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## **MODIFIED NOMINAL GROUP TECHNIQUE: WHAT AND HOW**

### **Abstract**

Continuous improvement in quality of products/services, more often than not, requires implementation of new ideas in the systems. Consequently, generation of good ideas is regarded as a crucial task in quality management. This paper shows how a traditional brainstorming technique can be integrated with the analytic hierarchy process in generating and subsequently prioritizing a large number of ideas. The working of the integrated technique has been shown by means of two exercises: (1) Identifying important factors to improve quality in teaching, and (2) Identifying important factors to improve quality in academic institutions administration. The method can be applied in many similar situations.

### **Keywords**

Nominal group technique, analytic hierarchy process, quality in higher education, total quality management.

## **Introduction**

In today's highly competitive business world, national/multinational companies increasingly demand that their employees find new and better ideas so that the jobs are done in better ways. The most common way to generate ideas is to take the relevant people in a room and brainstorm. Each mind is filled with ideas that can be valuable to decision making and problem solving. Brainstorming is one way to access this information, experience, and judgment.

The history of brainstorming dates back to 1954, when Osborn published his seminal work [8]. With illustrative examples, he explained how brainstorming could be used to help groups generate ideas. Osborn's central theme

was that group can generate more ideas if their members concentrate on producing whatever ideas come into their minds while avoiding evaluation of their own and others' ideas. However, it is to be remembered that simply bringing people together does not assure maximum participation and quality group decision. Brainstorming sessions are often more storm than brain. It has been observed that the sessions are dominated by only a few individuals who impose their ideas upon the majority. To overcome the difficulties in this traditional brainstorming technique, researchers have developed a number of structured variants of it including Delphi technique [6] and Nominal Group Technique (henceforth NGT) [2]. The NGT has alleviated many of the difficulties present in the traditional brainstorming technique. Before proceeding further, a brief description of NGT is provided.

## **1. A brief description of NGT**

In business today, it is necessary to stimulate employees to generate fresh, creative, and productive ideas for the benefit of the organization. NGT is a management tool that is being increasingly used to generate a large number of ideas. The technique is helpful in identifying problems, exploring solutions and establishing priorities among the solutions generated. It structures group interactions to elicit the information and judgments of individual participants and to promote the development of a consensus among all group members. The technique has the following steps (the steps are also shown in Figure 1):

1. Enunciation of the statement of the question pertaining to the issue.
2. Silent generation of ideas in writing.
3. Round-robin recording of ideas.
4. Serial [consecutive?] discussion of the ideas.
5. Voting to select the most important ideas.
6. Discussion and reaching consensus on the selected ideas.

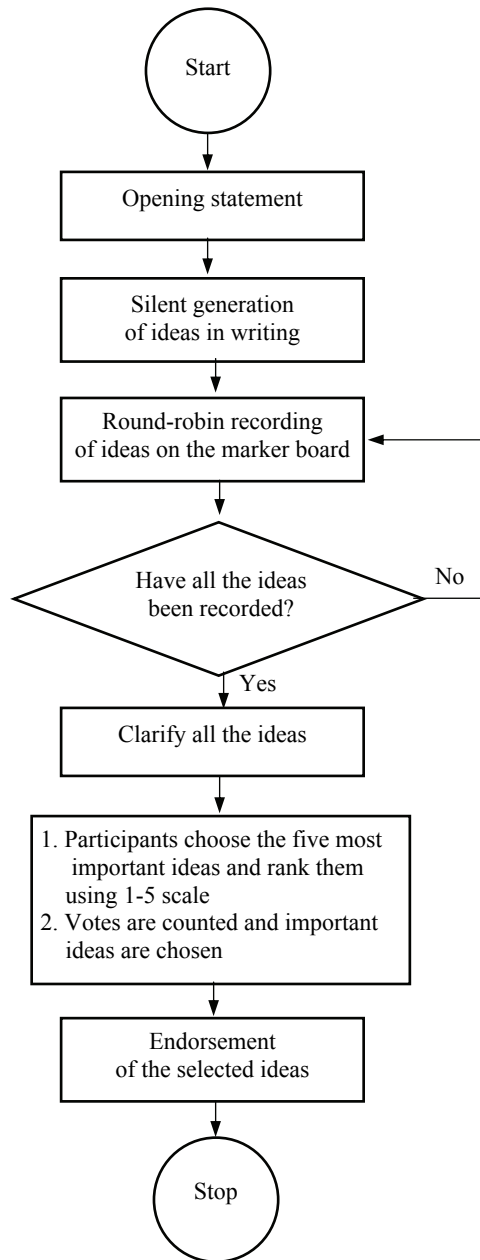


Figure 1. Steps in Nominal Group Technique

For a successful nominal group session, the following rules should be observed:

- No criticism on any idea during the session.
- The more unusual and original the idea, the better.
- While generating ideas, quantity not quality is the primary objective.
- Dissecting, modifying and commingling of ideas is desirable.
- Anonymity of input.
- Defer in-depth evaluation until all the inputs are displayed.

