# Using the Nominal Group Technique (NGT) Effectively

The NGT, if used properly, can help the JFS and JT&E Directors to effectively use the knowledge and expertise of subject matter experts (SMEs) who often have diverse views and opinions. The NGT provides the means of arriving at an agreeable consensus for groups as few as ten and as large as several hundred. The technique results in the identification of the most important elements that must be considered in a JT&E out of a larger list of alternatives. The technique must be carefully planned, rehearsed, and executed. One or more prior practice sessions are critical to the successful employment of the NGT.

The NGT is performed as follows: A group, e.g. 20-25 SMEs, are brought together to address a limited number of operational topics (e.g. tactics, techniques, procedures). The facilitators must develop a focus area prior to applying the technique. To illustrate the application of the NGT, consider a JFS objective related to non-Naval Service integration of helicopters that must interoperate with the command and control (C2) node of a Landing Pad Helicopter (LPH) ship and be integrated into the ship's aircraft flight operations. In this case, the SME's brought together must identify important issues that relate to aircraft shipboard certification processes (e.g. electromagnetic interference, deck loading, deck space, etc). Each member of the group is asked to provide their thoughts regarding this topic in a short statement. There is no debate allowed during this phase of the process. This prevents domineering persons from overriding another's inputs and ensures that those who are normally inhibited have the opportunity to participate in the process without being biased or responding to another's bias. The idea/issue provided by the participant is listed on butcher paper and numbered. The process continues around the table of participants e.g. 20-25 people. Once each participant has had at least one opportunity to provide input, the process is repeated. This continues until there are no more inputs by the participants (when a participant has no input, they verbably state that they pass. They can participate in the next cycle.). On average, there will be approximately, on average, 45 to 50 issue items listed by the group (each issue is numbered sequentially). The next step is to consolidate the listed issues by identifying those that are closely similar. This is a group process and limited discussion is allowed. The facilitators must maintain a reasonable level of control and be proactive in identifying when progress is no longer being made and move on to the next topic. There is usually 35 to 40 items remaining (no need to change the numbers that were sequentially assigned). Next is the voting process that utilizes preprinted cards that have a space for the Issue #, the issue topic, and a rank score. The NGT rules for scoring are: for 15 or less ideas/issues on the list use 5 cards, for 16 to 30 use 7 cards, and for greater than 30 issues use 9 cards. Each participant, privately, now selects their most important or highest priority idea/issue from the larger list of ideas/issues. One idea/issue is written in the center of each card with the sequential idea/issue number from the chart recorded in the upper left hand corner. Next the participants rank their ideas/issues (the cards should have been filled out, with the exception of the rank field, before the ranking process begins). The highest rank is based on the total number of cards passed out to the participants with the highest number being ranked as the most important (e.g. for nine cards, the highest rank number is "9"). Record the number in the lower right corner of card. Next, the participants are asked to rank the lowest priority (a proven mental game that forces the participants to look at each remaining idea/issue from a different

perspective) - this idea/issue is assigned a "1". Note that there is no discussion allowed during this process and absolutely no one can be allowed to argue any specific point (discussions are concluded at the idea/issue consolidation stage) - the decision process is based on the knowledge and understanding of each individual participant. This process is repeated with the participants assigning the next most important item an "8", then the next most least important a "2", and so on.

The scores are then tallied (probably during a break using a simple computer program that tallies the scores or doing them manually by sorting the cards by idea/issue number, then tallying the score). The vote tally process is done in a manner that reflects the number of votes (number of participants voting) and the total score of the vote for that idea/issue. e.g. idea 7 - 11/99 indicates that 11 people voted for idea 7 and each assigned a score of 9. The number of voters and total scores is important to note to prevent a small group from overriding a larger group e.g. in a group of 10 people, 3 voted a score of 8 to provide a score of 3/24 whereas 7 assigned a score of 1 giving a score of 7/7. For the most part, a larger sample size of participants typically negates this problem. The scores are then rank ordered by score. Those with the highest score are considered by the group to be the most important idea/issue, those of the least score are of lesser importance. This will provide a scientific based means for obtaining consensus from the group. The document further elaborates the process and provides additional clarifying information for applying the NGT.

For groups larger than 25, recommend that the larger group be broken down into subgroups of 20. The described process is completed in these smaller forums. The results are brought back into the larger group and placed on new butcher paper and sequentially numbered (new numbers assigned). The consolidation process is repeated and the larger group goes through the same voting process as above. Keep in mind that the results will require more time to calculate because of the larger number of voters.

# Using the Nominal Group Technique Effectively

The Nominal Group Technique helps groups generate ideas and reach consensus through a five-stage structured process.

