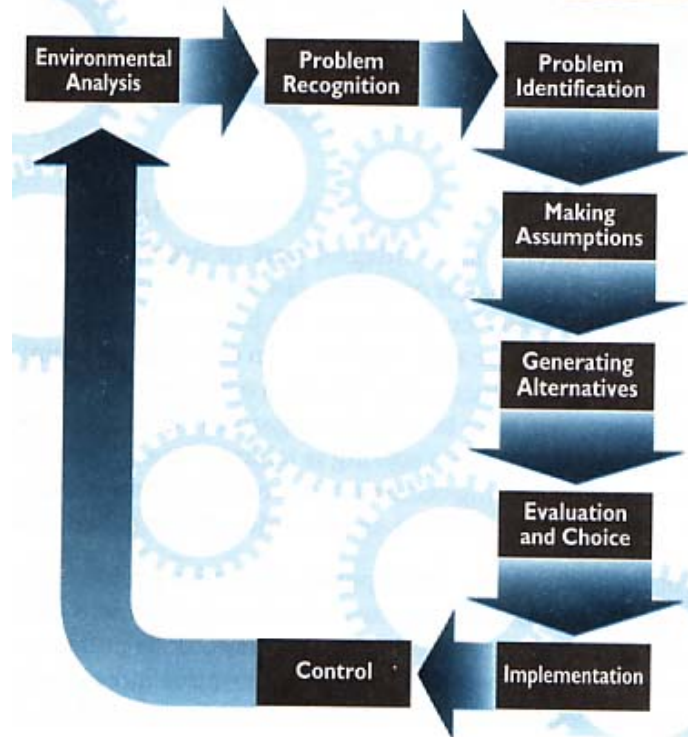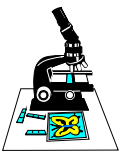

Figure 6.1: The creative problem-solving (CPS) Process.

6.8.1 Analyzing the Environment

Analyzing the Environment

If you're not constantly searching for problems *(which, as defined here, include opportunities), how will you know if they exist? And how can you solve problems or take advantage of opportunities if you don't know they exist?* Most strategists believe that firms must be prepared to respond quickly to problems and opportunities in order to be successful in the future. Thus, being able to recognize problems and opportunities as soon as they occur, or even before they occur, is vital to success. **Both internal and external organizational environments must be constantly and carefully monitored for signs of problems or opportunities.** In this stage of the process, you are gathering information. Information gained during the control stage of CPS is vital to this stage of the process. **Royal Dutch Shell Oil Company** spends millions of dollars annually tracking its competition and the economy, and learning about its customers, for just one type of information system the strategic information system. It also trains all levels of management to look for weak signals of environmental change. It spends thousands of man-hours creating forecasts /scenarios of possible futures, all to enable it to solve strategic and operational problems better. **The individual problem**

solver must also spend time and money searching the environment looking for signals of problems or opportunities. For example, spend a few minutes to look at your internal and external organization environments. What is happening that might lead to problems or opportunities?

Recognizing a Problem

6.8.2 Recognizing a Problem

You need to be aware that a problem or opportunity exists before you can solve it or take advantage of it. It is from the information gathered in analyzing the environment that you will learn that a problem or opportunity exists. Often, however, the problem solver has only a vague feeling that something is wrong or that an opportunity exists. **A gestation period** seems to occur in which information from the environment is processed subconsciously and the existence of a problem or opportunity eventually registers at the conscious level. For example, when Mikio Kitano, Toyota's production guru, began analyzing the firm's manufacturing cost information in the early 1990s, he intuitively sensed that something was wrong. The firm simply wasn't saving as much money, as it should from all of the automation and robotization that it had just completed. He believed **it was because robots were being used when human beings could do the job just as well, at less cost.** Other top managers doubted him, but in the end he proved that he was right saving Toyota millions of dollars in unnecessary investment.

Identifying the Problem

6.8.3 Identifying the Problem

The problem identification stage involves making sure the organization's efforts **will be directed toward solving the real problem rather than merely eliminating symptoms**. This stage also involves establishing the objectives of the problem-solving process and determining what will constitute evidence that the problem has been solved. The outcome of this stage is a set of decision criteria for evaluating various options.

Both rational and intuitive thinking may occur at this stage, but identification is largely a rational process. **Key questions to be asked include the following:**
1. *What happened or will happen?*
2. *Who does it or will it affect?*
3. *Where did it or will it have an impact?*
4. *When did it or will it happen?*
5. *How did it or will it occur?*
6. *Why did it or will it occur?*
7. *What could we do to be more successful?*

In asking these questions you are primarily interested in getting to the core problem or identifying the real opportunity.

6.8.4 Making Assumptions

Making
Assumptions

It is necessary to **make assumptions about the condition of future factors** in the problem situation. For example, what will the state of the economy be when the new product is to be launched? Or, how will your manager react to a suggestion? Remember that assumptions may be a major constraint on the potential success of a solution, or may cause you to overestimate the potential of a particular alternative to solve the problem effectively.

6.8.5 Generating Alternatives

Generating
Alternatives

Generating alternatives involves **cataloging the known options** (a rational act) **and generating additional options** (a rational and intuitive act).

To the extent that you can **clearly identify and formulate useful options**, you can maximize the chances that a problem will be solved satisfactorily. The purpose of generating alternatives is to ensure that you reach the selection stage of CPS with enough potential solutions. Creative techniques for generating alternatives can help you develop many more possible solutions than you might come up with otherwise.

Generating alternatives is partly a rational and partly an intuitive exercise. It's rational in that you follow a series of steps. It's intuitive in that these steps are designed to unleash your intuitive powers so that you can use them effectively. In this stage, you should be more interested in the quantity of new ideas than in their quality. For most people, creativity reaches its highest levels in this stage of CPS. When Apple Computer Corporation's engineers designed the "Newton", the firm's new personal digital assistant computer *(a small computer designed to help people in a wide range of jobs)*, they generated hundreds of alternative capabilities for the machine. In the end, several major ones were chosen over the others'.

6.8.6 Choosing Among Alternatives

Choosing
Among
Alternatives

Decision making should be **based on a systematic evaluation of the alternatives against the criteria established earlier**. A key, very rational part of this process involves determining the possible outcomes of the various alternatives. This information is vital in making a decision. The better the job done in generating alternatives and determining their possible outcomes, the greater the chance that an effective choice will be made. The choice process is mostly rational, but very skilled decision makers rely on intuition as well, especially for complex problems.

When Honda engineers pioneered the development of an engine that would get 55 miles per gallon, they had several alternatives to

choose from. Important to their decision of the technology they chose, were the impacts of the new technology on the costs of production, compatibility with existing transmissions, and so on. Each possible technology had to be evaluated for its impact on these factors. Similarly, McDonalds Corporation, in considering new menu items for its fast food restaurants, has hundreds to choose from. Each potential menu item has to be evaluated against important criteria such as freezability **(all McDonalds' ready-made foods are frozen)**, compatibility with other menu items, taste, customer demand, and cost/price relationships.

Kimberly-Clark's diaper division bet on Huggies Pull-Ups, he did so totally from intuition. The product looked promising but development proved difficult. He stayed with the product and eventually he was proven right. At the end of 1991, the product had 31% of the U.S. market.

6.8.7 Implementation

Implementation

Once you have a clear idea of what you want to do and a plan for accomplishing it, **you can take action**. Implementation requires persistent attention. This means accounting for details and anticipating and overcoming obstacles. Set specific goals and reasonable deadlines, and gain the support of others for your solution is a series of problems and opportunities.

When **General Mills Restaurants**, a subsidiary, of General Mills, Inc., began a total quality management program for its Olive-Garden chain, it paved the way for adaptation at all sites by providing a lengthy training and development program. In addition, success stories were chronicled and distributed on video tape to all restaurants.

Control
6.8.8 Control

Evaluating results is the final, and often overlooked, stage in the creative problem-solving process. The purpose of the evaluation is to determine the extent to which the actions you took have solved the problem. **This stage feeds directly into the environmental analysis stage,** which begins a new cycle of creative problem solving. It is important at this stage to be able to recognize deficiencies in your own solutions, if necessary. If you can admit to making mistakes or changing your mind without feeling defensive or embarrassed, you have acquired the skill of open-minded adaptation. This often requires objective thinking, intellectual courage, and self-confidence. At Federal Express, group decisions based on CPS are part of the everyday routine, and so is control. For example, when one team solved problems related to sorting packages, they were required to track results and make further improvements.

