

# Rational and Non-rational Influence in a Time-Constrained Group Decision Making

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**Abstract** When humans make decisions, they tend to rely on the heuristic approaches, instead of considering all available facts. When humans need to make decisions as a group, this tendency also seems true. However, there are some additional mechanisms that can only be observed in the group level, which are influence and conformity. Understanding these mechanisms and their process patterns is necessary to interfere and manipulate a group decision making in order to make a good group decision. This is particularly critical in emergency situations where decision making needs to be done under time and risk pressure. This paper proposes a model of group decision making process using I-P-O model, emphasizing the influence process in the group. Besides, this paper also explains an analysis towards a group decision making experiment in laboratory setting. The discussion process was observed to find the influence pattern among the members.

**Keywords** Group decision making · Group conformity · Influence · Personality

## 1 Introduction

One important aspect in resilience engineering is how an organization responds to changes that happen from either within or outside the organization. When a change happens, the organization needs to shift from its usual routine into a new action. Changing from the routine into a new condition requires some decision makings.

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In the modern world, most of that decisions should be made by a group instead of a single individual. As pointed out by Stasser and Dietz-Uhler [1] even though group is far from perfect, their choice, judgment, and solutions are generally better than individuals.

Individual decision making has been studied intensively in many fields, including psychology, economics, politics, and so on [2, 3]. Group decision making, however, is relatively a newer and less matured subject compared to the studies of individual decision making. Group decision making is more complex, since it is both involving the information processing by its member individually and the social process between the members. This social process is not just including information exchange between the members but also how each member influences on other members' agreement towards the group decision.

Reaching a consensus in a group decision making is not just the norm of the group, but also triggered by human's natural response against cognitive dissonance. Cognitive dissonance happens when group members discover that they do not agree with other members [4]. This is such an unpleasant state that people are motivated to take steps to reduce it [5]. Some of the steps done by the members are changing their own position (conform) or trying to change other members' position (influence). These processes sometimes happen unconsciously because the nature of social influence is very complex [6, p. 221].

In this paper, the dynamics of conforming and influencing process in group decision making is observed. Even though conformity and influence are affected by many situational characteristics [6, p. 211], in this paper it is argued that in general, it can be divided into rational and non-rational influence. This research aims to find the pattern of rational and non-rational influence in several short decision making discussions.

## 2 Theoretical Perspective

To make a good decision, group members should thoroughly and carefully consider as much information as possible relevant to the problem. When a person makes a decision as an individual, however, a heuristic approach is usually used due to human's limited cognitive ability. One often relies on simple, fast, and easy-to-access heuristics [7]. This situation also happens when a group makes a decision. Even though there are more resources to process information, group members still need to rely on heuristics such as other people's opinion instead of information from actual sources.

To illustrate the group decision making process and observe the social influence, input-process-output model is used. The model is explained in the following subsection.



Fig. 1 The IPO model of influence in group decision making

### 2.1 Conceptual Model

As shown in Fig. 1, the inputs consist of three entities. Personal knowledge or preference is the individual’s knowledge relevant to the problem being discussed, and also their personal preference regarding the decision. The difference in this part will trigger the discussion process until a consensus is reached. Members’ characteristic is the personal traits that will determine the dynamics of the discussion process, mainly the non-rational one. Some examples of this characteristic factors are introversion/extroversion and self-esteem [6, p. 214]. The context defines the situational characteristics of the decision making. For example, in an emergency situation, usually the group is pressured to make a unanimous decision in a relatively short time.

In the process, the members exchange information, influence, and conform to each other. In this model, ‘information exchange’ is different from ‘rational influence’ due to its neutral property. In ‘information exchange’, the information is exchanged merely for letting the others know about it. Meanwhile, ‘rational influence’ is described as a process when a person use information or logical analysis to convince other people towards a certain decision. Rational influence is used because naturally people are motivated to interpret and perceived the reality as accurate as possible [8]. Other factors besides rational influence that can affect conformity are defined as non-rational influence. One example of this is a persistent statement of a person without providing any argument, or when someone emphasizing the time constraint to force other members to conform, or the pressure that exists due to the opinion of the majority.

The output of the group decision making process are the group decision and the individuals’ view towards it. Even though the group has reached a consensus, it does not mean that all members also privately agree with the decision. This will be explained in the next subsection.

### 2.2 Social Response in Group Decision Making

Like all other social processes, a group decision making is involving social influences—interpersonal activities that change other people’s thoughts, feelings, or behaviors [6, p. 203]. In a group decision making, Nail and MacDonald [9] (as cited

in [6]) pointed out that there are five social responses related to influence: compliance, conversion, independence, anticonformity, and congruence. That categorization is made based on the status of agreement between the individual decision (before and after discussion) and the group decision. A group may reach a consensus after all the members agree with it *publicly*. However, they may or may not *privately* agree with it. If they agree both publicly and privately, it is called conversion. Otherwise it is called compliance. However, if they have agreed even before the discussion, it is called congruence. Independence is when a person disagrees with the group decision at all time. Anticonformity is when a person initially agree (or neutral) but afterward disagree with the group.