D. Scott Sink

Since 1969, when the Nominal Group Technique was first tested, interest in and applications of this structured group process have grown exponentially. What began as a technique to enhance the effectiveness and efficiency of program planning in health services has rapidly expanded into the areas of productivity measurement systems development, strategic planning and strategy implementation, participative problem solving, and many others.

This article will describe what the Nominal Group Technique is, briefly outline how to use it, and describe case studies of actual applications.

## Background of the Nominal Group Technique

Developed by André P. Delbecq and Andrew H. Van de Ven in 1968, the Nominal Group Technique (NGT) is a special-purpose behavioral science technique that is useful in situations where individual ideas and judgments need to be tapped but where a group consensus is the desired outcome. The NGT is essentially a very structured and therefore very effective and efficient mechanism for idea generation and group consensus seeking. It is useful when a specific task or question already identified requires a group's ideas and judgment.

The NGT has come along at a particularly appropriate time in the evolution of management thought, technique, and practices. Most American managers are reexamining basic philosophies and practices, and for many this has involved giving increased attention to group processes and techniques. Improved commitment, understanding, communication, coordination, and cooperation are viewed as valuable outcomes. Quality circles, productivity action teams, quality-of-work-life programs, team building, and productivity gain-sharing plans such as Improshare, Scanlon, and Rucker all place important emphasis on group processes and behavior.

Experience is proving that the quality, effectiveness, and efficiency of specific group processes play a

*The Nominal Group Technique is a social-science breakthrough that managers can apply relatively easily.*

significant role in the overall success of these programs and techniques. And since managers often spend as much as 80 percent of their time in meetings, the quality of the group processes utilized in these meetings has a great impact on managerial productivity.

Unfortunately, group processes too often leave participants exhausted and discouraged because of the seemingly endless meanderings into unfruitful byways in what has been called "reactive search"—a search focusing on initial responses rather than a continuing creative flow; the focus effect that occurs when a group is unable to extricate itself from one channel of thought; or the mixing of solutions with problems and problems with solutions. What group has not rushed to "solutions" before the problems were clear? Felt frustrated by overbearing extroverts who dominate the sessions? Suppressed disparate or conflicting ideas because of differences in authority, prestige, age, race, sex, or levels of professionalization? What group has not experienced the general lack of creativity and absence of a sense of closure or accomplishment that leaves participants feeling impotent, bored, and frustrated?

In a management era where participative decision making and problem solving are increasingly common, techniques like the Nominal Group Technique have been quite welcome. For while the NGT is not itself a program but a participative data collection and consensus-forming device, it can be an important component of participative, group-oriented programs.

The NGT has proved to be extremely effective in that it is (1) easy to learn, (2) applicable to a wide variety of areas and situations, (3) easy to integrate into programs and projects of larger scope, (4) highly satisfying to participants, and (5) quite successful at inspiring a commitment to action, follow-through, and follow-up.

In short, the Nominal Group Technique is a real and very timely social-science breakthrough that managers can relatively easily and successfully apply.

# How to execute the Nominal Group Technique

The NGT is a structured group meeting that proceeds along the following basic format:

1. Individual "silent generation," Delbecq's and Van de Ven's term for the writing of ideas by the group members; 3x5 cards
2. Individual round-robin feedback from group members of their ideas, which are recorded in a succinct form on a flip chart;
3. Group clarification of each recorded idea;
4. Individual voting and ranking on priority ideas; and
5. Discussion of group consensus results and focus on potential next steps.

## Silent generation

Imagine a typical meeting room in which five to twelve individuals are seated around a U-shaped conference table. A facilitator/leader addresses the group, stating the purpose of the meeting, the desired outcomes, and the general character of the NGT. A written task statement is passed out to each participant, and the individuals are asked to silently respond to the task statement.