Although the nominal group technique has been applied in manifold areas it has received criticisms from many researchers. To alleviate its limitations, a number of modifications have been proposed. A brief account of proposed modifications has been provided in the following.

## 2. Previous modifications of NGT

Since the introduction of NGT, a number of modifications of the technique have been proposed. Fox [3] proposed to use  $3 \times 5$  cards to provide all the ideas by one person at one time instead of round-robin recording of ideas. Although it ensures anonymity of the participants, its shortcoming is that one cannot get stimulated by other's ideas. To increase group member participation, Bartunek and Murningham [1] suggested one of the two possible voting procedures: (1) Vote for an idea at one time with a minimum number of votes for selection. (2) Vote as described in (1) but eliminate the ideas with only few votes prior to the additional voting. In addition to the above, NGT has been combined with other methodologies. Some of the integrated methods are: NGT and Multi-attribute utility theory [11]; NGT and Multi-dimensional scaling [4]. Also in numerous studies, NGT has been compared with Delphi technique.

One major issue pertaining to NGT in its existing form is that it assigns ordinal weights to the most important ideas. For example, 5 is assigned to the most important idea, 4 for the second most important one, and so on. This weighting scheme means that the difference (5-4) between the quality of most important and the second most important is same as the difference (2-1) between the 4<sup>th</sup> most and the 5<sup>th</sup> most. However, in reality, this may not be true. In order to overcome this difficulty, we propose to integrate NGT with the Analytic Hierarchy Process (AHP), a popular multi-criteria decision making method. The revised technique has been called Modified Nominal Group Technique (MNGT).

### 3. Proposed modification of the NGT

In the fifth step of NGT, the participants need to find out and rank the 5 most important ideas. In the existing framework of the methodology, there is no specific guideline to rank the best 5 ideas, rather they (the participants) have to do it by a holistic approach. The main objective of this paper is to show how Analytic Hierarchy Process (AHP) [10, 12] can be integrated with NGT to alleviate the above drawback.

Specifically, we propose to choose the five most important five ideas from the pool of ideas as it is done in the NGT. But unlike NGT, we compare these important ideas in a pairwise fashion, i.e., each idea in the chosen five is compared with all others one-by-one using Saaty 1-9 absolute scale. This will result in a pairwise comparison matrix from which the necessary priorities can be computed. Later, we have provided the advantages of this integrated method to generate and prioritize ideas in a nominal group setting.

To show the working of the integrated method, we have conducted two exercises.

#### Exercise 1

Teaching is an essential part in any academic institution. The quality of outgoing students depends largely on the quality of teaching in the classroom. The problem of improving quality in teaching in a classroom is long-standing [5, 7, 9]. The topic has drawn considerable interest from many researchers. With the development of newer technologies, research will continue on the topic. Staying on the same issue, we conducted a nominal group session. Thirteen (final year) students from the author's undergraduate class on Quality Management and two Master's of Management students took part in the session. In the following, all the steps plus the proposed modification have been described:

- Step 1. As the facilitator of the session, I (the author) posed the following question at the start of the session, "what factors contribute to quality teaching in a university classroom?"
- Step 2. The participants were given 10 minutes to generate ideas on the issue.
- Step 3. The whole session lasted about 85 minutes. Due to time constraint, I conducted only 3 rounds of round-robin recording of ideas. The ideas are shown in Table 1.

