

The Research of Multi-Person, Collaborative and Interactive Mechanism of Command Post Based on Brainstorming Method

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Abstract—In the command post, multi-person discussion is an effective means to improve the efficiency of command decision-making. Based on the existing command collaborative interaction technology, we discussed the application of command post “Brainstorming” argument process and mind map in collaborative research, and then, standardized users’ operation in the process of discussion. At last, SPIN is used to verify the users’ operation in this mechanism.

Keywords—collaboration and interaction, brainstorming, mind map, user operation, SPIN

I. INTRODUCTION

Brainstorming method originates in the word “brainstorming”. The so-called brainstorming was first used by psychopathology, referring to a state of insanity in terms of mental illness. But now it turns to be free association and unrestricted discussion, which aims to generate new ideas or stimulate innovative ideas. In group decision-making, due to the group members’ psychological interaction, it is easy to bend to authority or majority opinion and finally form the so-called “groupthink.” Groupthink weakens the group’s critical spirit and creativity, and also damages the quality of decision making. In order to ensure the creativity of group decision making and improve the quality of decision making, a series of ways to improve group decision-making in management were developed, and brainstorming is a typical one.

As for brainstorming method, scholars at home and abroad have done a lot of researches and experiments ranging from theoretical system to method application. For instance, Mao Mei^[1] compared the differences of the number of creative ideas and the creativity of indie handmade stickers, which are generated by 90 tested college students who use three different ways of thinking, such as individual independent thinking, verbal brainstorming and electronic brainstorming; using the example that ABC Companies used brainstorming method to solve practical problems of the subject, Qing Kui detailed his innovative applications of brainstorming method; Paul B. Paulus and other scholars’ studies have shown that in organizational environment even members know each other well and have team training in advance, when they participate in the brainstorm and discuss work-related issues, the number

of ideas generated by interactive group is still not as much as that of the named group. But studies also show that the subjects believe that by interacting with the group, they can raise more vision.

These studies on brainstorming mainly relate to two aspects: one aspect is to assess the effectiveness of a typical brainstorming; another is to test the effectiveness of new ways to produce ideas. These studies show that in the view-generating stage, the number of views generated by small interactive groups is more than the named groups, for sake of obvious “synergy”, and less affected by “evaluation of anxiety” and “social loafing”.

Multi-Person, Collaborative and Interactive Process of Command Post is the process that commanders and staff officers in the command post interact with the information devices like the electronic sand table and have collaborative discussion with each other. In command post discussions, in order to make more divergent thinking and innovative views, as well as forming more correct decisions, we consider to apply brainstorming method flexibly in the whole process of command post in multi-person interaction and collaboration, and combine it with information-based command post’s status. We find a discussing mechanism which can be applied to information-based command post, that is, Multi-Person, Collaborative and Interactive mechanism of Command Post.

Ideas of the whole mechanism are shown in Fig. 1.

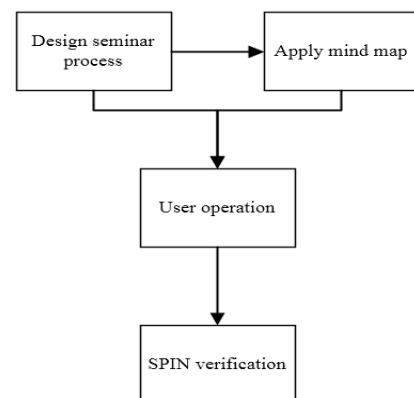


Figure 1. Mind map of established mechanism

II. COMMAND POST "BRAINSTORMING" DISCUSSION PROCESS

A. Principles of Brainstorming

Brainstorming application must follow the four principles of the method:

- (1) Exclude critical judgments ---- judging after discussion.
- (2) Encourage free imagination ---- more ridiculous the idea is, more valuable it is.
- (3) Require a certain amount of ideas ----more ideas there are, more likely to produce valuable ideas.
- (4) Combine or improve ideas ---- require participants to improve others' ideas or combine several ideas, and then put forward new ideas.

B. Discussion Process

In addition to the above principles, we need combine process of the method with this special background of command posts, according to the specific requirements of brainstorming, organization, staffing, operational processes integration.

In terms of participants, the commander generally performs as the moderator, while the business staff and related professional and technical personnel as the panel of experts. Besides, there should be a recorder, which could be performed by the staff. Procedures can be divided into the preparatory stage, the warm-up stage, task-clearing stage, speaking stage, idea-finishing stage, free talk stage, evaluating ideas stage, decision-forming stage.

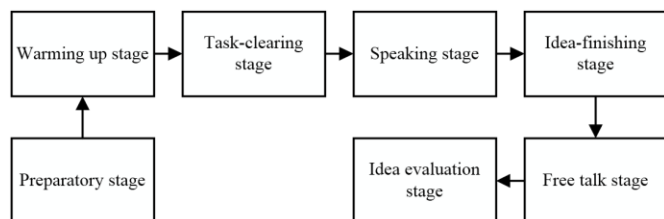


Figure 2. Seminar flowchart.