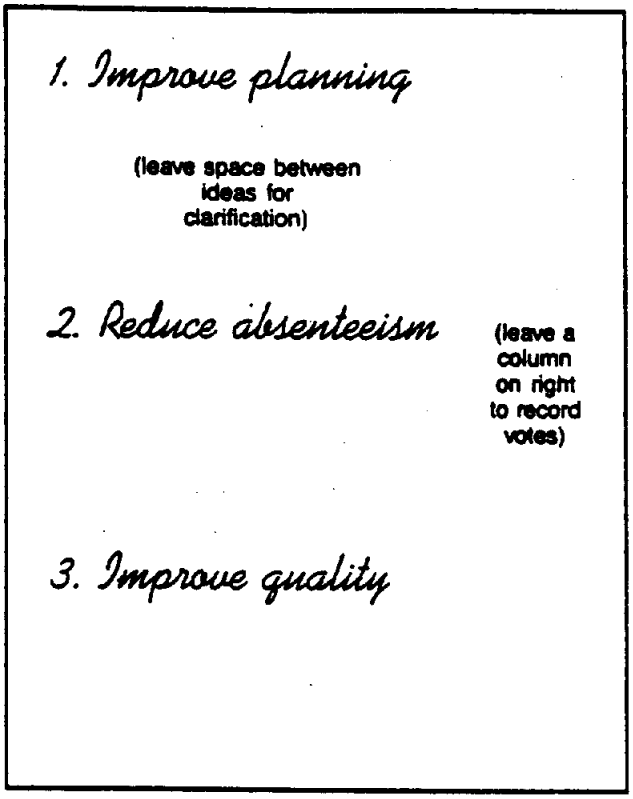
## Round-robin feedback

After from five to fifteen minutes, a structured sharing or presentation of ideas takes place. Each individual, in round-robin fashion, presents one idea in a succinct, three- or four-word phrase from his or her list. An assistant, recorder, or the facilitator writes that idea on a flip chart in full view of the other participants. Each idea is given a sequential number. There is still no discussion at this stage in the NGT session.

Round-robin listing of ideas continues until all of them have been recorded on the flip charts. As the charts are filled, usually with from three to four ideas per chart page, they are taped up on walls in full view of the participants. The round-robin phase typically will take from fifteen to twenty-five minutes, depending upon the number of participants, producing a list of from fifteen to sixty ideas or responses to the task statement. One can typically expect from two to three ideas per blue-collar participant and from four to five ideas per professional and/or managerial participant. Figure 1 depicts a sample flip chart page.

*Hierarchical consistency between ideas on the list is often a problem.*

**Figure 1**
**Sample Flip Chart Page**




## Group clarification of ideas

The next stage of the NGT incorporates a structured group discussion of all the ideas. The purpose is for the facilitator to ensure that the list is collectively exhaustive and nonrepetitive. This can be done by asking the participants to scan the list to ensure that each item is clear to them, items do not overlap, items have not been left off, and there are no items that need to be combined or even deleted. The clarification stage is typically the part of the technique where the group is most likely to get bogged down. Hierarchical consistency between ideas on the list is often a problem. That is, one idea may be broader or more general than another and questions will arise as to which should be combined with which and how specific or narrow an idea should be. The facilitator should let the group decide on hierarchical consistency but be alert to the danger of prolonged and disruptive argumentation. A steady pace must be maintained. This stage takes between twenty and thirty minutes.

A convenient way to overcome the difficulties that arise during the clarification period is to allow participants to depict overlap or hierarchical dependencies on the voting cards to be discussed in the next section. In this way, each participant can depict his or her perception of interdependencies between ideas without forcing the group to agree with the logic in the session itself.

For example, a number of ideas posted during the round-robin stage may overlap or be similar in terms of focus, intent, and/or context. Often, no clear consensus with respect to the combining of like ideas may emerge during the clarification stage. In these situations, the facilitator may allow individuals to identify what they perceive as overlap between ideas and to note this during the next stage. At that time they can vote for the idea within the overlapping group that most represents the point they feel is important and simply record overlapping ideas on the back side of that particular voting card. When the votes are tabulated and recorded on the flip charts, ideas that members perceived as overlapping may be identified accordingly.

## Individual voting on ideas

The fourth stage of the NGT provides an opportunity for individual voting on the ideas. Each participant is provided with from five to nine 3x5 index cards. (If there are fifteen ideas on the list, use five cards; if there are from twenty to thirty, use seven cards; and if there are more than thirty, use nine cards.) Figure 2 depicts such a card.

Each participant, privately, selects his or her *n* (from five to nine) most important or highest priority idea subset from the larger list of ideas. One idea is written in the center of each card. The sequential idea number from the flip chart pages is recorded in the upper left-hand corner of the card for each of the *n* selected ideas. Again, if members feel there is overlap among ideas that did not get resolved during the last

*If the ranking process fails for any reason, the entire NGT meeting is essentially wasted.*

**Figure 2**
**Typical Preprinted Card for Voting and Ranking**

IDEA #_____

IDEA_____

_____

_____

_____

RANK _____

stage, they may, on the back side of the voting card, note ideas that they perceive have commonality. The sequential number of the overlapping idea is sufficient notation. Next, each participant privately identifies priorities by ranking the ideas.

A very reliable and valid method for structuring this ranking process is to ask the participants, once they have finished identifying their *n* most important ideas, to spread the cards out in front of them. The participants are then each asked to choose the most important ideas of the ones selected and assign the highest number (from 5 to 9, depending on how many ideas were selected in the priority subset) to that idea. This value is recorded in the lower right-hand corner of the card. The participants are then asked to set that ranked card aside and to select the least important idea of the remaining ideas. This idea is assigned a value of 1. The participants are then asked to identify the most important idea of the remaining ideas and to assign it the second highest number. This outside-in ranking process continues until all ideas have been assigned a number and have thereby been arranged in priority order.