6.9 Group Techniques for Increasing Creativity

6.9.1 Brainstorming

The best known and probably most widely used procedure to **stimulate creativity is brainstorming**. It was originated in 1938 by **Alex F. Osborn** in response to his dissatisfaction with the-usual-business conference. **Osborn**, as did so many other business executives, came to regard the usual business conference as a waste of time because, although the business meeting would be called to deal with one or more important problems, it usually did not yield anything of value. Therefore, **Osborn** developed brainstorming as a means of achieving "organized ideation" in group meetings held in his advertising company. These group meetings began to be called *brainstorming sessions* because" 'brainstorming' means using the *brain* to *storm* a problem."

A) Theory
For Osborn "the creative problem-solving process" consists of: (1) **Fact finding, (2) Idea-finding, and (3) *Solution* -finding.**

Fact finding consists of two parts: problem definition and preparation. The former involves selecting and highlighting the problem while the latter involves assembling information related to the problem.

Idea finding involves producing ideas through idea generation and through the combination of and extrapolation from existing and available ideas.

The third phase of the creative problem-solving process, ***solution finding,*** involves evaluating ideas and adopting one of them for further development and eventual use.

Osborn recommended brainstorming for the second, **"idea finding,"** phase of the creative problem-solving process. **Brainstorming as we said is a method for coming up with ideas without regard to their evaluation.** This does not mean that evaluation is disregarded forever but rather that it is only deferred. Osborn carefully separated evaluation from idea generation for fear that evaluation, if it came too early, might adversely affect the number and quality of ideas produced in attempting to solve a problem.

This orientation in the brainstorming procedure, as Osborn himself points out, has a long history. A technique very similar to brainstorming has been used **by Hindu religious teachers for more than 400 years while working with religious groups**. The Indian name for this method is *Prai-Barshana. Prai* means 'outside you' and Barshana means 'question'. In such a session there is no discussion,

or criticism. Evaluation of ideas takes place at later meetings of the same group.

It is apparent then that Osborn believed that an individual could *deliberately* set out to come up with ideas that would provide creative solutions to problems; and what held for an individual also held for groups of individuals. He therefore recommended brainstorming to help overcome the restrictive and rigidifying effects of evaluation that occurred in most business conferences. On the group level, therefore, Osborn saw a brainstorming session as "nothing more than a creative conference for the sole purpose of producing a checklist of ideas; ideas which can serve as leads to problem-solution ideas which can *subsequently* be evaluated and further processed."

Efforts devoted to deliberately coming up with ideas for creative solutions could be facilitated by following two major principles and four major rules.

The two major principles are: *deferment of judgment and quantity breeds quality.* **The four major rules are:** (1) Criticism is ruled out; (2) freewheeling is welcomed; (3) quantity is wanted; and (4) combination and improvement are sought.

b) The Two
Principles

Deferment of
Judgment

B) The Two Principles
- **Deferment of Judgment**

Thinking, according to Osborn, involves both a **"judicial mind" and a "creative mind".** The former "analyzes, compares and chooses" (i.e., evaluates), whereas the latter "visualizes, foresees and generates ideas." The judicial mind "puts the brakes" on the creative mind - and these brakes need to be removed so that ideas can be generated. To remove these brakes, the first principle of *brainstorming - deferment of judgment-has* to be observed. The individual verbalizes or writes down his ideas without concern for their value, feasibility, or significance (all of which are, however, considered later). Yet he does not engage literally in free associations, for this might result in fruitless ideas: "instead of literally deferring judgment, we are, in reality, using 'limited-criteria' thinking-these 'limited' criteria being dependent on the way we state the problem." **For example,**

> In using the principle of deferred judgment, we don't say, "List ideas that come to your mind by free association. Instead, we say, "List ideas with respect to such-and-such a problem." When we list uses for a broom, for example, we are setting the criteria of "uses" and "broom" in our minds as we allow our automatic associative processes to go to work. In other words, we are saying, I will entertain any idea that comes to my mind with respect to using a broom in some way…." Hence I am judging (and ruling out)

automatically any thought or idea that comes to my mind that is not pertinent to "uses of a broom" [Parries, 1967a, pp. 68-69].

Expressed differently, the problem as stated "sets" the individual, and his thought processes do not run on at random, but operate within the more limited framework of what Parnes calls primary criteria, for example**, "uses" and "broom"** in the sample just presented. What, then, is deferred? According to Parnes, secondary criteria are deferred. These secondary criteria include such evaluative thoughts as: Will it be too expensive; will it take too long to do; will it require too many people to do it?

Quantity
Breeds
Quality
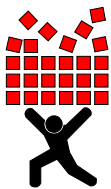
- **Quantity Breeds Quality**

The second principle of brainstorming is that quantity breeds quality. The rationale for this dictum originates in associationistic psychology, which assumes that our thoughts or associations are structured hierarchically. **The most dominant thoughts** in this hierarchy are those which are most habitual, common, or usual, and are therefore likely to be, from other points of view, the "safest" and most acceptable to others. It is necessary to "get through" these conventional ideas if we are to arrive at original ones. After the dominant ideas have been reviewed and rejected, additional effort has to be expended in order to generate fresh associations. Implicit in this view is that somewhere in the repertoire of an individual's associations there are some that are original or others that, if combined properly, can yield creative results.

c) The Four
Rules

C) The Four Rules

The two basic principles just described deferment of judgment and quantity breeds' quality, give rise to four essential rules for a brainstorming session.

Criticism is
Ruled Out

1. **Criticism Is Ruled Out**: *All criticism and evaluation are put off until some future date.* This key rule is the means of implementing the principle of deferred judgment. It is so critical that when brainstorming is conducted in a group, some chairmen or leaders ring a bell whenever any member of the group criticizes another's ideas or is self-critical or apologetic for that which he has himself suggested.

Freewheeling
Is Welcomed

2. **Freewheeling Is Welcomed**: Participants are to feel free to offer any idea; as a matter of fact, the wilder the idea the better, for "it is easier to tame down [an ideal than to think [it] up." The intent of this rule is to help the individual feel more relaxed and less inhibited than he might in ordinary circumstances by encouraging him to and implicitly rewarding him for using his imagination. It relieves him of responsibility for evaluation.

Quality is
Wanted

3. **Quantity Is Wanted**: This rule is a restatement of the second principle of brainstorming, that the more ideas suggested the greater the probability that an original one will come up.

Combination and Improvement are sought

4. **Combination and Improvement are Sought**: The intent of this rule is to motivate participants to build on others' ideas by showing how already offered ideas might be improved or combined in various ways with other ideas. This rule not only encourages the development of additional ideas, but also offsets any feeling of embarrassment individuals might experience at not having been the first to think of an idea.

*To **summarize**, these two principles and four rules constitute brainstorming fundamental orientation to the generation of ideas irrespective of whether this orientation is practiced by an individual or by a group of individuals; to achieve a creative solution the idea-generation stage is separated from and is followed by idea-evaluation.* There are no specific guidelines on how to evaluate a list of ideas developed through brainstorming, probably because Osborn, brainstorming originator, assumed that people are more practised in idea evaluation than idea generation. Nevertheless, should an obstacle be encountered in the process of idea evaluation and should more ideas be needed, the brainstorming process following the two principles and four rules can be reinstituted.

d) Setting up for a group brainstorming session

D) Setting up for a group brainstorming session
Brainstorming with a group of individuals **is a bit more complicated than with a single individual not because of complications in the process but because of the number of persons involved.** A review of the literature highlights several important pointers regarding group composition, problem selection, etc. some points of which may also be of value to individuals using brainstorming.

e) Group Composition

E) Group Composition
Brainstorming, as we have said, involves a deliberate attempt to make effective use of what is known about the creative process. This holds true not only for the development of creative solutions to problems but also for the selection of people involved in the process. **To randomly select individuals to participate in** a brainstorming session and to expect them to come up with creative ideas is rather unrealistic. This is not to say that all possible participants do not have the potential for creativity, rather it is to highlight the point that maximization of the probability that brainstorming will prove valuable requires thoughtful selection of participants and leaders. We now turn to some of the more critical issues involved.

f) Participants

F) Participants
Participants **should have knowledge and/or experience with the field in which the problem is based.** If there are participants who have no previous experience with brainstorming then they should attend an orientation session at which they learn what to expect. This meeting could include a discussion of the fundamentals of thinking and forming ideas as well as the basic principles of brainstorming. Use can also be made of slides, movies, etc.

It is helpful for the group to include a few **"self-starters"** *to get the ball rolling. If they dominate or monopolize the group it may be necessary to tell them to hold back. As Bristol put it, "In choosing your panel member, it is wise to choose at least one or two people of known creative ability. You may find it wise, also to choose a few panel members who are not too close to your problem, because their ideas may reflect a more refreshing approach to your problem".*

Executives who *"have been over-trained in the usual kind of non-creative conference"* are undesirable as participants. All members of a brainstorming group should hold the same administrative rank within the organization so as not to feel inhibited in their superiors' presence.