Table 1

Factors for quality teaching in an academic institution			
No.	Factor	MNGT Weights	MNGT Ranking
1.	Study materials and lecture should be well coordinated	0.061	
2.	Avoid bias	0.035	
3.	Lecturer should be a responsible person	0.398	8
4.	Lecturer should have relevant and in-depth knowledge	$0.559+0.567+0.191+0.579+0.567+0.495+0.352+0.355+0.461=4.126$	1
5.	Use relevant and clear visual aids	$0.032+0.055+0.174+0.053=0.314$	10
6.	Equipment provided and used		
7.	2-way communication	$0.541+0.239+0.288+0.133+0.106=1.307$	4
8.	Create conducive environment	0.083	
9.	Use of teaching aid, e.g. PowerPoint slides with OHP		
10.	Lecturer should make class interesting	$0.044+0.249+0.063+0.057+0.047=0.460$	7
11.	Fun learning environment		
12.	Lecture should be delivered in such a manner that students can understand	$0.092+0.045+0.139=0.276$	12
13.	Encourage creativity and openness	$0.079+0.101=0.180$	15
14.	Attitude of the students	0.205	13
15.	Smaller number of students	$0.048+0.041=0.089$	
16.	Respect each other	0.038	
17.	Flexibility of the lecturer		
18.	Encourage students to participate	$0.062+0.067+0.066=0.195$	14
19.	Time management	$0.145+0.048+0.037+0.085=0.315$	10
20.	Efficient and effective delivery of knowledge	$0.297+0.477+0.106+0.221+0.380=1.481$	3
21.	Use simple examples	0.146	
22.	Relate subject to the practical problems	0.079	
23.	Lecturer should gauge students' proficiency level		
24.	Lecturer should be able to recognize all the students in the class	0.047	
25.	Lecturer should have proper control over the class		
26.	Proper planning on the lecturer's part	$0.205+0.079+0.235=0.519$	6
27.	Reasonable duration of the class		
28.	Lecturer should be able to convince the students with his /her ideas		
29.	Give some group work		

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30.	Lecturer should ask thought provoking, interesting questions		
31.	Effective communication skills	$0.438+0.556+0.447+$ $+0.311+0.439+0.313=2.504$	2
32.	Proper choice of time slot	$0.038+0.062=0.100$	
33.	Lecturer should be aware about students' proficiency level	0.124	
34.	Personality of the lecturer	0.393	9
35.	Lecturer is well prepared	$0.061+0.216+0.166+0.269=$ $=0.712$	5
36.	Students centered approach in teaching	$0.084+0.218=0.302$	11
37.	Lecturer should discuss the answers of the mid-term and quiz question papers		
38.	Comfortable class room	0.060	
39.	Variety of teaching methods	$0.121+0.102+0.175=0.398$	9
40.	Deliver lectures at a reasonable voice and speed		
41.	No interruption during the lecture		

Legend: A = Lecturer should have relevant and in-depth knowledge, B = 2-way communication, C = Choice of proper time slot, D = Variety of teaching methods, E = Respect for each other, 'O' = quality teaching.

Step 4. A few ideas on the table were clarified, so that all the participants had proper understanding about them. The purposes of this step are to (1) ensure that all the participants have proper understanding of all the ideas, and (2) make sure that the meaning of a particular idea is the same to all (i.e., no idea should be construed differently by different participants). In particular, it was agreed that the idea 'Efficient and effective delivery of knowledge' did not include 'effective communication skills'. 'Avoid bias' (No. 2) means that the lecturer should be fair in dealing with all the students. The idea No. 11 means that the lecturer should be witty.

Step 5. In this step (where modification is proposed), each participant is required to select the five best ideas and rank them in order of importance. Usually, a 1-5 scale is adopted to perform the task. The most important idea is assigned a rating of 5 and the least important, 1. The three intermediate ideas receive 4, 3, and 2, respectively. Instead of doing so, the task can be performed in two stages, namely: (i) out of the 41 ideas on the board (visible to all), choose the 5 most important ideas but do not rank them as above, (ii) using the Saaty 1-9 ratio scale,

compare these 5 ideas pairwise. In the following, we provide one participant's pairwise comparison matrix and the weights of the five ideas:

Cards from all the thirteen participants were collected and the weights of the ideas were calculated on an individual basis. The weights were written on the board. The overall weight of an idea was calculated by adding the individual weights obtained from the participants. For example, the overall weight for '2-way communication' is 1.307 ( $0.541+0.239+0.288+0.133+0.106$ ). The most important ideas selected are shown in Table 2. It is to be noted that each participant is required to select only five best ideas and compare them using AHP, irrespective of the total number of ideas on the master list.

Step 6. A few minutes were spent to discuss the selected ideas.