In the preparatory stage, the moderator should first analyze tasks or commands comprehensively, and figure out the key tasks and set goals required to solve the problem. At the same time, the moderator should select participants in the discussion, who consist of research staff and professional and technical personnel, generally 3-5 persons. Then the moderator should inform participants in advance about the matters to be discussed, such as time, place, the problem to be solved, reference, some ideas, military targets needed to be achieved to make participants fully prepared.

In the warm-up phase, after announcing the start of discussions, the moderator should explain the rules of discussion, and then casually talks about some interesting topics or issues, so that participants can think in a relaxed and active state. If the questions and discussion topics connect with each other, it will be easy and better to turn to discussion topics.

In task-clearing stage, the moderator briefly introduces tasks and problems to be solved. The introduction should be concise, clear and not too comprehensive, otherwise, too much information would restrict people's thinking or interferences imagination and innovative thinking.

In the speaking stage, staff and related professional and technical personnel speak one by one, and describe their views clearly and in a detailed way. They can add some words to their speech after the completion of the other team members' speech. The recorder needs to record each speaker's views and key data in his words, and then numbers the ideas and form a table.

In the idea-finishing stage, after a period of discussion, we have deeper understanding about the problems. At this time, in order to find new angles and new thinking, the recorder should analyze and conclude discussing materials to find more creative ideas and inspiring presentation.

Then is the free talk stage, which is the creative stage of brainstorming. In order to make participants speak out freely, the rules should be made as the following. Firstly, do not talk in private, in order not to be distracted. Secondly, never interrupt or comment on others' speech, and each person talks about his own ideas. Thirdly, your opinions should be simple and clear. The moderator should announce these rules at the beginning, then guide participants to speak and imagine freely, so that they can inspire each other and complement each other. Finally, sort out participants' speech records.

Then it will be the idea evaluation stage. One or two days after the end of the discussion, the moderator should ask for participants' new ideas as a complement to research records. Then organize everyone's thoughts into a number of programs, according to the general standard CI design, such as recognizable, innovative, enforceable standards for screening. After repeatedly comparative advantages in merit and finalize 1 to 3 the best solutions. The best solution is often a combination of a variety of creative advantages, which is the result of the combined effects of collective wisdom.

III. APPLICATION OF MIND MAP

To make discussing staff who use brainstorming method better in divergent and clear thinking, we consider using mind mapping tools which can help the thinking process. Mind mapping is a kind of approaches which can specify radioactive thinking. It uses both graphic and text techniques to perform the relationships between themes of different levels with each other under the hierarchy diagram shown. It also establish memory links between topics' keywords and image, color and so on.

Finally, complete content and organizational editing before formatting. Please take note of the following items when proofreading spelling and grammar:

The following will describe how to use this tool in each stage of command post "brainstorming" discussion process:

In the preparatory stage, the general staff or professional and technical personnel should use mind mapping tool ---- Mindmanager to make his important ideas related to data

analysis and sorting materials into their own mind map in advance. At the same time, the moderator (commander) can prepare a simple mind map introducing the central seminar task.

In the task-clearing stage, the moderator (commander) can briefly describes the central task of research based on their ready mind map.

In the speaking stage, the general staff or professional and technical personnel should explain their opinions in accordance with the prepared mind map, and operate on the electronic sand table appropriately. In this way, all participants will have better communication with each other and better interaction with information platform like the electronic sand table

In the idea-finishing stage, the moderator will integrate everyone's mind maps easily into a total mind map which can

make the central theme clearer and stimulate participants' innovative thinking collision about relevant problem and task target in a friendly atmosphere. Besides, each participants can freely adjust the look on your display other people's thought processes and Insight, while ready to put their new ideas, new proposals being added to the general plan, and promptly sent to other people.

In the free talk stage, after the seminar, according to the mind map, the recorder can sort out the total table of ideas, and bring different perspectives into categorized column, which can easily be screened and ultimately get the most concentrated opinions and the formation of different solutions.

In the idea evaluation stage, everyone can rank the ideas on the table to get the final mark with the top three priority view, and ultimately get the formation of the reference scenario. As is shown below in Fig. 3:



Figure 3. Application model of mind map

IV. USERS' OPERATION

In the command post "brainstorming" discussion process, we should take full account of the service characteristics of the command post. In general, commanders need to conducted activities in the sand table combining the content of discussions. But in informatized command post, electronic sand table is used to realize trend view, military standard plot, situation tagging and other operations. Setting the interactive electronic sand table as the discussion platform, each person will be involved in the discussion by touch operation for the display screen, sitting around the electronic sand table. The specific actions include situation viewing, military standard plotting and situation marking. Specific descriptions of the three operations are as follows:

A. Trend View

Trend situation generally includes several tasks: situation choosing, viewpoint adjustment, point information querying and area information querying. Only one sub-tasks can only be performed at same time, but operation can be repeated many times. Situation choosing is relatively simple, it can be realized just by selecting the required momentum in the menu list options. Adjustment of the viewpoint can be decomposed into zooming the map, moving maps and three-dimensional perspective transformation. User are required to follow several gestures to adjust the graph of situation in the electronic sand table. Point information querying refers to details for a target object (such as piers, reefs, etc.) on the map, which is displayed in the form of a list. Area information querying refers to information querying of multiple points in given district.