Brainstorming groups can be established throughout an organization. Guests from other parts of the organization could be invited to any core group so that more and more people gain experience in solving problems creatively.

The optimal size of an idea-finding brainstorming group is twelve persons. The critical point is not so much the size of the group as that it should be an even number of persons. For idea evaluation or decision making, according to Osborn, one might want an odd number of participants. In the idea-finding group, in addition to the leader, associate leader, and recording secretary (who is not really a participating member of the group) the group can consist of five regular or core members and five positions that can be filled by nonregular members or visitors.

Obviously, both men and women can constitute a brainstorming group. And a group so composed can frequently add more rivalry, excitement, and zest to the group process.

g) leader

G) Leader
The group leader's personality, his knowledge and experience with the problem, and his knowledge and experience in brainstorming are all critical considerations in his selection. "You will want to choose him with great care, because your chairman can mean the success or failure of your brainstorming session. You want to choose a keen-witted, friendly person who is able to be both a 'driver' and a 'relaxers', that is, someone who can keep the session atmosphere friendly and informal".

The leader has to fulfil several very critical functions. He has to process the statement of the problem so that it is stated in a workable manner. He has to select participants who will be able to follow brainstorming's two principles and four rules. He has to prepare new participants. He has to provide a warm-up session for the group and

prepare the total group prior to the brainstorming session. And, he has to conduct the session in terms of brainstorming principles and in such a manner as to enable the group to manifest its full potentiality.

H) Associate Leader

The associate leader **should have the same characteristics as the leader.** He helps the leader as necessary and should also be able to take over the leader's function should it become necessary to do so.

I) Recording Secretary

A secretary who is a non participating member of the group records participants' ideas and suggestions. **These may be recorded in a telegrammatic fashion but with enough data so that their general sense is not lost.** If the topic discussed is very technical then a secretary with technical knowledge has to be selected. On some occasions two secretaries have been used to keep up with the rapidity of the flow of ideas. On such occasions the secretaries take turns in recording every other suggested idea. Tape recorders may also be used but they need not replace the secretaries.

It is a good idea to **number ideas as they are recorded**. The leader then has a ready tabulation of the number of ideas produced which he can use to tell a group how well it has done and to spur it on to even greater production.

When ideas are recorded, **they are not noted with the name of the suggestor.** The need for group congeniality far outweighs the good of granting individual credit.

J) The Problem

If brainstorming is to be effective it is necessary to state the problem properly. Brainstorming is not for all problems. According to **Osborn** it is indicated for problems that require idea finding rather than judgment. The problem to be selected is one that lends itself to many alternative possible solutions. Brainstorming cannot be of much help with a problem such as "when should we introduce such-and-such a new course"; But, it can be used to produce ideas for tests that would help in arriving at such a decision.

A problem should be specific rather than general. An example given by Osborn is that a general question may be that of introduction of a new synthetic fibre. To be more specific, it should be altered to ask what ideas would help to introduce the new fibre to weavers and mills or to introduce the new fibre to dress houses and cutters, etc.

If a problem is a complex one, **it should be broken down into component subproblems** and each should be worked on separately. A brainstorming session may even be devoted to breaking down a problem into its subunits. And, then, a separate brainstorming session can be devoted to each unit.

k) The process

K) The Process
Prior to the brainstorming session, **the leader prepares about a 1-page memorandum in which the time and place of the brainstorming session is given as well as a very simple statement of the problem.** The memorandum also includes the background of the problem and examples of the kinds of ideas that are desired. If necessary, illustrations and other exhibits should accompany the memorandum.

This memorandum is circulated to the participants **at least 2 days before the brainstorming session** so that they can become acquainted with the problem and allows their ideas to incubate.

When the participants report at the time selected for the brainstorming session, the leader starts off new participants with a warm-up session using some very simple problem (improving men's pants is one suggested by Osborn) unrelated to the problem they will finally work on.

The leader presents the problem and answers questions. **The four brainstorming rules are stated:** *"(1) Criticism is ruled out. (2) 'Free-wheeling' is welcomed. (3) Quantity is wanted. (4) Combination and improvement are sought". Then he calls for ideas and suggestions from the group.*

Just as soon as a hand goes up the leader asks the person to state his idea. If too many hands go up, each person in turn is given a chance to state one idea. No one is allowed to read his ideas from a list if he brought such to the meeting. The lists can be given to the leader before the meeting and their contents should be given at the meeting.

As people verbalize their ideas, one idea may stimulate a related idea. These are called "hitch-hikes", and they are given priority of statement in the brainstorming process. It is important that a participant have some way of signifying (e.g., snapping his fingers) that he has a hitch-hike so he can be given priority by the leader. A participant might well make a note of his ideas so that he doesn't forget them.

When the group seems as if it is running dry, the leader might encourage the participants to come up with more ideas by telling them how well they have already done or by urging them to come up with "about 10 more ideas," etc. He can suggest his own ideas during these slow periods or come up with idea.

We could have something that you placed over a cup and as you pressed it, it opened out to release some sugar and at the same time spun to stir the sugar in.

... If there is so much fun stirring in sugar then perhaps we ought to have some sort of inert sugar which people who don't like sugar could use in order to enjoy stirring in.

A once off spoon made of sugar.

A device which contains sugar and which is moved up and down in the cup. But if you don't want sugar you keep a gate closed.

. . . I would like to take up the idea of electricity but not using a battery or anything like but using the static electricity present in the body.

... This idea of a screw. One could do it on the autogiro principle. As the screw went up and down the fluid would make it revolve.

... Like a spinning top.

... A vibrating table that would agitate everything on it-whether you had sugar or not.

... What about a sugar impregnated stick?

At the end of the brainstorming session participants are asked to keep the problem in mind for the next day allowing them further opportunity for incubation. They are later contacted by the leader who notes their new ideas if they have come up with any. A list of all ideas is then compiled and after the leader ascertains that ideas are stated succinctly and clearly, and properly classified if necessary, is presented to the evaluation group.

I) Evaluation Group

L) Evaluation Group
In brainstorming, **idea generation is separated from idea evaluation.** Therefore after the ideas are compiled they are presented to an evaluation group consisting of five persons. There is an odd number in an evaluation group to avoid ties in arriving at decisions. A brainstorming group, it will be recalled, consisted of an even number but such a group was not involved in decision-making or evaluation activities.

Osborn tells us that an evaluation group can be constituted in various ways. It can consist of all of the members of the previous (idea-generation) panel, some members and some non-members of the idea-generation panel, or it might be made up of a completely different group of people.

Whenever this group is constructed it should be composed of individuals who will have direct future responsibility for the problem. As an aid in deciding the relative merits of the various ideas, the evaluation group may use a checklist of criteria. They might ask themselves whether the idea is simple, timely, costly, spurring

questions as: What other uses can one make of such-and-such? How can such-and-such be changed in terms of colour, sound, and motion? etc.

As ideas are suggested they are noted by the secretary. **Experience has shown that 30 minutes is an optimal period for a brainstorming session.** However, some practitioners suggest 15 minutes or less and some as much as 45 minutes.

M) Brainstorming in Action

The following is an excerpt of an idea-generating brainstorming session quoted from **De Bono's** book, *Lateral thinking: Creativity Step by Step.* It was to redesign a teaspoon.

… A rubber spoon

… I feel that the secondary function of a spoon which is that of transferring sugar from the basin to the cup has largely disappeared and that a teaspoon in the shape of an egg whisk would be much more efficient.

... (Put down egg-whisk.)

... And make it electrically driven.

... Incorporate a musical box for the aesthetic function.

... Have something like a pipette tube which you dip in the sugar with your finger over the top and transfer sugar in that way. Then the sugar would be provided with a dispersing agent so that you would entirely lose the pleasure of stirring.

... Going back to the egg whisk 1 think one ought to have a sort of screw thing, rather like an electrical swizzle stick. The axle would be hollow...

... (Can I interrupt here? You are beginning to tell us how you would make it and that are not the function of this session.)

... No, I am just describing what it looks like.

... (Could you describe it more simply?)

... A rotating spoon?

... No it's got a screw. You know a propeller type screw. ... You push it up and down?

... No it's electric; you just press the button on the top.

… It seems to me this is too complicated. Now you have an ordinary sugar tongs and each individual would have his own sugar tongs and would pick up a couple of lumps of sugar. The tongs have two ends and you could create turbulence just as easily as with a spoon.