It is important for the facilitator to maintain pace during this stage. If the ranking process fails for any reason, the entire NGT meeting is essentially wasted, since the primary goal is to achieve a group consensus.

## Discussion of results

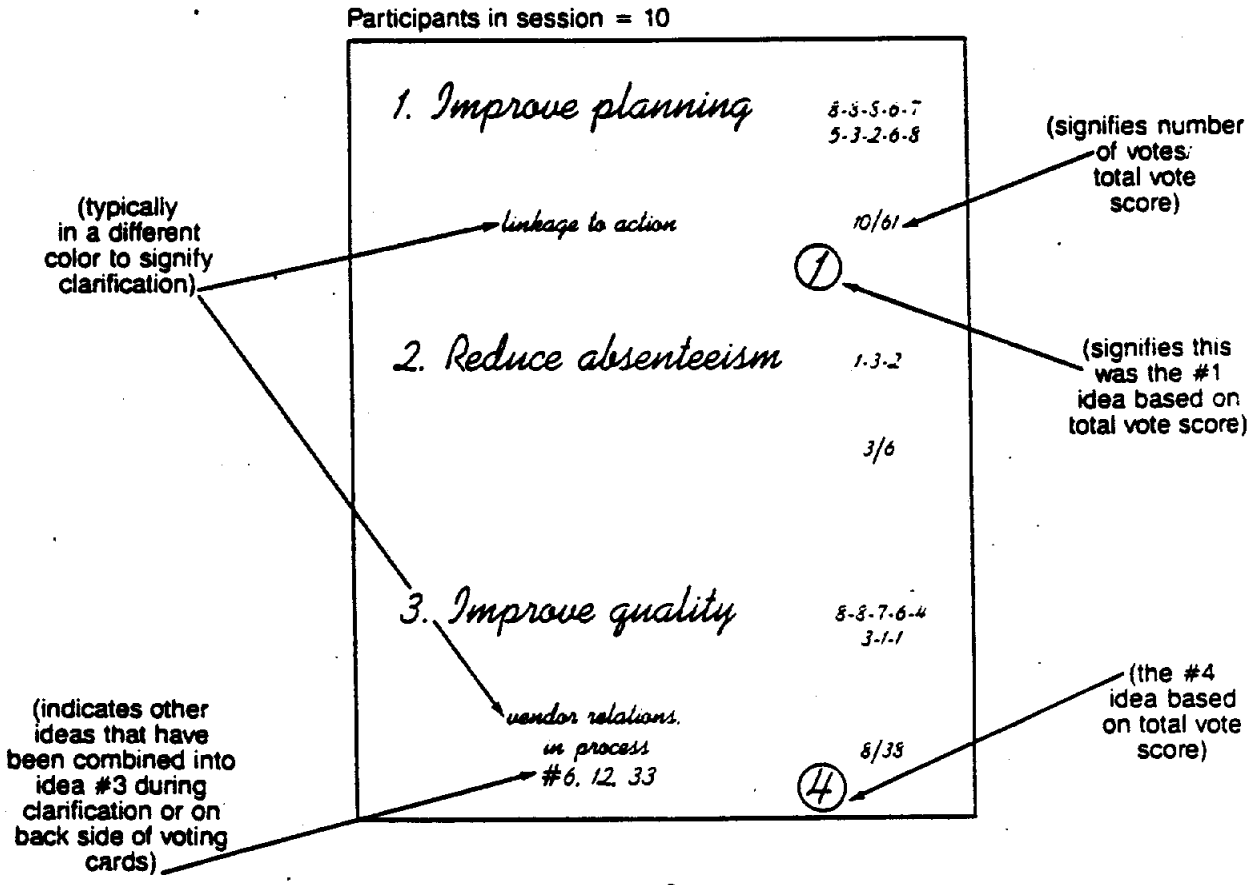
Figure 3 depicts a typical flip chart sheet after this stage. The discussion of results typically focuses on participants' perceptions of consensus priority ideas. The facilitator should point out that there are two types of consensus: strength of vote score and number of votes. For example, in a group of ten persons, three members could give one idea an 8 while the other seven members might not select it at all. On the other hand, all ten members might have given another idea a 1. The former idea has a score of 24 while the latter has a score of 10. On the basis of strength of score, the first idea is "more important." But on the basis of number of votes the second idea is clearly "more important"—more people have selected it as belonging among the *n* (from five to nine) most important ideas although its ranking among those ideas may be low.

Discussion then typically focuses on what the group might do next if the results are to be used as a component of a larger effort, such as a quality-circle program, a productivity improvement effort, a planning activity, a productivity measurement process, etc. The NGT, as mentioned, is primarily a data collection and a consensus-shaping methodology. Therefore, the session produces a prioritized list of responses to a particular task statement or question (e.g., identify and list ideas for productivity improvement). (For summary format for NGT results, see Figures 5, 6, 7.)