Table 2

Top 10 ranked factors for quality teaching

No.	Factor	Absolute Weight	Relative Weight	Requirement in Percentage	Rank
1.	Lecturer should have relevant and in-depth knowledge	4.126	0.338	33.8	1
2.	Effective communication skill	2.504	0.205	20.5	2
3.	Efficient and effective delivery of knowledge	1.481	0.121	12.1	3
4.	2-way communication	1.307	0.107	10.7	4
5.	Lecturer is well prepared	0.712	0.058	05.8	5
6.	Proper planning on the lecturer's part	0.519	0.042	04.2	6
7.	Lecturer should make class interesting	0.460	0.038	03.8	7
8.	i. Lecturer should be responsible ii. Variety of teaching methods	0.398	0.033	03.3	8
9.	Personality of the lecturer	0.393	0.032	03.2	9
10.	Time management	0.315	0.026	02.6	10
	Total	12.215	1.000	100	



Exercise 2

Basically, staff members of an academic institution are divided into two categories: academic staff and administrative staff. Academic staff are involved in teaching and research, while administrative staff are mainly involved in administering the institution. However, there are some academic staff who are also involved in administration; mainly they hold high positions on the administrative ladder, e.g., vice-chancellor, deputy vice-chancellor, dean, etc.

In the previous section, we have dealt with quality in teaching which is pertinent to academic staff. In this section, we will deal with administration. Specifically, our objective is to identify the factors that contribute to quality in administration. Towards this end, we have again applied the modified nominal group technique to generate the factors. In this exercise, 12 students participated. Since the details of various steps are provided in the previous section, here we provide only the output of the session. After performing all the 5 steps, we obtained the factors with their corresponding weights, as shown in Table 3.

Table 3

Factors for quality administration in an academic institution			
No.	Factor	MNGT Weights	MNGT Ranking
1.	Motivated administrative staff	$0.184+0.474+0.285+0.242+0.256+0.074 = 1.515$	2
2.	Good reward system	$0.096+0.500+0.396+0.451+0.142 = 1.585$	1
3.	Well-equipped administration		
4.	Good communication	0.060	
5.	Have fun	0.068	
6.	Good relationship among people of various divisions	$0.117+0.191 = 0.308$	13
7.	High responsibility	$0.270+0.273+0.301+0.255 = 1.099$	4
8.	No communication gap between teachers and students	$0.079+0.417+0.088 = 0.584$	7
9.	Clearly stated Vision and Mission statements	$0.372+0.078 = 0.450$	12
10.	Full utilization of resources		
11.	Courtesy	$0.023+0.144 = 0.167$	15
12.	Quick process of application forms		

13.	Good leadership qualities	0.144	
14.	Quick in response	0.111	
15.	High employees' involvement		
16.	Effective registration in each semester		
17.	Qualified/efficient staff	0.493	11
18.	Effective system for receiving students' feedback		
19.	Friendly/helpful staff	$0.091+0.214+0.327+0.543 = 1.175$	3
20.	No technical problems during pre-registration		
21.	Proper planning		
22.	Employee empowerment	$0.072+0.092 = 0.164$	
23.	Knowledge of students' needs		
24.	Sufficient equipments provided to keep all the department' records updated	0.167	15
25.	Strong support from upper level management		
26.	Training facilities to the employees		
27.	Awareness among employees regarding quality improvements		
28.	Long term planning	0.055	
29.	Timely communication of grades	$0.214+0.103+0.190 = 0.507$	10
30.	Secured student records/files	0.045	
31.	Good facilities		
32.	Enough staff	$0.484+0.207 = 0.691$	6
33.	Clear policy towards quality		
34.	Robust policies	$0.123+0.164 = 0.287$	14
35.	Ensure trust	$0.394+0.121+0.067 = 0.582$	8
36.	Positive attitude towards teamwork	0.121	
37.	Top management commitment to quality	0.113	
38.	Full knowledge about all facilities	$0.252+0.188+0.365 = 0.805$	5
39.	Sufficient information to the students		
40.	Ethical behavior	0.040	
41.	Reduced absenteeism	0.119	
42.	Rapid maintenance process		
43.	Completeness in service	$0.060+0.177+0.195+0.072+0.044 = 0.548$	9
44.	No gap between actions and words		

From the overall weights of the factors, we select the most important 10, which are shown in Table 4.