... Doesn't this restrict you to lump sugar?

… Yes, small lumps. But you can still get the quantity of sugar you want.

... (What shall we put down there?)

... Tongs.

... What about something like those ashtrays which spin as you press them?

… Feasible, etc.

Those ideas that are selected are reported back to the idea generation group so members of that group can still maintain a sense of participation in arriving at a creative solution to the problem.

It will also very likely be necessary to persuade others in the organization to accept an idea or a tentative working model of an idea. This may require knowledge and experience in marshalling arguments and being persuasive. Finally appropriate techniques need to be used in introducing the final work to the audience at large.
At each step in the total process there may be the need for additional new ideas. Under such circumstances, a brainstorming session and the process, as described previously, can be begun again.

n) Errors and pitfalls to Be Avoided

N) Errors and Pitfalls to Be Avoided
There are certain mistakes that should be avoided, if the effects of brainstorming are to be maximized. Bristol suggests the following:
1. **Failing to get support for your brainstorming program** of at least one of your superiors.
2. **Boasting prematurely about brainstorming** and getting your colleagues to expect too much.
3. **Failing to indoctrinate** your panel adequately.
4. **Submitting the unscreened** list of ideas to people unfamiliar with how brainstorming works. It is best to keep the unscreened list confidential.
5. **Failing to see that** the next steps are taken.

Osborn also suggests as two reasons why brainstorming may not work: the failure to follow instructions *(by the group leader as well as the participants)* and exaggerated expectations. What can be expected is that some sessions may produce final answers, provided the problem has been stated simply enough; some sessions may

produce planks for plans; some sessions may produce checklists that are guides to stimulate further thinking; some sessions may produce approaches to subsequent solutions.

O) Its Uses

o) Its Use

To avoid unrealizable expectations it is necessary to recall Osborn's assessment of brainstorming as "only one of the phases of idea-finding which, in turn, is only one of the phases of the creative problem-solving process". **He adds:**

"Let's bear in mind that group brainstorming is meant to be used - not as a substitute - but as a supplement, and especially in these three ways:

1. **As a supplement to individual ideation**: Individual effort is an indispensable factor in creative problem solving. Brainstorming sessions should never be considered as a substitute for such effort. Group brainstorming serves solely as a supplemental source - a means of generating a maximum number of potentially usable ideas in a minimum of time.

2. **As a supplement to conventional conferences:** The usual conference is necessarily judicial, both in spirit and in function, and therefore relatively unproductive of ideas. This does not mean that brainstorming sessions should supplant conventional conferences. It merely means that conventional conferences can be profitably supplemented by an occasional brainstorming session - if and when creative thinking is the primary purpose.

3. **As a supplement to creative training**: In over 1,000 courses in creative thinking, group brainstorming has been used as one of the teaching methods. This type of self-demonstration does much to induce a more creative attitude and to develop fluency of ideas. By the same token, participation in brainstorming sessions can help improve the average person's creative ability, not only in group effort, but also in individual effort.

By way of emphasizing the nature of the relative contributions of both individual and group brainstorming, it should be noted that **Osborn** said, "Despite the many virtues of group brainstorming, individual ideation is usually more usable and can be just as productive. **In fact,** *the ideal methodology for idea finding is a triple attack:* (1) Individual ideation. (2) Group brainstorming. (3) Individual ideation".

This then is a summary of the theory and assumptions underlying brainstorming, the factors to be considered in setting up a brainstorming session, and the factors to keep in mind to maximize the benefits to be reaped from its proper use. Needless to say, many more details may be obtained from reading **Osborn's and Parnes'** basic works.

Synectics

6.9.2 Synectics

Synectics, **"the joining together of different and apparently irrelevant elements",** originated with **Gordon**. It is based on the use of metaphors and analogies within a systematic framework to achieve creative results. It is central to synectics that we can attain better comprehension of a problem that is strange or unfamiliar to us by thinking of an analogy or metaphor that makes it more familiar and hence more amenable to a creative solution. On the other hand, there are problems with which we have difficulty because we are too familiar with them. We feel we are "too close" to them. We cannot see the forest for the trees. Under these circumstances, once again an appropriate metaphor or analogy provides us with necessary distance so that we can get a better view of the problem and move on to a creative solution.

In synectics, then, the problem as one is presented with it initially, has to be restated and looked at in various ways through the use of metaphors or analogies. During the course of this process, the individual goes on what synectics people call an *"excursion"* and as a result of such a trip creative solutions are attained. Just how different kinds of analogies and metaphors may be used, what the purpose and function of an excursion is and related matters are all part of synectics training.

Synectics began about 1944 when **Gordon** undertook an intensive study of individual and group processes in creativity. This was followed with systematic exploration of his ideas in 1948 with a group of artists in what Gordon refers to as the Rock Pool Experiment. Gordon later formed a subgroup within the consulting firm of Arthur D. Little & Co., and went on to set up synectics groups in several companies. He left Arthur D. Little in 1960, and together with G. M. Prince, whom he had met there in 1958, set up Synectics, Inc. in Cambridge, Massachusetts, to provide training facilities and training personnel for those interested in learning his technique to stimulate creativity. He then left Synectics, Inc. to start another organization, Synectics Education Systems (SES), which "is involved with all forms of problem-solving and education based on the metaphorical approach". Synectics Education Systems works both with groups and individuals. It is not limited to groups "because such learning experience makes people group-bound and unable to function alone".

Gordon's views of the creative process and how to stimulate it are set forth in his first book, *Synectics (**Gordon, 1961**).* This book contains the basic information on what Gordon called psychological states and the operational mechanisms, both of which will be discussed at greater length. Synectics also contains descriptions of how synectics has been used systematically in various situations, as well as Gordon's thoughts on how a synectics group might be set up within an industrial organization. Gordon's later book, The

Metaphorical Way, is devoted to the central concept in his system-the metaphor. He discusses its use in education, learning, the inventive process, and psychological processes. The *Metaphorical Way* also contains an interesting section on the variations in the use of the metaphor in synectics in which Gordon also brings synectics up to date from his point of view. Gordon's primary involvement, therefore, is with what he calls the operational mechanisms-what we would regard as the mental procedures and techniques for unlocking the psychological processes involved in creativity.

Although Prince also makes use of metaphor in his work, his major interest is in how group processes can be used to stimulate more creative contributions.

A) Metaphors

a) Metaphors

Awareness of the importance of nonrational processes and the attempt to engage them through the purposeful use of metaphors probably reflects the uniqueness of the synectics approach. Many individuals have theorized about the roles of the preconscious and unconscious in the creative process, but no one has so systematically tried to engage these sources of creative possibilities as have the synectics people. However, rational and logical processes are also used in synectics. They too are valued, encouraged, and enhanced in a group atmosphere that is free, easy-going, and accepting. *Furthermore*, regardless of the emphasis placed on nonrational factors, the whole synectics process occurs within a framework that has very practical goals.

There are many factors that shaped the processes used in synectics. **Gordon's and Prince's** reading, thinking, and theorizing, as well as their observations of the problem-solving behaviour of the groups with which they worked were no doubt very important considerations. Gordon cites several instances from pure and applied sciences where he believes metaphorical thinking played a critical role. Commenting about his own thought processes, Einstein is said to have reported that he used visual and muscular **"signs"** and **"images".** The Wright brothers based their work on turning and stabilizing the airplane on observations of buzzards keeping their balance in flight. **James Clerk Maxwell** is said to have used balls and cylinders in working out his 'electromagnetic wave theory. Darwin's work was based on several earlier developments; one was Lyell's demonstration of the earth's age and his refutation of the notion of catastrophic extinction of animals. Lamarck described evolutionary continuity. What Darwin lacked for his theory was how animal adaptations occurred. Gordon reports that Darwin based his work on the efforts of husbandrymen who could selectively breed animals to make them more valuable. Thus, he developed the thesis that there was a naturally occurring selection process among wild animals similar to that used by husbandry men with domesticated animals.

Laplace is also mentioned by Gordon for his use of the self-healing process of the body in the development of his theory that the status of the solar system is continually restored despite derangements that are radical and temporary.

Schrodinger talked about living organisms sucking in negative entropy when eating and breathing, for his critique of the second law of thermodynamics. Brunel developed the concept of the caisson on the basis of observations of the boring capacity of the toredo, a shipworm.