But the primary value of the NGT lies in its capacity for developing commitment and other behavioral outcomes that spur action on behalf of a larger effort (productivity improvement, quality circles, etc.). Such post-process outcomes are generated by the nature of the NGT activity itself.

The final discussion stage is crucial for the effective utilization of the NGT results—both the ideas, or process output, and the post-process behavioral outcomes. For this stage to achieve its purpose, two conditions are crucial. First, the program designers and related management personnel must have thought through the short- and long-term goals of the larger effort and how the NGT results can be used in achieving them. Then, during the discussion stage of the NGT, an action plan focusing on use of the NGT results can be presented, evaluated, and developed further. For example, if a particular NGT session focused on developing

**Figure 3**
**Typical Flip Chart Sheet at End of NGT Session**




a prioritized list of problems within a particular work group, an action plan for tackling the top priority problems can be developed. Such an action plan would necessarily deal with a list of activities, sequencing for those activities, costs and benefits, the persons responsible and accountable for the overall plan as well as specific activities, alternative approaches to solving the problems, and target dates for obtaining the expected results.

Second, considerable leadership judgment is required during the discussion stage of the NGT. The NGT process itself imposes structure and requires specific facilitator behaviors in the first four stages but not in the final discussion stage. In that stage, the level of task-directed leadership that is appropriate seems to vary significantly from group to group. The facilitator needs to be able to perceive and respond appropriately to a particular group's need for structuring of the ensuing steps. Without sufficient leadership, participants will leave the meeting with a commitment but without a mechanism for follow-through. In some cases leadership emerges from the group itself, and this should be encouraged. However, in other cases a significant degree of direction and perhaps even task assignment will be required from the facilitator.

## NGT results and participation programs

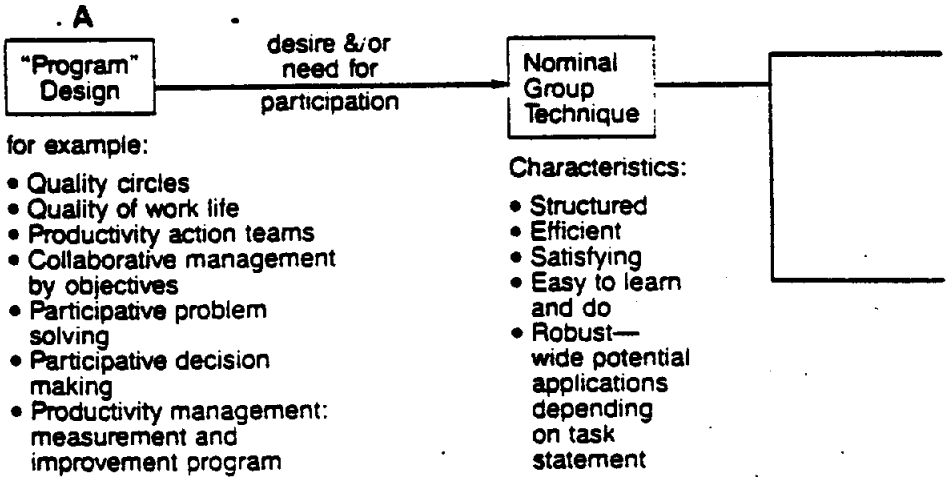
One way to conceptualize the linkage of results from an NGT session to the goals of a larger program, such as a quality-circle effort, a productivity measurement process, or a planning activity, can be depicted in Figure 4. The Figure suggests that in those cases where programs involving participation are desirable and appropriate, the NGT can play a central role.

Programs listed in box A have been growing in popularity and, probably, in appropriateness in the U.S. All of these programs entail a relatively high degree of participation and therefore are prime candidates for application of the NGT. In fact, the NGT has been utilized successfully in all of the types of programs listed. It has been found to be a very effective and efficient mechanism for structuring early stages of participation. It has also been found to be highly reliable for producing desirable process output (box B). That is, the probability is quite high that a correctly managed NGT session will create a high quality list of prioritized ideas. In the past six years I have personally conducted over fifty successful NGT sessions that generated such lists; only one session ended in failure.

The generation of certain post-process behavioral outcomes (box C) is also highly likely. Experience has shown that satisfaction with the session itself, willingness to follow up, actual follow-through, commitment to future involvement and future steps, and general employee development are all reliable post-process outcomes. In a sense, the NGT process sets up certain critical psychological states deemed necessary for the achievement of many of the desired outcomes (box E) from the larger program effort. Critical psychological states reflect job-related attitudes such as a felt responsibility for outcomes associated with the job, experienced meaningfulness of the particular job, and perceived significance of the task. Job design and job enrichment theory and research suggest that any process that can positively affect these and other critical psychological states has a high probability of causing one or more of the desired outcomes to occur.

