

Group Decision Analysis (GDA)
-- A Framework of Structural Rational Group Discussion --

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Abstract

We propose a simple formal framework to represent the structure of rational discussion, which we call Group Decision Analysis (GDA). GDA is a formalization of an integrative (win-win) negotiation (Raiffa, H. (2002) "Negotiation Analysis") that prescribes members of a group to discuss effectively.

Based on GDA model, we illustrate the essential roles of a group discussion. Particularly, we argue that group objectives must be clarified at first in order to achieve an effective group discussion, which implies that a group discussion requires commitment of the members to some sort of group cooperation. We show a simple case in which there exist members that do not like to have a discussion.

Keywords: decision analysis, discussion, group decision, negotiation, voting

Introduction

What is the role of rational discussion in group decision making?

Discussions may incur huge opportunity costs on the participants. Consider a meeting in a private company consisting of high-level managers. The cost = (the wage + personnel cost) * the number of managers + the cost of preparation and so forth. It is easy to imagine that the cost may soar to a significant figure. The firm should really think seriously how it can optimize the outcome of meetings with discussions.

The aim of the paper is to clarify the essential components of rational discussion such that the stakeholders of the discussion can improve the outcome.

In this paper, we formalize discussion in a two-step exchange of information and structuring of the decision situation by a group:

1. Information sharing. Each proposer of a bill must defend his proposal.
2. The enhancement of alternatives. By finding values that did not appear in minds before discussion, the group can search for better alternatives.

We will observe two effects:

- How does the discussion do in group performance?
- What is the incentive compatibility of group discussion for the members?

The first task of this paper to achieve the purpose stated above is to present a simple discussion model of group decision analysis (GDA), that generalizes the framework used in (Keller, L. R. and Kirkwood, C. W., 1999).. GDA can be used either explicitly to facilitate group discussions or as an ideal (abstract) benchmark to check whether the discussion in concern is working or not.

Decision analysis (DA) is an individual decision making method. GDA applies DA to a group decision. First, members discuss the values they want to achieve through the group decision. The group generates values through discussion, or elicitation by each participant (brainstorming or other methods). The group then constructs objective measures (attributes) for each value. The entire group value can be determined through informal negotiation. Formally, the group value is defined as a multi-attribute utility function. The weights of the attributes are determined by the weighted sum (in terms of the members) of the weights reported by each member.

After the group value is determined, the group searches for feasible alternatives. Feasibility of alternatives and causal relationship between the alternatives and the attributes are fact-based. We assume that rational discussion can reject subjective claims regarding the causal relationships. However, it is not always possible to generate the universal set of feasible alternatives. Rather, alternative search is a creative search process even when the objectives are fixed. Thus, each member can be subjective in what particular feasible alternative to propose in the rational discussion. What has to be done in the discussion is to verify that the proposed alternative is indeed feasible and good in terms of the group value.

An unstructured discussion may be trapped in deadlock and may lead the group nowhere. Such a meaningless discussion may be observed in various situations, such as discussions in parliaments (diets), meetings in companies and third party conferences for public project assessments.

We classify the reasons considered for the mess of group discussion in such situations into two categories.

The first is bounded rationality of the members. In many cases, the members do not know what they are discussing, or what the discussion aims at.

The second, which is the main theme of our interest, is strategic move by some members. Consider a group in which the members' stakes are in concordance with the group stake and in which each member is given a high reward for high-quality contribution to the improvement of the group choice -- a private firm with adequate labor incentives is an example. In such a group, discussion works well in terms of both incentive compatibility and collective rationality. What if, on the other hand, some members do not like the alternative good for the whole group? A small interest group that

has conflicting interest with the mass consumers is an example. In a group consisting of members with conflicting interests, some members may not like discussions itself. They may want to limit the intelligence held by other members, and may want the group to choose the feasible alternative they presented instead of the group's searching for another alternative.

The paper proceeds as follows. We first begin with stakeholder analysis to see the aims of effective rational discussions. Then, we introduce the framework of group decision analysis (GDA) as a concrete structuring tool. In section 4, we illustrate the existence of a player disliking a rational discussion by introducing an example of the UN security council decision of the declaration of Iraq War. We close the paper with the concluding remarks.