Bell used the function of the inner ear bones as one of the bases on which he built the telephone receiver; and Kektule, imagining a snake swallowing its tail, thought of carbon atoms in a ring rather than in a linear chain. Pasteur used the analogy of "safe attack" for his work on hydrophobia, and Cajal the analogy of "protoplasmic kiss" for his work on the manner in which nerves transmit impulses.

b) Theory and Techniques of Synectics

Psychological States

B) Theory and Techniques of Synectics

- **Psychological States**

Among the various factors that play important roles in the theory and technique underlying synectics are **four "oscillating" psychological states involved in the creative process** and one other state that is not so oscillating-the hedonic response. These states are induced by several operational mechanisms to be discussed later.

The four psychological states are:

Involvement and Detachment

(1) *Involvement and Detachment* -This state refers to the relationship between the individual and the problem on which he is working. Involvement refers to understanding and interacting with the elements of the problem. In involvement, there is a feeling for and resonance with the problem. However, the creative process also involves the capacity to detach from and become distant from the problem-to view it objectively.

Deferment

(2) *Deferment* -There is a danger in quick and immediate solutions to a problem: Experience has shown they are likely to be premature and superficial. Deferment refers to the capacity of both the individual and the group to defer these quick solutions until they have arrived at the best one.

Speculation

(3) *Speculation* -The group and its individual members need to be able to let their minds run free so that they can come up with ideas, hypotheses, and solutions. Speculation refers to this type of thinking.

Autonomy of Object

(4) *Autonomy of Object* - As the creative process proceeds and a solution is approached, there is a feeling that the solution has an entity and demand quality of its own. The individual or group must be willing and free enough to allow this feeling to develop and to follow it.

Hedonic Response

(5) ***Hedonic Response*** - Synectics involves, among other factors; play with "apparent irrelevancies". This play is used to generate energy for problem solving and to evoke new views of problems. One of these irrelevancies is an emotional factor called "hedonic response", which serves as an "irrelevance filter". The feeling involved in the hedonic response is very subtle. It is similar to the inspiration or intuition that is sensed prior to achieving the solution to a problem. It is the pleasurable sensation that accompanies the feeling of being fight about a hypothesis or a solution before it has been proven correct. There are both aesthetic and pleasurable elements in hedonic response. Gordon has been unable to develop an operational mechanism to bring it about. It is obviously of tremendous importance, and if an individual could learn how to recognize it, then he would probably not waste so much time and energy in the creative process; the individual would have that "feeling" - aesthetic or otherwise - that would "tell" him when to follow up a hypothesis and when to pursue a tentative idea to solution. Most techniques for stimulating creativity have one or more procedures for stimulating ideas and possibilities that may result in manifest creativity. None of them has much to say about how to go about selecting from what one has thought of. The fiedonic response may be a clue to what might be helpful in this regard. To learn more about it and enable us to make better use of this response, Gordon suggests that tape recordings of synectics sessions be reviewed and that special attention be paid to those points at which an individual achieved a breakthrough in the problem-solving process. Such study may lead to knowledge of those cues that alert an individual to the fact that he is coming upon something quite significant. It is important that this point be recognized because, once a solution is articulated, it becomes autonomous and develops a life a *"being"* of its own.

Operational Mechanisms

C) Operational Mechanisms
The aforementioned psychological states are induced by operational mechanisms. ***There are four such mechanisms:*** (1) personal analogy; (2) direct analogy or example, (3) symbolic analogy or book title or essential paradox or compressed conflict; (4) fantasy analogy. When working on a problem what one actually utilizes are these operational mechanisms, and if they operate effectively, then the psychological states function very quietly and take care of themselves. The operational mechanisms do not make up the whole problem solving process, but they are a most important part of it.

One of the functions of the operational mechanisms is to make the familiar strange. In so doing, one of the important psychological functions that are accomplished is to increase the "distance" between

the individual and the problem. This increased distance enables the individual to avoid becoming stuck with what he already knows about a problem and being limited to it. As we shall see, the degree of distance achieved between individual and problem varies as a function of the operational mechanisms used. The four operational mechanisms are:
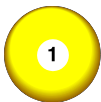
a. Personal Analogy

a. Personal Analogy
The individual imagines himself to be the object with which he is working. He *"becomes"* the spring in the apparatus and feels its tension, or he *"becomes"* the pane of glass and allows himself to "feel like the molecules in it as they push and pull against each other. The rigid and controlled individual finds this hard to do, for it stirs too much anxiety and insecurity. To use this mechanism effectively involves the capacity to *"lose"* oneself.

As a result of his work with this mechanism, Gordon believes that the critical element in personal analogy is empathic identification and not mere role playing. Role playing as a means of arriving at personal analogy is rather useless when working on a problem with a sociological or psychological base-a people problem. For this kind of problem, role playing, instead of making the familiar strange, makes the strange familiar because it does come up with enough strangeness.

Together with compressed conflict this operational mechanism is regarded as an auxiliary operational mechanism [direct analogy is the basic operational mechanism]. A personal analogy has more freedom and breadth than does a direct analogy, and the former yields more understanding than the latter.

Four degrees of involvement in *personal analogy* have been described. They are as follows:
(1) **First-person description of facts.** This is very shallow and involves a mere statement or listing of facts. Thus, in the Synectics Teacher's Manual the example is given of someone who is asked to imagine he is a fiddler crab and he says that he would have a hard outside and a soft inside, etc.

(2) *First-person description of emotions.* This level represents "the lowest order of identification". The content of this analogy, although better than the previous form is too general to yield any very valuable insight about that which the analogy was developed. For example, when asked to imagine himself as a fiddler crab, a person responded that he was busily involved in getting food for himself and had to watch out that he did not become food for a bigger fish. Such an analogy yields no added insight into the fiddler crab since all animals are confronted with the problem of eating or being eaten.

(3) *Empathic identification with a living thing.* This is regarded as "true" personal analogy. It represents both kinestlietic and

emotional involvement with die object. Again, while imagining to be a fiddler crab, a person might say that his big claw is rather burdensome and useless. When he waves it nobody is frightened and it is quite heavy to carry around.

(4) *Empathic identification with a nonliving object.* This is the most sophisticated kind of empathy. Relatively speaking, it may be easy to attribute human emotions to living objects as in level (3) but it is much more difficult to do so with nonliving objects. For example, when asked to imagine that he was the mud in which the fiddler crab lives, a person said that he felt that no one cared about him. The crabs do not thank him and he would like to make them do so.

Prince describes only three levels of involvement in personal analogy-the first two are the same as the first two just described, and the third combines the third and fourth just described. Prince feels that the use of personal analogy can help a group become more cohesive. After members of a group have produced good personal analogies, Prince feels they can work together more effectively.

b. Direct Analogy or Example

b) Direct Analogy or Example

Here facts, knowledge, or technology from one field are used in another *(e.g., a shipworm runneling into wood serves as an analogy to solve problems in underwater construction).* Biology, Gordon believes, is one of the most fruitful areas for direct analogies in solving technical problems. Knowing how certain goals and activities are accomplished in biological organisms serves as a good basis for developing ideas in technology and other areas. Emphasis on biology does not preclude interest in other areas. Whatever other information an individual has at his disposal may be helpful to him in direct analogy.

Experience has shown Gordon that organic direct analogies used for inorganic problems, or inorganic direct analogies used for organic problems, are more effective than organic for organic or inorganic for inorganic.

Gordon makes an intriguing statement about the relationship between *"constructive strain"* that is introduced *"by the distance on the analogy" and the "level of inventive elegance".* He says that analogies with small psychological distance from the problem can be effective for problems being worked on for the first time; but for problems that have been worked on a great deal, analogies that reflect great psychological distance-those that are rather remote from the individual's experience-are required.

Prince says that the more strange the example *(his term for the direct analogy),* the greater the logical distance between subject and example. And the less the seeming relevance to the example, the greater is the chance that it will be meaningful and helpful in the

problem-solving process. He points out that two examples of closure are door and mental block. The latter is more likely to enable an individual to look at a problem in a new way than is the former because it is logically more distant from the subject and it is less immediately relevant.

Direct analogy is the basic mechanism by which an individual tries to see problems in new contexts. A direct analogy is clear and straight forward. It produces immediate results and "its process can be reproduced".

c. Symbolic Analogy, also Called Book Title, Essential Paradox, and Compressed Conflict

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This form of analogy uses objective and impersonal images to describe the problem. An individual effectively uses symbolic analogy in terms of poetic response; he summons up an image which, though technologically inaccurate, is aesthetically satisfying. It is a compressed description of the function or elements of the problem as he views it *(e.g., one synectics group used the Indian rope trick as a basis for developing a new jacking mechanism).*

Although direct analogy is the basic operational technique, compressed conflict and personal analogy are used together with it to increase the conceptual distance between the individual and the problem. In a compressed conflict there is direct analogy with built-in *"conceptual strain"*; there is both a modifier and a noun; the noun reflects the direct analogy and the modifier produces strain or conflict, e.g., *'structured freedom'* "or" *'wax cloud'.*

Prince, in whose system book title bears many similarities to symbolic analogy and compressed conflict, says that in a book title there is *"both an essence of and a paradox involved in a particular set of feelings".* The function of book title is to generalize about some specific matter and to use the generalization to suggest a direct analogy. According to Prince, the technique helps people who stay close to the problem to get away from it.