Regardless of the success of the NGT in terms of creating process output and post-process outcomes, it cannot be utilized in larger-scoped programs without management leadership and support. Note that box D, leadership structure for action planning and integration of NGT results into the larger program effort, reflects a critical component in the process of utilizing NGT results. It influences, and in some cases even directly

**Figure 4**
**Role of NGT in Employee Participation Programs**



*The range of NGT applications has increased sharply in 13 years.*

determines, the extent to which desired outcomes are actually achieved. Experience suggests that without leadership intervention, the desired outcomes from programs such as those listed under box A are less likely to take place.

In the past six years, the author has been involved in numerous applications of the NGT in a variety of organizations. In each case, management utilized the NGT as an early, sometimes even initial component of a program designed to achieve one or more of the desired outcomes listed under box E. Three specific case applications of the NGT are briefly described in the following section. Their purpose is to assist the reader in thinking through applications that might be appropriate in his or her organization. These case studies do not represent empirical research on the effectiveness of NGT applications. They do represent specific systematic yet pragmatic attempts to improve the effectiveness and efficiency of employee involvement activities in organizations.

## Case studies

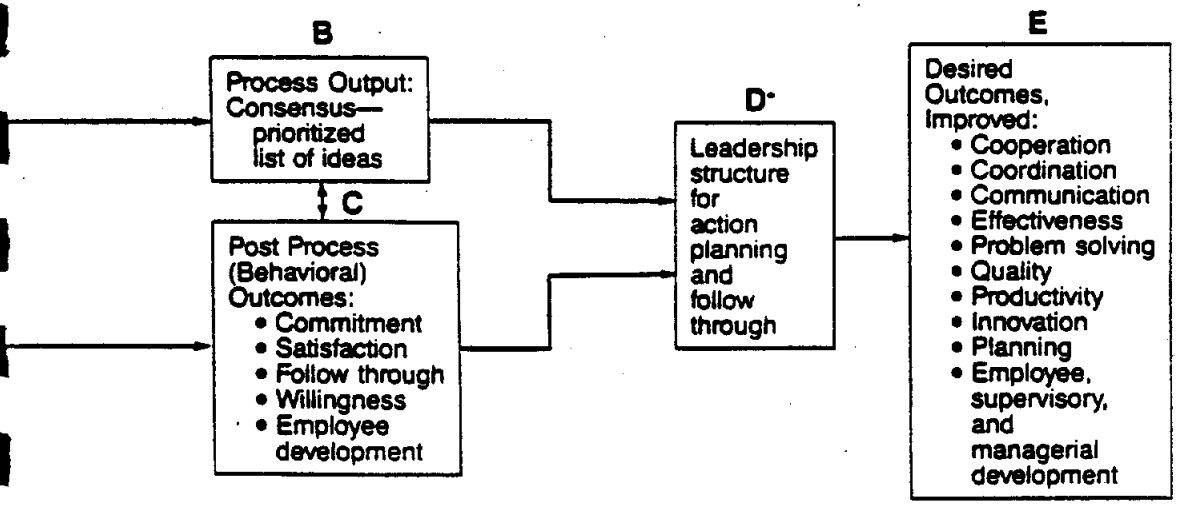
In the roughly thirteen years that the NGT has been available to managers, educators, and researchers, the range of its applications has increased significantly. But perhaps the most important areas for application of the NGT in U.S. organizations have been the following:

1. Planning processes—NGT is used to increase the amount and quality of participation in and thus, it is hoped, commitment to the planning process, to link strategic planning to strategic as well as tactical and operational actions;
2. Productivity measurement system design and development—NGT is used to generate "normative" productivity measurement systems composed of measures, ratios, and/or indexes;
3. Participative problem solving—NGT is used in programs like quality circles and productivity action teams as a mechanism for increasing the effectiveness and efficiency of identification and selection of priority opportunities, problems, causes, alternatives, etc.

Brief descriptions of an actual case study for each of these three applications will now be presented.

### NGT applications in the planning process

An academic department at a major university



*A university department faculty using the NGT in short-range planning tends to "buy into" the objectives.*

initiated a planning process several years ago. The basis for the planning process came from work done by Peter Drucker in 1954.

Phase I of the planning process implementation focused on getting the faculty acquainted with planning concepts and comfortable with thinking in longer range terms. The stress was on developing department goals that were congruent with overall university goals and were acceptable to the faculty. Several years were spent on this early phase.

When the department head concluded that the faculty was ready to move to Phase II of the planning process, attention began to focus on linking strategic planning to strategic, tactical, and operational actions.