B. Military Standard Plotting

Military standard plotting includes zooming maps, moving maps and military standard editing. The military standard editing includes military standard moving, military standard zooming and rotating of military standard, which is used to reflect the state change of the corresponding cell. Linear military standard editing includes adjusting the length, width, direction and trajectory of the curve.

C. Situation marking

Situation marking is an important way to express the intent of the commander. It includes operations such as drawing, erasing, selecting and moving. Such hand touching interaction in the electronic sand table is very similar to drawing on the whiteboard, when people can choose a brush to freely express their will.

D. Mode of Task Assignment

In multiplayer's interactive collaboration in the same electronic sand table, mode of task assignment must be taken into consideration in case of conflicting operations. According to chronological division, there may be four kinds of task allocation pattern of the cooperative interaction mechanisms: serial mode, parallel mode, mixed mode and interlude mode.

In the actual multiplayer interactive tasks, serial mode is most commonly used while parallel mode most ideal in these four task allocation modes. However, in the specific operation, mode selecting has a direct correlation with operation task itself. Based on experience, there are two principles of assignments in a collaborative interaction:

1. When performing "situation viewing" operational tasks, task allocation can only take serial mode.

2. In the implementation of "military standard plotting" and "situation marking" operation, any of the above four ways can be selected. This is because the platform supports multi-point touching recognition. Operations can be performed at same time.

V. SPIN VERIFICATION

Mentioned that when a user performs "situation viewing" operational tasks, task allocation can only take serial mode. In order to verify the correctness of the operating principles and ensure the smooth process of the whole discussion, we consider using automatic model checking tool SPIN to design process model and simulate the "situation viewing" operation in the process of brainstorming seminar.

Automatically model-checking tool SPIN (Simple Promela Interpreter) is suitable for parallel system, especially secondary analysis protocol conformance testing tools. Currently, SPIN has been successfully applied in the security protocol verification, controlling system validation, verification, and optimization software field planning.

SPIN uses Promela language to describe the process model. We use Promela model to define four processes, namely BRAINMAN1 process standing for Staff1, BRAINMAN2 process standing for Staff2, COMMANDER process and init process. After completing the model initialization, as long as the operation is not in the atoms inside, any of these processes can be interrupted at any place of the implementation, and pauses until an event drives it to run down. Exchanging information between processes by defining the channel will always execute concurrently until the cooperative operation is completed. When initialization is defined as BRAINMAN2 first, the other two processes wait. When it comes to critical resources, BRAINMAN1 and COMMANDER will have intentions to apply for control right. After BRAINMAN2 agreed to release control of the resources, BRAINMAN1 or COMMANDER will continue to run, thus completing the control of the transferring process. Simulation results are shown below in Fig. 4:

As the Fig. 4 shows, Staff2 (i.e. process BRAINMAN2) firstly operated and he sent out the "being used" signal of interactive system to the commander (i.e. process COMMANDER) and staff1 (i.e. process BRAINMAN1); After Staff2 completed his operation, he sent out the control right of the system, which would belong to one of the other two; when Staff2 was willing to operate again, he asked whether the commander or staff 1 had finished their operations and got the signal that the control right of the system had not been released; however, since the signal itself or the Staff2's misunderstanding, he still operated under the situation that the control of the system had not been released, resulting in the conflict of the control right. Therefore, when several users take the "trend view" operation, task allocation model is a serial mode and you must have a floating menu of the control as the

carrier to coordinate the user's behavior to ensure the natural collaborative research, efficient, and smooth.

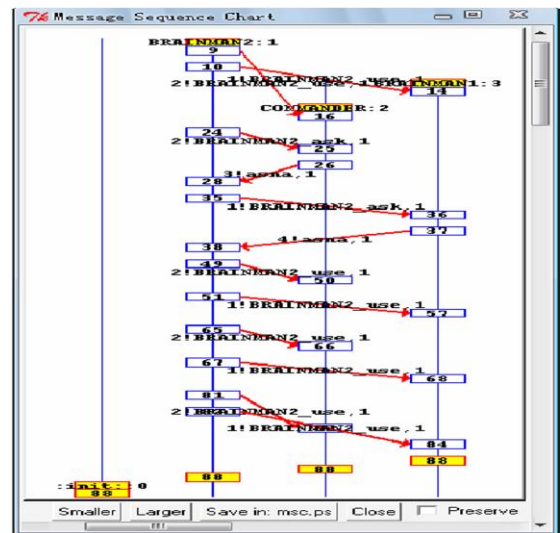


Figure 4. SPIN verification result screenshot

VI. CONCLUSION

Brainstorming ideas discussed in line with thinking people, it is now widely used in various areas of discussion or meeting. In this paper, the principles and organizational processes of brainstorming conducted applied research, to better grasp the core essence of the method, in order to transform its processes reasonably. We finally explore multi-Person, collaborative and interactive mechanism of command post based on brainstorming method, which provides a theoretical basis for the development of people-based collaborative interaction mechanisms of information platform of the command post.

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