Prince cites a group working on a problem involving a ratchet and, when asked to develop something paradoxical, contradictory, or opposed to one of the ratchet's characteristics dependability, the group came up with dependable intermittency, directed permissiveness, and permissive one-wayness.

d. Fantasy Analogy

d. Fantasy Analogy

This is based on Freud's idea that creative work represents wish fulfilment. The individual states a problem in terms of how he wishes the world would be. For example, the synectics group that was working on a vapour proof closure for space suits asked the question, *"How do we in our wildest fantasies desire the closure to operate?"* This form of analogy is said to be very effective if used early in the process of making the familiar strange. Gordon regards it as an

excellent bridge between problem stating and problem solving because it also tends to evoke the use of the other mechanisms.

In the early days of synectics, it had become apparent that fantasy analogy was getting mixed up with the other mechanisms. It seemed to be part of the other mechanisms. Between 1961 and 1965 it was not used because it did not seem necessary. Fantasy analogies were usually offered by group members while they were using the other analogies. Synectics sessions in which fantasy analogy is used become productive very quickly but can also become dry very quickly. It is a very efficient operational mechanism but also a very limited one according to Gordon's experience.

Synectics thus tries, in the course of problem solving situations, to make the familiar strange and to make the strange familiar through the use of the different types of analogies just described. These analogies enable the individual to look at problems in new ways, and thereby hopefully gain new insight into the problems.

Also by means of the operational mechanisms, synectics attempts to make conscious what goes on in the unconscious. It is also through the use of the operational mechanisms that the psychological states of involvement, detachment, deferment, speculation, and commonplaceness are induced. These states create the psychological climate necessary for creative activity. It is assumed that all people have experienced and utilized these analogies. Hence, when group members are asked to use them in synectics sessions, they do not feel they are being manipulated. They claim that their natural creative potential is increased rather than decreased.

It is apparent from the descriptions of the operational mechanisms that they are simple. However, it does take a great deal of energy to apply and use them. Synectics, therefore, does not make creative work easier but "rather is a technique by which people can work harder". At the end of a synectics session, participants may emerge quite fatigued, because they move into areas that appear irrelevant and expend a good deal of mental energy developing their analogies and trying to determine how well those analogies help to solve the problem. Although sometimes exhausting, the synecties session is often profitable and mentally fulfilling.

The material presented on psychological states and operational mechanisms contains much of the required theory for understanding the basics of synectics. For these basics to be of use in creative problem solving more is required than what has been said thus far. Before considering the characteristics of the problem-solving process or how a synectics session is conducted, let us look at the characteristics of its constituent members-the leader, the participants, and the client-expert.

D) The Participants in a Synectics Meeting

In addition to their experience in coming up with new ideas and the time they have spent analyzing the creative process in groups, synectics workers have also had much experience in the conduct of group meetings and have learned 'how to utilize group dynamics so as to facilitate the creative process.

The *"typical" (i.e., nonsynectics)* **meeting**, Prince points out, reflects confusion in purpose or confusion in organization. While the function of meetings is generally described as solving problems, people participating in them usually find their creativity and speculations discouraged. An antagonistic attitude toward ideas is evident, and group leaders use their power unwisely. Group leaders usually feel more important than group members and hence there is not much open and free communication in the group.

Prince sees **a meeting as consisting of offering information, asking for information, and accepting or rejecting information.** He believes that in the traditional meeting, each person sees the situation as capable of being won or lost. For Prince, group participants manifest combinations of such opposing characteristics as sensitivity and aggression. Sensitivity dictates that the individual takes advantage of opportunities and manifests his creativity. However, when responding in terms of aggression the individual displays poor conduct. Thus, such an individual may put forth a creative idea in an aggressive way. This may elicit aggressive criticism and the individual must spend a good deal of time defending his ideas and/or repairing his image. Therefore, the sensitive-aggressive individual appears to be constantly on the defensive. Prince tries to counteract such negative aspects of behaviour in groups. He believes that the information involved in a negative situation can be conveyed to an individual without evaluation or rejection, and that everyone in a group does have a contribution to make and no one needs to lose or to feel he is losing something.

Prince has developed a variety of methods, some of which he admits are "mechanistic", to help keep a group at a high level of effectiveness. One of those developed to cope with negative features in a group is called the *spectrum policy*.

At a meeting there is a spectrum of ideas or suggestions. All of the ideas may be good or parts of the ideas offered are good and acceptable and other parts are unacceptable. Prince believes that people tend to emphasize the unacceptable characteristics. In doing so, however, they impede the development of solutions. In the early stages of problem solving, no member of the group can tell whether or not an idea or any part of it may indeed prove quite valuable at some time during the problem-solving process. Consequently, it is unwise to concentrate on the bad characteristics. Group members should build on what is worthwhile, and try to overcome the faults in

an idea. One of the problems that people have in applying the spectrum policy is that they simply do not listen to each other. Prince solves this problem by suggesting that if someone cannot find something good in what another has said, he should keep the other person talking until he can apply the spectrum policy-comment on what he does not like but also comment on what is good in the idea.

Another technique that Prince uses effectively involves videotaping the group's sessions. The tapes are played back to the group so that the participants can observe and discuss their own, each other's, and the total group's interaction.

The other important factor that Prince emphasizes is a clear perception of the roles that all persons - *the leader, the participants and the client-expert* - play in the group sessions. In a traditional meeting, these roles can be commingled, but in synectics they are separated and clarified to avoid confusion. The role prescriptions will be spelled out on the following pages, but as a general overview in a single, concise statement, it can be said that for Prince (1970a) the leader is servant of the group, the group is servant of the problem, and the client-expert is the problem's representative. The client-expert's opinions are honoured solely with respect to the problem and not with regard to the conduct of the group or its behaviour. Let us now turn to what Prince has to say about each of the roles.

e) Leader's Role and Principles of Leadership
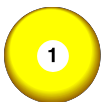
E) Leader's Role and Principles of Leadership
It is important that the leader structure his role according to the following principles:

1

1. "***Never Go into Competition with Your Team***": This is a very difficult principle for leaders to accept, since everyone feels he has ideas to offer. However, it is important that this principle be accepted, since leaders are likely to favour their own suggestions. If this were to happen participants would become discouraged and not participate fully in the meeting.

There are times when the leader can contribute his ideas in a synectics group-when early possible solutions are sought (suggestions) and during a stage called *force fit*. Even on these occasions the leader offers his only when no others are offered. Should someone else have an idea, it has precedence over the leaders. The leader supports members' ideas and if possible he should build or add to a member's idea to strengthen it.

2

2. "***Be a 200 Percent Listener to Your Team Members***": The leader's job is to understand participants' points of view. He should be sure he understands a participant's point of view, and to achieve this goal he might well try to paraphrase what he hears. He should *not* evaluate what he hears. In this manner, the leader fosters an

atmosphere in which everyone's idea is worthy of consideration. In his books Prince presents a list of phrases to be used by leaders for "intervening without manipulation" and to generate nondefensiveness.

3. "***Do Not Permit Anyone to Be Put on the Defensive***"**:** The leader operates with the belief that there is value in whatever a participant offers, and his job is to find that value. The leader never asks for justification of a metaphor; he accepts opposing points of view, and if a member starts by looking for negatives he asks him to tell what he likes about what he heard *(spectrum policy);* when an idea looks like it may falter he tries to keep it alive by generalizing from it; he sees to it that ideas are never completely condemned, they are only put aside; he sees to it that no participant is pinned down, pressured, or put on the defensive.

Laughter should be looked into because it may be stirred by an elegant idea that is just beginning to emerge and no one may be consciously aware that this is so.

4. "***Weep the Energy Level High***"**:** The leader's intensity, interest, and alertness can spread through the group. It is therefore of help for him to move around and underscore points by using body movements. He should select areas of interest to himself, and keep the meeting moving quickly; he should be humorous or encourage humour in others; he should ask challenging questions; and use the element of surprise.

5. "***Use Every Member of Your Team***"**:** All group participants are to be used and encouraged to respond. Quiet and/or shy persons may need to be brought out or handled quite tactfully. Prince suggests that verbose members be thanked rather quickly after a response; their eyes should be avoided when the leader asks for a response; and the leader should hold his hand up and look at someone else to stop the compulsive talker.
If none of these techniques works, a frank talk or the suggestion that the compulsive talker listen to the tape of the session may be worthwhile.