Stakeholder Analysis

One of the key features of the paper is that it focuses on the members with conflicting stakes. Thus, before anything, it is fundamentally necessary to see what kind of stakeholders are related to the discussion.

First of all, who is the owner of the discussion? (Checkland, 1999) argues as though as many stakeholders as possible should be included, but that is not necessarily the case due to various constraints such as costs. In quite a few cases, the owner herself may not participate in the discussion.

A most typical case in which the owner does not participate due to participation cost is *indirect democracy*. The voters should watch closely how the representatives act in the parliament. Parliament discussions are the most typical places where the voters may check how well the politicians are doing their job. Since the representatives (agents) usually have the stakes different from that of the people they represent (principals), the voters should watch out for the *moral hazard*. Avoiding moral hazard requires adequate design of incentives.

For example, in private firms, sectionalism may become one of the serious problems. It may help the whole company if the participants of the discussion are evaluated based on how much their opinions contribute to the profit of the entire firm.

There are other situations in which the owner of the decision wants to monopolize the decision instead of asking for opinions through rational discussions. One example may be top-down quick decisions under crises. In such cases, it may be effective instead to communicate the decisions quickly. Decision analysis gives a useful concept called *value of information* for judging how much more information a decision maker may want before she makes a decision. The idea is that you should incorporate further information only if that piece of information changes your action so much that the increase in the expected gain exceeds the acquisition cost of the information. As stated in the introduction, discussion incurs huge cost, particularly huge when the decision has to be made vary fast. Therefore, it is critical to decide whether to have a discussion in the first place (Raiffa et al., 2002) gives the following generic questions for exploring the purpose of a meeting (along with discussion):

- why us?
- why now?
- why this problem?
- who should be deciding?
- who will be affected by any decisions we make?
- where does this problem occur elsewhere?
- how do we find out about the experiences of others working on similar problems?

There are various factors that can become potential costs for group discussion other besides the speed of decision as well. The following list of factors is again from (Raiffa et al., 2002):

- Complexity
- Coordination loss
- Communication overload
- Cognitive overload
- Interpersonal conflict
- Disengagement

The basic idea is that the owner of the discussion should minimize the number of people in the discussion. Invite only as many people as sufficient and necessary. The two key factors for choosing whether to invite an additional member in discussion are *expertise* or *approval*.

There are of course merits for including more participants in discussion as well (Raiffa et al., 2002):

- Resources -- enhance creativity
- Arousal -- raise morale
- Ownership -- increase the chance of acceptance

So far, the discussion was made to improve the quality of decision for the owner of the discussion. However, you may not always be the owner of the discussion. If you are related to discussion but are not the owner, you might very well want to implement the moral hazard stated above. We will show a case study describing how it may benefit for a group member to destroy rational discussion. The main aim of the paper is naturally to assist the owners such that if the insights in this paper or similar works come to be shared by the owners more, it becomes more difficult for the participants to implement moral hazard.

If the group members share stakes, discussion has a natural interpretation as seeking for the more *correct* decision. In a most abstract sense, we

discuss in group decisions to improve the quality of decisions. But what kind of improvements? We state below two intuitive measures of the improvement of group decision brought about by an adequate discussion.

1. *Fostering structural understanding of the decision situation* – Structural understanding may assist members to make a correct choice at the final choice stage such as voting.
2. *Synergy* – Discussion may be carried out for purpose of exchanging and sharing the views, so that the members may become more creative in search for new alternatives by learning.

What if the group consists of members with conflicting stakes. In parliaments for instance where the stakes of opposing parties seem drastically different, the policy debate often sounds sadly meaningless and incommensurable. Especially, at a first glance, the majority seems to dominate the final result regardless of the discussion. However, there are some roles in addition to the above-stated ones in policy discussion even in the voting context.

One apparent role is related to *corporate governance*. The discussion is often not really made against the other players in the group decision, but for the sake of implementing the accountability to the clients of the decision. The actual participants in modern society often represent clients like shareholders or voters, thus the participants have to explain what they are after for each group decision problem. Both in politics and in private companies, moral hazard is a serious problem, thus the clients have to make sure that the representatives make clear explanations. Especially in politics, political parties often act for the sake of minor interest groups instead of the citizens in general, so the citizens have to watch out.