In the first year of Phase II, the stress was almost entirely on developing objectives, targets, and responsibilities for each major goal. At an annual planning retreat during the second year of Phase II, the department head decided to incorporate the NGT as a component in the planning process. Specifically, the NGT was used to generate one-year objectives for the department. The faculty received a brief explanation of the process and the technique and were then asked to respond to the following task statement: "Please list below specific objectives that our department should be working on during the next year." Each faculty member had received information on the university's as well as the department's long-range goals. Therefore, short-range planning incorporated thinking about strategic actions. Results of this NGT session are shown in Figure 5.

### Evaluation

This particular academic department has now been utilizing the NGT as an integral part of the planning process for four years. Initially there was some skepticism concerning the technique, particularly regarding its highly structured nature. But subsequently, acceptance of the technique has been so high that over a third of the department's faculty has used it in other applications outside the department itself.

Prior to inclusion of the NGT to set one-year objectives for the department, the planning process was significantly more top-down. Goals and objectives for the department were generated by its head and then cursorily discussed by faculty. And the general perception was that substantive follow-through on objectives was minimal.

Since the inclusion of the NGT in the planning process, setting one-year objectives for the department is significantly more bottom-up and participative in character. General perceptions are that faculty are significantly more involved in the short-range planning process and as such have tended to "buy into" the objectives themselves. In the four years this process has been used, the department of fourteen faculty members accomplishes an average of between ten and twenty significant department-related objectives per year. Note that these objectives are group objectives and are in addition to individual faculty position responsibilities.

The department for a number of years has earned a reputation as one of the better in the country from an administrative and academic standpoint. There is considerable agreement among the faculty that a primary reason for this success is the quality of the planning process. The NGT has been a significant component in this process.

## Design and development of productivity measurement systems

A supervisor of a department of twelve engineers in an equipment service division of a major U.S. corporation returned from a three-day course on productivity measurement and improvement. She was particularly impressed by her exposure to a multifactor, firm level productivity measurement model and what had been called a "normative" productivity measurement approach. The latter approach, she had been told, was appropriate at the group level and, in particular, was very useful for hard-to-measure applications.

Using the NGT, this approach assigned members of the organization the task of developing the components of a productivity measurement system. The approach appeared to have been quite successful in other organizations at linking productivity measurement to productivity improvement actions. She was very excited about implementing it, as her greatest difficulties in the past had been precisely the linking of planning for improvement to specific individual engi-

**Figure 5**
**Academic Department Application of NGT for Setting One-Year Objectives**

Group: Industrial Engineering Department

Facilitator Name: Scott Sink

Date: January 27, 1978

Number of participants = 14
n (number of objectives/action programs asked to vote for) = 8

Task Statement: "Please identify specific action programs or objectives our department should be working on and accomplishing during the next year."

Key: O—Programs which are aggregates as result of clarification
S—Programs for which subprograms were identified in subsequent sessions
D—Programs which became topics of discussion during open session
I—Programs for which implementation was discussed

| | Action Program/Objectives | Votes Received 8 = Most Impt., 1 = Least | Total (number of votes/total vote score) |
|---|---|---|---|
| ISO | 1. Faculty Development | 8-8-8-8-8-8-8-7-6-5-4-4-1 | 13/83 |
| O | 2. Graduate Recruitment | 8-7-7-7-5-5-5-4-3 | 9/51 |
| DSO | 3. Industrial Liaison | 8-8-7-6-6-4-4-3-2-2 | 10/50 |
| DO | 4. Faculty Support | 7-7-7-6-6-3-3 | 7/39 |
| SO | 5. Intra. Communication | 7-6-5-2-2-2-1 | 7/25 |
| | 6. Working Papers | 8-6-4-3-1 | 5/22 |
| | 7. Minors Ph.D. | 6-4-4-2-1-1 | 6/18 |
| O | 8. Course Content Coordination | 4-3-3-3-2-1 | 6/16 |
| | 9. National Conference | 5-5-5-1 | 4/16 |
| D | 10. Coop Program | 8-3-2-2 | 4/15 |
| | 11. Interdisciplinary Research | 7-6-1 | 3/14 |
| | 12. Graduate Support | 7-4-3 | 3/14 |
| | 13. Timeliness of Info on Funding Opportunities/RF | 6-5-3 | 3/14 |
| O | 14. Begin-End Courses Evaluation | 6-5-3 | 3/14 |
| | 15. Manufacturing Institute | 5-4-2 | 3/11 |
| O | 16. Indices | 7-3 | 2/10 |
| | 17. Material Handling/Plant Layout | 6-4 | 2/10 |

(Note: There were 41 objectives; 33 received votes; the 17 top vote getters are listed in the figure.)

neer behaviors. The risks and costs, she had been told, were that the quality of the measurement system initially might not be as good as she would like and that her engineers would have to spend some time participating in the development of the measurement system. She was reluctant to involve her engineers in activities that were not directly productive but decided it was an investment that could have significant direct as well as indirect benefits.