6. *"Do Not Manipulate Your Team"*: The purpose of the group is to come up with new solutions. A group is generally manipulated if the leader already has a solution in mind and his goal is to get the group to accept it. The leader's authority and responsibility is to aim the members' minds in a specific direction". He keeps them informed as to where they are in the synectics process, but he does not push for a specific solution.

7. "***Keep Your Eye on the Expert"***: The final goal of a meeting is to provide the expert with as many potential solutions or "viewpoints" as possible. It is therefore very important that the leader keep his eyes on the expert. When the expert seems to be interested in something,

the leader keeps going at it and works with the group to come up with more viewpoints, and if the expert gets very involved with a possible solution the leader should even encourage him to take over. When an expert responds to something, the leader should be careful to note that the spectrum policy is followed. Positive statements, what the expert likes about something, should be included with negative ones.

(8)
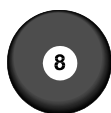
8. "*Keep in Mind that You Are Not Permanent*": Assuming that traditional leaders can enjoy too much the exercise of power and authority, and also assuming that everyone wants to be a leader, Prince suggests that the leadership role be rotated. Thus, everyone can be motivated to participate more fully. If one can be both participant and leader he can learn the relative advantages and disadvantages of either role.

In summary, then while Prince regards the leader in the traditional meeting as "self-serving and manipulative", he sees the leader in the synectics meeting as serving others. The leader must use his power and capacity to control a group very carefully, for he becomes a model for the group members for the time when they will become leaders, as well as affecting their behavior directly when he is leader. The leader watches, records, and stays with a plan as the group moves freely and imaginatively along. He emphasizes imagination and flexibility and tests all kinds of ideas for their usefulness. He maintains a constructive viewpoint constantly by keeping open communication lines between participants, he does not allow fear of being wrong to be a deterrent to participation, and he tries to see to it that experts' objections are also used constructively.

The leader gives priority to avoiding damage to anyone's image; to directing aggression against the problem and not the people; and to showing that through effective participation no one loses and everybody wins.

f) The Participant's Role

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The participant's role is to give all of himself to the problem. In so doing, he will manifest his uniqueness and individuality, and thus every participant in a group ends up looking at a problem in his own way. The participant uses his own sensitivity to offer ideas and speculations about the problem at hand. He need not concern himself with whether or not a suggestion or idea is helpful. In this sense, synectics also removes evaluation as one of the participants' responsibilities. The participant should try to overcome his habitual tendency to spot weaknesses in ideas and try to expose them. It is better if he seeks ways to overcome the weaknesses he spots. In the process of being a participant the individual also learns about leadership patterns by observing his leader, and he can profit from this as well as from his own reactions to these patterns since he too will have to assume the leadership role at some point.

G) Client-Expert's Role

The third role in a group is that of the expert. He is the individual with the most factual understanding of the problem. He is generally the client's representative and within the client's organization is the person who is responsible for solving the problem. Consequently, in most traditional meetings the expert is likely to be put on the defensive. Having the responsibility for solving a problem, he may not relish the idea of having someone else solve it. For effective participation in a synectics group he must strive to overcome this attitude. He must become both participant and expert. By freely speculating about ideas during the course of a meeting he sets an example for the participants to follow. In his responses to participants' ideas and suggestions he follows the spectrum policy in which he tries to strengthen the positive in their ideas and point out weaknesses. In this fashion he encourages the group to build on that which is positive. In so doing, his intent is not to be polite but rather to be thorough. His is a difficult role since he supports ideas, but he must also be realistic and voice realistic concern as he moves along.

The expert tries to demonstrate to the group that he is there to find workable ideas. He is not to build himself up at others' expense. He points out acceptable directions. He shows the group he is willing to listen to their ideas. He builds on their suggestions when possible, and he helps the group understand as much as necessary about the problem. He counts on the group, since he is the one who will most likely make use of potential solutions.

The leader checks the goals that the group is working toward with the expert. The leader also checks with the expert to make sure that possible solutions and viewpoints are clearly understood.

A synectics group is never larger than seven individuals; it is better to have six than seven and ideal to have only five. The group includes the leader, the client-expert and the participants. If the group is run within a company, **Lee of Remington Arms**, who has used synectics in his company, recommends that some of the group represent the department directly involved in the problem and the remainder come from different departments. One should try to ensure a "good mix" and bring together different personalities. Leek suggests that the men's boss should not be the group leader, and if possible he should be kept out of the group.

The group's meeting place is important. It needs to be quiet and have no distractions. It is therefore important to protect the group from interruptions by secretaries, telephones, etc. Leek held his meetings close to nature, in a fishing club in the woods and a stable of an old mansion owned by his company. He has also held meetings in a local theatre club, a motel room, and home basement.

As indicated previously, meetings should be taped, and the tapes

should be available to the group members for review of their processes and behaviour. A synectics session requires the expenditure of a fair amount of energy; it is recommended, therefore, that no session go longer than an hour without a break.

H) Synectics Problem-Solving Process

We have covered the psychological states, the operational mechanisms, the various individuals who make up a synectics group, and the roles they play. These constitute almost all the basic ingredients for a synectics problem-solving session and almost all the critical jargon and terminology. There are still several other terms, such as *problem as given, purge, suggestion, force fitting,* and *viewpoint.* All of these and several others will be noted in their proper places, defined, and discussed as we present the synectics problem-solving process. Again, **Gordon's and Prince's** approaches will be combined, and where differences exist they will be pointed out.

The synectics problem-solving process consists of three major segments. **The first** is devoted to defining, elaborating, analyzing, and understanding the problem. **The second** is devoted to applying the different operational mechanisms, the metaphors and analogies, to the problem. When this is completed the group tries to *force a fit* between what they have arrived at as a result of applying the operational mechanisms and the problem on which the group was working. Hopefully, the result of the force fit is such that it either is a solution to the problem, a suggestion that, can lead to a solution, or an idea that results in a better understanding or better approach to the problem. Under the last circumstance, the whole process is now begun again bearing in mind the new view of the problem. The process may be repeated as many times as necessary until a solution is found.

Because a synectics session can become quite free flowing, discipline and structure have been introduced by the synectics people by way of a flow chart. The place of the group in terms of the flow chart may be written on a blackboard or on a flip-chart placed on an easel by the leader so that the members of the group will know where in the process they are. The material that follows will be presented in the form of a flow chart.

1. Problem as Given (PAG)

For both **Gordon and Prince**, the character of this step is denoted in its title. The problem may be posed by an outside source or by an individual in the group.

Prince adds an interesting emphasis. He suggests that the word *"problem"* may connote, for some individuals, obstacles or difficulties which might serve to block an individual in his efforts. **Prince** recommends substituting for the word problem the word opportunity, which can serve as a positive signal for solving the problem.

2. Short Analysis of the PAG

Essentially these first two steps constitute attempts at analyzing and defining the problem. The first step is a statement of the problem as presented by the client. Another technique has also been used by Gordon. In this procedure the problem or goal is actually hidden from the group and in its place the group is asked to discuss a matter central to the goal. **For example,** in one problem the group was to come up with a new can opener. It was not told, however, that the goal was a can opener. Actually, problem-solving activity began with a discussion of what *"opening"* meant to the group.

Whatever approach is used for the group's activity, the first two steps in the process are to *"make the strange familiar",* as Gordon puts it. The group tries to understand the problem and to make still unrevealed elements in the problem better known. One of the dangers of this phase of the problem-solving task is to become too engrossed in details.

Prince puts **greater emphasis on the client-expert and at this point in the process** calls on him to present an analysis of the problem in sufficient detail that everyone has a good understanding of it. Of course, no one need have as complete an understanding as the expert.

An example of what transpires thus far in the process comes from Prince's book in which the problem as given, is to "*Devise an ice tray that releases ice without effort*". The expert starts by explaining the problem in sufficient detail that the group has a common understanding. Since the expert is also a participant, he does not need to reveal all the minute details of the problem. These can all come out later during the session. **For example,** in the ice tray problem, the expert's contribution consisted of the following statement: "The ice tray must be superior to anything on the market and must not cost any more than those already available".

3. Purge; Immediate Suggestions

During the time that the group is clarifying the problem it is likely that individuals will think of suggestions or solutions. Such solutions are not likely to be valuable; they should *however,* be verbalized. By doing so, individuals and the group can rid themselves of superficial ideas and are forced to turn to more innovative possibilities. Solutions at this point of the process serve another function. It will be recalled that the expert also participates in the problem-solving process. Therefore, early solutions can be criticized by the expert, resulting in further clarification of the problem as a by-product.