Another apparent role is to *convince* other uninformed players in the group. The players may change their votes after the preference update resulting from the discussion.

A third view that we are particularly interested in this paper is related to *enhancement of alternatives*. In a policy debate especially, the discussion often revolves around a proposed bill by the ruling party. If we ignore the effect of moral hazard, the ruling party is not too stupid to propose an bill which is group-wise worse than the status quo. Therefore, the discussion by the opposition party of trying to reject the bill seems fruitless. However, proposing amendments or another well-structured bill seems legitimate. The key idea is to foster more effective disagreements instead of deadlock that may lead nowhere.

It is important to understand that unless the decision situation is rigidly zero-sum game, the members in average can expect some gain by discussion enhancing the range of alternatives. However, again, it is not trivial whether such gain is worth the cost of discussion.

Moreover, unlike two-party voluntary negotiation, in quite a few cases, the discussion members may not necessarily gain from the discussion per se.

Group Decision Analysis (GDA)

GDA proceeds in the same way as it does in individual decision analysis. First, the N members discuss the objectives of the group, possibly by brainstorming for instance. Then the members organize the objectives and select the L important ones. It may be possible for instance to construct an objective hierarchy and treat objectives at each hierarchy separately, then combine. Here, for simplicity of description, we assume that the group faces mutually independent objectives on which the group wants to seek for trade-offs. For each objective (attribute) l , an evaluation measure (or proxy measure) $x_l \in X_l \subset \mathbb{R}$ is defined. Proxy measures are measurable data regarding the consequence of the decision. For example, consider environment assessment of a public project. Experts can give objective prospects regarding how much carbon dioxide emission will be caused by the project. For procedural simplicity, it is often assumed as we also assume here that members have the same the single-dimensional value function $v_l(x_l)$ on evaluation measure x_l . $v_l(x_l)$ may take negative values as well when x_l is categorized as costs. When the decision maker is risk-neutral with respect to x_l , it is possible to let $v_l(x_l) = k_l x_l$, where k_l is a constant that changes unit. In cost-benefit analysis for example, all evaluation measures must be transformed into the unit of money. For the details regarding the discussion above, refer (Keeney, 1992).

We assume that the attributes are additive independent and that the overall utility of consequence $x \in X_L = \times_{l \in L} X_l$ each member i feels is expressed by $u_i(x) = \sum_{l \in L} b_l^i v_l(x_l)$, where b_l^i is the marginal value member i feels from a unit increase in the value of attribute l .

The next task is the determination of the normalized group attribute weights $\omega = (\omega_l)_{l \in L} \in \Delta_L$ (a simplex on \mathbb{R}_+^L). Following a standard method, we define the weights as the weighted sum of the weights $\omega^i = (\omega_l^i)_{l \in L}$ reported by the each member i . In informal discussion settings, each member may stress relative importance of attributes according to her taste. In our formal setting, we assume for simplicity that the members report the weights they feel truthfully on a normalized message space of attribute weights. Thus, $\omega_l = \sum_{i \in N} w^i \omega_l^i$, where $\omega^i = (b_l^i / \sum_{l \in L} b_l^i)_{l \in L}$ and $(w^i)_{i \in N} \in \Delta_N$.

Member weight w^i corresponds to the voting power such as the one of the member states of EU. The group value function is

$$v(x) = \sum_{l \in L} \omega_l v_l(x_l)$$

Member weights may be determined by the various factors, but in general, it may be independent of the quantitative impact that each member feels from the consequence $x \in X$. Denote $b^i = \sum_{l \in L} b_l^i$. Then the following relationship is satisfied.

Proposition (exchangeability theorem) $v(x) = \sum_{i \in N} (w^i/b^i) u_i(x)$

The proof is straightforward.

Exchangeability theorem ensures that it does not harm any member by aggregating the individual judgments regarding the relative evaluation weights of attributes instead of aggregating the utilities directly.

There are two intuitive interpretations of this result.

One is negative and that we have to be careful when we talk about a *group objective*. This is clear not only from the proposition, but from the well-known facts in social choice theory that aggregation method may change the outcome drastically. Particularly, in our case, the linearity of attribute value functions play the central role.