Based on what she had learned at the course and on further suggested readings, she developed the following plan of action:

1. Hold productivity basics seminar with engineers (one day, outside consultant);
2. Make informal assessment of response to the subject with individual engineers;
3. Present proposal to engineers for develop-

ment of productivity measurement system;

4. If accepted, run NGT session to develop consensus list of productivity measures, ratios, and/or indexes;
5. Review results and discuss next steps with group; and
6. Integrate and operationalize results with current control system.

The plan was well received by the engineers, and an NGT session was run to develop productivity measures, ratios, and indexes. Results of the NGT session are presented in Figure 6.

## Evaluation

The engineers were highly pleased with the NGT session and its results but were unclear as to what came next. They voiced concern over how the measurement system would integrate with the existing individual performance appraisal and merit evaluation system.

In response to their concern, the supervisor asked them if they would like to go a step further and become involved in using the NGT-generated results to design the department's productivity system. Their unanimous response was that they wished to be involved so long as she felt they could contribute and so long as their participation did not interfere with their projects and duties. The result has been that as she has developed the productivity measurement system—guided by the NGT results—she has periodically submitted it to the engineers for review.

The group has since used the NGT to generate consensus ideas for productivity improvement. Action teams are set up and subgroups of engineers work on specific priority projects identified by the department itself.

The supervisor and the engineers are pleased with the role the NGT has played in structuring group

**Figure 6**
**Results from NGT Session to Develop Productivity Measures, Ratios, and/or Indexes**

Group: Engineers
Facilitator: Scott Sink
Date: 6/25/82

Number of participants = 12
n (number of measures asked to vote for) = 8

Task Statement: "Please list below measures, ratios, and/or indexes of productivity that you feel this engineering group should use to monitor, evaluate, and control productivity performance for the group."

| Measure, Ratio, Indexes | Votes Received 8 = Most Impt., 1 = Least | Total (number of votes/total vote score) |
|---|---|---|
| Number of times our clients ask for our help | 8-8-6-4-8-3-1 | 7/38 |
| Measurable output / Resources utilized | 8-8-8-8-8-8 / 8-7-4-8-5-1 | 12/81 |
| Projects completed on time and within budget | 7-7-6-7-5-3-8-7-5 | 9/55 |
| Customer satisfaction | 1-3-7-6-6-6 | 6/29 |
| Percent of group objectives accomplished on time | 7-7-7-6-6-7-4-3-5-4-5 | 11/61 |
| Percent of successfully implemented projects | 7-6-6-6-5-4-3-1 | 8/38 |

activity in both the area of productivity measurement and improvement. They sense substantial progress within the department regarding group goals and objectives. The engineers seem pleased that they have been able to contribute to the design of a productivity measurement system. They are particularly pleased with the opportunity to work together as a group on common problems and opportunities.

## Participative problem-solving programs

A plant manager for an oil-industry-related manufacturing and fabricating company with 250 employees implemented an employee involvement program with the help of a local state university. The program began with a pilot-study group of eleven welders plus their supervisor. The NGT was an integral component of the program.

During the first meeting of the group, the NGT was used to identify and set priorities for ideas on productivity improvement. The results of this session are shown in Figure 7.

After the first session, a management review committee screened the list to verify the quality of the ideas. The group of welders was then broken down into smaller action teams of three to five workers and assigned a specific idea to develop. Once taught how to develop alternatives for carrying out the ideas, each action team presented a proposal to a management review committee for approval. The committee then decided how to proceed.

### Evaluation

The plant manager has noted progress in all of the four top priority areas targeted by the welding group for productivity improvement. Perhaps even more important is the improvement in worker attitudes that he has observed. In fact, the plant manager has commented that the major gain achieved through the par-

**Figure 7**
**Results from NGT Session to Develop Ideas for Productivity Improvement**

Group: Welders on shop floor
Facilitator: Scott Sink
Date: 6/17/82

Number of participants = 11
n (number of ideas asked to vote for) = 8

Task Statement: "Please list below ideas for improving productivity, effectiveness, and/or efficiency of your work group."

| Idea | Votes<br>8 = Most Impt., 1 = Least | Total<br>(number of votes/total vote score) |
|---|---|---|
| Interdepartment and intershift cooperation and coordination | 8-8-8-8-8-8-7-7-6-4-3 | 11/75 |
| Labor-management relations | 8-8-8-8-8-7-7-7-7 | 9/68 |
| Unnecessary non-conformances, improve quality control procedures | 7-6-5-4-4-3-2-2-2-2-2 | 11/39 |
| Improve scheduling, reduce set-up time | 7-6-4-3-3-2-2 | 7/27 |

(Note: The welders identified 22 ideas for productivity improvement. The NGT helped them reach the level of consensus shown above in an hour and a half.)