4. Problem as Understood (PAU); Goals as Understood (GAU)

Some element or aspect of the problem as given is selected for work and solution. This element is called the *problem as understood.* It is stated as clearly as possible, and members of the group focus on it.

Prince suggests that, at this step, **each participant be called upon to come up with his personal way of seeing the problem and his dream or wishful solution.** These are written down by the leader. *Prince feels that engaging in such personal ways of looking at the problem at this point is important for the following reasons:* (1) Each participant can make the problem his own. He can preserve his own individuality and need not be forced into a shared consensus. (2) Giving each person an opportunity to state the problem as he sees it takes advantage of the diversity in the group. (3) Allowing oneself to engage in wishful thinking at this point enables the participant to broaden his perspective and not restrict himself to limiting conditions. (4) By analyzing the goals as understood, the goals can be broken down into parts of problems that can be dealt with separately, thereby eliminating the need to cope with a large, unmanageable problem.

Continuing with the ice tray problem, **the following two goals as understood were arrived at:** "1. how can we make an ice tray disappear after ice is made? 2. How can we teach an ice tray to release instantly on signal"? *(The last goal is not as wishful or as far-fetched as it may appear, for if an ice tray is suspended it will make icicles which when they reach a certain size can be used to signal the release.)*

After checking with the expert, the leader selects one of the goals as understood to work on. He then asks the group to put the problem out of its mind and to concentrate on what he asks. Essentially, he now starts to take the group on a mental excursion.

5. Excursion **5. Excursion**
At this point, a rather extended stage of the problem-solving process follows, which for Prince, is **like taking an "artificial vacation" or "a holiday from the problem".** He makes a point of asking the participants to put the problem out of their minds. He is aware that if they are capable of doing so, they will put it out of their conscious minds while continuing to work on it in their preconscious minds.

It is during this stage of the process that the different operational mechanisms - *the different kinds of analogies* - are used. Essentially, it is during the excursion that the group tries to "make the familiar strange". The leader questions the members and tries to evoke responses to his requests for different kinds of analogies.

Prince adds further elaboration of this step. He suggests that after analogies are produced that the leader selects one of them for further *examination. The example is selected on the basis of these criteria:* (1) The leader finds it interesting. (2) The example seems strange and irrelevant to the problem. (3) He thinks the group has some information about the example or analogy.

The example is examined to produce "*factual and associatory material*" which enables the participants to view the problem in a new way. The facts produced during an examination are differentiated by Prince as "*simple descriptive facts*" and "*super facts*", which are more speculative and "more associatory". These are more interesting and useful than descriptive facts.

Prince points out that a good deal of self-discipline is involved in the examination since the participant must not think back to the problem unless he is asked to do so by the leader. Thus, each step in the excursion closes the door on the previous step. In so doing, Prince believes that the probability of diversity in thinking is increased.

Thus, both Gordon and Prince conclude the excursion in essentially the same way. In Gordon's terms the direct analogy is analyzed for further understanding, and for Prince the example is examined.

i) Setting up a Synectics Group Within an Organization

I) Setting up a Synectics Group within an Organization

It is possible to establish a synectics group within any company, and Gordon and Leek have done so. In his book, Gordon presents several specific ideas on the selection, training, and reintegration of a group chosen for synectics training and whose goal would be product improvement and product development within a company. These suggestions are probably not very workable in most situations. They are presented here only to stimulate further thinking about various possibilities on the part of individuals who might want such a group within their own organization. The purpose of "stimulation only" needs to be emphasized, since several groups that have been established in various companies have not survived. The reasons for this fact are neither all clear nor all available. It may well be, for example, that being involved in synectics is not a full-time job. But whatever the reasons, what follows might be of help to those who want to start such groups.

J) Selection of Participants

J) Selection of Participants

Eight criteria for selecting participants for an in-house synectics group are suggested by Gordon.

(1)   **Representation-**the group, consisting of five to seven members, should be representative of the company's total operation.

(2)   **Energy Level-**a group member should have a high energy level.

(3)   **Age-**members should be over 25 and under 40 to maximize the probability of selecting flexible individuals and individuals with experience. These age limits also allow for more homogeneity in salary levels and status.

(4)   **Administrative Potential-**individuals with administrative potential have the ability to generalize, and furthermore, since these individuals are likely to rise in the organization, starting with them increases the probability that synectics techniques

> will later be introduced at higher levels of management.

(5) **Entrepreneurship -** the group must be able to accept the responsibility for the success and failure of its operation regardless of management's sanction. The group should feel apart from the company since if it is too close to it, it may feel and/or actually be controlled by the company.

(6) **Job Background** - diversity in experience allows for a broad base of knowledge of the company.

(7) **Education -** the selectee should have a history of having shifted major fields of interest. Broad interests will help increase his "metaphoric potential."

(8) **The "Almost" Individual -** experience has shown that there are individuals who have characteristics of productive people but whose own work remains mediocre. These persons may have their abilities "liberated" by a synectics program.

Each potential participant then goes through further selection in meetings with the "Synectors", members of Gordon's staff, to determine if he possesses the following characteristics: metaphoric capacity, attitude of assistance,. kinesthetic coordination, enjoyment of risks and what kinds of risks, emotional maturity, capacity to generalize, commitment, nonstatus orientation, and "complementary aspect". Of course, each person in the group cannot be expected to have all desirable characteristics to an equal degree. Deficiencies in one person should therefore be compensated for by characteristics of the others, and the last characteristic mentioned, complementary aspect, refers to whether a person's characteristics complement those of others in the group and whether theirs complement his.

The group, as finally composed, thus represents a wide variety of skills, knowledge, and interests. One of the most important criteria in selecting group members is their "*emotional constitution*" - the way in which they go about solving problems. For example, is the individual amused at himself when he is wrong, does he use his energy effectively or does he become passive at crucial moments? The synectics group should be composed of individuals with a variety of emotional constitutions. Thus, if there were a choice between two individuals of similar intellectual background and emotional orientation, only one should be chosen; but two individuals with the same intellectual backgrounds and different emotional orientations might both be included. Emotional and experiential diversity helps the group tolerate different approaches to a problem with depth.

Since no group of five to seven people can have all the technical competence to determine the technical feasibility of a solution, experts can be called in as needed. The expert either plays the role of encyclopaedia or devil's advocate. He is a resource person who provides technical advice or isolates weakness in a concept or solution.

The leader of the group, the person who will become the group's administrative head when the group is reintegrated into the company, is to be selected on the basis of observations made of the group during the course of his training. He needs:

(1) **Extreme optimism** - reflected in believing that anything is possible;

(2) **Total grasp** - involving experience in life and in industry that would enable him to integrate and interpret what comes up in the group;

(3) **Synectics grasp** - a deep understanding of synectics; and

(4) **Psychical distance** - a capacity to maintain proper control over his personal involvement with others so that sessions can be steered constructively.

k) Course of Training

K) Course of Training

The selected group, **Gordon** suggests, should have a place in the company that is separate from others so that high morale can be built. It undergoes training for 1 week a month for 12 months. Training begins with having the members read books that are selected to help them increase their metaphoric potential. These are books in the life sciences, because they yield the best metaphors, and "*books of trauma*" - for example, those which describe polar expeditions, exploration in general, and disasters at sea. The books serve to increase bonds between group members and to alert them to many basic life situations for which creative ideas and inventions are necessary. There are discussions with the group as to how their industry fits into the National and Global economy and how they fit into their company's value system.

With this as groundwork, the group selects one of the problems presented to it by the company for solution - trainers help it apply synectic mechanisms either by demonstrating the mechanisms or by replaying tape recordings of the sessions to correct the errors that the group may have made and to alert them to appropriate uses.

Throughout the year the group is in training, each of the individual members tries to develop an understanding of the work activities of the other members. In this manner, the group becomes better integrated. The group is also made to feel it must move faster than similar groups in existing traditional large corporations.

There are certain reactions that need to be guarded against during the early experiences of the group. One is the feeling of guilt. Although the group works hard and long, its members may nevertheless be vulnerable to guilt feelings. Members may find the work not onerous but enjoyable. Selectees also suppose that they are expected to conform to certain roles; it takes them time to learn that they are expected to behave as they wish. Finally, during the early days of training, selectees are cynical until there is some successful experience.

Gradually, the trainers become less and less important to the success of the group, until finally the group works independently of them. Independent sessions, however, are tape recorded for later evaluation by the trainers. Since the group works on company problems, management is in a position to pace and during the training program, rate the quality and quantity of the group's accomplishments.