The other is positive and that if we could assure the conditions in our setting be met, we can distinguish between the discussion regarding the *objective* value of attributes and the *subjective* assessment of values. By making the distinction clear, the participants are clearer about what they should aim at in each stage of discussion. For the objective assessments, we can make full use of neutral experts, while the subjective evaluation is inherently in the minds of stakeholders.

Application to the International Society's decision around UN on Iraq War

In this section, we give a brief explanation of what happened in the United Nations Security Council just before the beginning of Iraq War in March 2003. Our aim is not to capture the real situation as precisely as possible. Our aim is to give the readers the intuitive understanding on how GDA may be used to understand the dynamics of different stakeholders in discussion.

We limit the group to the members of the UN, particularly Security Council for simplicity. We divide the members into three groups: the USA allies (USA, UK, ...), the members against the war (France, Russia, China, ...), and other middle 6 countries, and treat the three parties as unit stakeholders.

The major value attributes are: 1) elimination of mass destructive weapons, 2) freeing Iraqi citizens from tyranny, 3) international legal order, 4) US public opinion, 5) Europe public opinion, 6) neo-Cons, 7) oil and other economic stakes 8) credits to Iraq. Notice that the selfish attributes are also included in the list of values.

From the attributes, the alternatives classified into big three categories are generated. Those are: a) attack Iraq, b) status quo, c) overthrow Saddam with a peaceful pressure. Again, it may be possible to generate much more creative alternatives. Also, we ignored risk analysis such as one regarding the choice from { attack with new resolution accepted, attack without new resolution, attack with new resolution rejected by veto power, attack with new resolution rejected by the majority}. We think alternative c) discussed to some extent by the experts is an attractive alternative, and sufficient to illustrate our point.

Now, being ready with the framework, let us interpret the actual history.

First, in the end of 2002, the USA attempted to propose a new resolution that allows multinational force to attack Iraq. Certainly, at this stage, the USA was heading towards individual voting and only seeked for how to realize the military action in a most favorable situation.

France responded at a quite early stage to this movement by the USA to announce the optional use of veto power, implying that it sought after the voting choosing the status quo. Though commitment strategy is often effective in negotiations, in this particular case, it seemed satisfactory for the USA to get the majority of the international support. Therefore, it worked in advantage for the USA that France played hard.

What was unexpected for the USA was that in a very short period of prenegotiation towards the majority support of the new resolution, particularly the middle 6 countries in the Security Council started to play a key role in creating a new alternative, giving more pressure to Saddam and at the same time tried to keep peace as much as possible.

This movement was not favorable for the USA in two ways. One was obviously that the group choice in the Swecurity Council was expected to support the new alternative, as it is also supported by our model. The second disadvantage is also shown in the attachment. The new alternative was much more acceptable for the USA than the status quo, thus the bargaining power reduces significantly due to the existence of an attractive outside alternative.

Disliking this expectation, the USA decided not to use the UN anymore for further international support. The USA justified its position criticizing France. Consequently, France made the critical error in two ways, if its real intention was indeed to stop the war.

By the beginning of 2003, the USA was in full throttle towards starting the war. It seemed as though means and ends were reversed. Powell's false address regarding the mass destructive weapons in Iraq, especially import of plutonium from Niger, was an illustrative example of the US attitude. Its main strategy was especially to drive people's eyes away from other important values such as international legal order and to let them focus on the narrow value of mass destructive weapons.

Concluding Remarks

There has been extensive research on the psychological effects on group decision making along with discussion. One very well-known effect is group think. Such stream of research has focused on the quality of group decisions when the members have common stakes.

This paper has focused more on the rational decisions of group members in relation to discussion.

We first proposed a framework to incorporate different stakes in a coherent manner. Moreover, by exchangeability theorem, we have shown the boundary condition for the use of structural subjective-objective distinction in group discussion.

We further gave an illustrative example to show how some members in a group may dislike the discussion. Thus, we have seen how important

stakeholder analysis is for the adequate design of group discussion.

In a companion research under preparation, we are aiming at analyzing more deeply the incentive compatibility of rational discussion. Under what conditions are group members willing to contribute to rational discussion? Will such contribution ensure a group efficient outcome? Those are the questions we want to answer. Now that we have presented a concise normative model of discussion by GDA, our next task is to verify whether that really works.

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