Table 4

Top 10 ranked factors of quality administration

No.	Factor	Absolute Weight	Relative Weight	Requirement in Percentage	Rank
1.	Good reward system	1.585	0.174	17.4	1
2.	Motivated administrative staff	1.515	0.167	16.7	2
3.	Friendly/helpful staff	1.175	0.129	12.8	3
4.	High responsibility	1.099	0.121	12.1	4
5.	Full knowledge about all facilities on campus	0.805	0.088	8.8	5
6.	Enough staff	0.691	0.076	7.6	6
7.	No communication gap between teachers and students	0.584	0.064	6.4	7
8.	Ensure trust	0.582	0.064	6.4	8
9.	Completeness in service	0.548	0.062	6.2	9
10.	Timely communication of grades	0.507	0.056	5.6	10
	Total	9.091	1.000	100	

Overall, the participants’ view is that the administrative staff play a crucial role in realizing comprehensive excellence in an academic institution. For this matter, the staff must be motivated in discharging their duties and responsibilities. University’s top management should implement a ‘good reward system’ in order to motivate its administrative staff. Since it is extremely important to have ‘friendly/helpful’ staff, especially at the counters, these staff must be provided with sufficient and relevant training. Training should not be an occasional job, it should be imparted on the continuous basis. According to the findings, staff should be trained to ensure the following:

- Adequate knowledge of the system within which the staff is working.
- Provide complete service to the students.
- Courteous behavior.
- Minimize application processing time.
- Satisfy customers, especially students, by fulfilling their needs promptly.

#### 4. Advantages of applying AHP in step 5 of NGT

1. In the traditional NGT, the five most important ideas are selected by using the 1-5 ordinal scale. In this procedure, merit or superiority of one idea is not judged with respect to the other four ideas separately. Consequently, relative weights are not obtained. On the other hand, in AHP ideas are compared in a pairwise fashion, i.e., one idea is compared with each of the other ideas separately. This increases the exactness of the results and gives the relative superiority of one idea over another.
2. In the traditional NGT, the important ideas are assigned 5, 4, 3, 2, and 1 leaving no room for equal weights. But in the modified NGT, if the participants feel that two ideas are equally important, then they can enter 1 in the appropriate cell of the pairwise comparison matrix.
3. In the traditional NGT, two distinct ideas can receive the same weight: 2+1+1+1 (from four persons) and 5 (from a single person). In this case, neither is regarded superior over the other. In the MNGT, chances of having tie are minimal due to the usage of cardinal weights.
4. In NGT, there is a very high chance that a large number of ideas will receive the same overall weight, whereas in MNGT this chance is minimal.
5. Following NGT, let us assume that the ranking made by two participants for the five ideas A, B, C, D, and E are respectively (5, 4, 3, 2, 1) and (4, 5, 3, 2, 1). It is to be noted that exactly the same ranking has been assigned to the idea D. Following the MNGT, the weights of the ideas for the same participants could be (0.53, 0.23, 0.15, 0.05, 0.04) and (0.28, 0.35, 0.16, 0.09, 0.07). So, for the second participant, the idea E has received more weightage than the weightage assigned to D by the first participant. So, ultimately, 'E' may emerge superior than 'D'. But in NGT, 'E' will remain inferior as compared to D.
6. In NGT, the weights of 5 most important ideas are 5, 4, 3, 2, and 1. Therefore, the relative weights are 0.333, 0.267, 0.2, 0.133, and 0.067. In all cases, this relative standing remains constant for the five best ideas selected by all the participants. This fact is contrary to human perception about relative weights of two different entities. MNGT overcomes this difficulty.

## 5. Further possible applications of MNGT in managing quality in higher education

There are numerous situations in an institution of higher learning, where MNGT can be applied. This paper has described only two applications. Following is a list of further possible applications of MNGT in an academic setting:

1. SWOT analysis: Identify strengths, weaknesses, opportunities and threats for certain department/unit/institution.
2. Solve problem such as 'why are enrollments decreasing in the business (for example) courses' or 'how to increase enrollments in business courses?'
3. What should be the vision, mission, goals for the department/unit/institution?
4. What is the most crucial problem the department is facing?
5. What are the suggestions to improve the working conditions in the department?
6. How can the surplus budget of a certain financial year be utilized?
7. What are the ways through which a local university can generate funds?
8. How can the overall communication be improved in the institution?
9. What are the issues that are to be resolved in order to ensure that the students leave the institution with a 'good' feeling?
10. What are the ways to check the high turnover in an institution?
11. How can campus security be improved?
12. How can food services on the campus be improved?
13. What measures of performance would be appropriate for the department?

## Conclusion

Nominal group technique is a powerful idea generation technique that has been used by practitioners in diverse areas. Its power is further enhanced by the integration with the popular multi-criteria decision making method, the analytic hierarchy process. The integration alleviates some of the difficulties present in the traditional NGT. The working of the integrated technique has been shown by means of two examples in academic setting. In addition to this, many areas in an academic environment have been identified where the method can be applied. Although the applications described came only from the academic area, the technique can obviously be applied in many other areas as well. We hope that the integrated method will draw due attention of the practitioners in those areas.

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