### 3 Experiment, Data, and Analysis

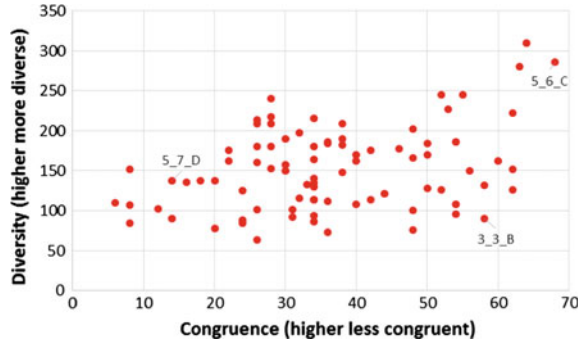
#### 3.1 Experiment Design

The purpose of the experiment is to find the pattern of rational and non-rational influence in regard to three different responses of group decision making: compliance, conversion, and congruence. The data were taken from a previous research about mutual belief model [10]. In that experiment, 21 groups of size 3, 4, and 5 persons were asked to give ranks to 15 items (such as oxygen, water, rope, etc.) based on their priority related to a fictional moon-survival story [11]. They were required to provide their own rank before discussion (IIR—Individual Initial Rank), publicly agreed rank (GR—Group Rank), and individual rank after discussion (IRR—Individual Revised Rank). In this experiment, only congruence, compliance, and conversion can be observed. Independence cannot be observed because by definition, this type of response is disagreeing with the group decision at all time, while in the experiment, the final group decision must be unanimous. For the similar reason, anticonformity cannot be observed as well. The discussion was conducted for 15 minutes, and they have to reach a unanimous decision within that time. The whole discussion process was recorded by both video and audio.

It is assumed that if the IIR between members are diverse, they will have more discussion. In the same manner, it is also assumed that if a person has a higher congruence, this person is regarded to be influential to the group because his/her initial answer remains close to the final group answer. By using these two assumptions, all participants were then mapped based on their diversity and congruence.

From the mapping, several participants' data were chosen, and their videos were observed to find the conformity pattern in the discussion. The detail of the mapping and video observation is explained in the following subsections.

**Fig. 2** Distribution of members based on congruence and diversity score



### 3.2 Congruence and Diversity Distribution

As mentioned previously, if a member agrees to the group’s decision even from before the discussion, this type of response is called congruence. By comparing IIR and GR, a score can be assigned to the degree of congruence. Next, by comparing IIR of members in a same group, a score can be assigned to the degree of diversity. The calculation is shown by the following formulas ( $m = \text{ID of participant}$ ,  $i = \text{item number}$ ,  $g = \text{ID of group where participant } m \text{ belongs to}$ ,  $p = \text{partner in the same group}$ ). The result of the mapping can be seen in Fig. 2.

$$\text{Congruence}_m = \sum_{i=1}^{15} |IIR_{i,m} - GR_{i,g}| \tag{1}$$

$$\text{Diversity}_m = \sum_{i=1}^{15} \left( \sum_p |IIR_{i,m} - IIR_{i,p}| \right) \tag{2}$$

In the graph, different conditions regarding congruence and diversity experienced by each member can be seen. For example, participant 5\_6\_C had a close answer to the group decision, but she faced a very diverse opinion from her partners. Meanwhile participant 3\_3\_B did not face such a diverse opinion. From this graph, three data were chosen arbitrarily from three different areas. The videos from these three participants were then analyzed further.

### 3.3 Analysis of Influence

In the current progress of the research, the video of group 5\_6, 5\_7, and 3\_3 have been observed. The videos was transcribed and the discussions were analyzed. The protocol analysis aims to separate rational influence and non-rational influence, and to see if there is a pattern of emergence of the influence, such as time-wise emergence. For each utterance in the discussion, two tags were assigned. The first is

the item related to the utterance, and the second is whether the utterance is an influence or not. If it is considered by the researcher as an influence, then it would be decided whether it is a rational or non-rational influence.

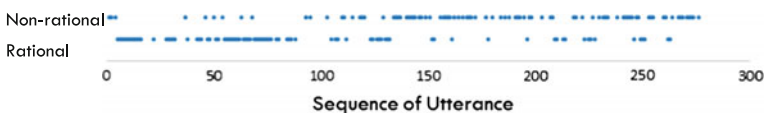
One example of rational influence is as follows: for the item oxygen, someone says, “The amount 2.5 kg is not sufficient”. The logical reason may be strong or weak but at least the participant shows a fact-based argument. On the other hand, an example of non-rational influence is as follows: for the item pistol, someone says, “Pistol is really unimportant”, without providing any argument. The statement that says whether an item is important or not is the expected decision, therefore when someone mention their preference about a decision without any argument, it is considered as a non-rational influence.

The result of the analysis towards group 5\_6 is shown in Fig. 3. In the figure, one dot represents one utterance. This group mostly discuss about compass and oxygen, 30 and 32 utterances respectively. For compass, 17 utterances were rational while for oxygen it was 24. The group was focusing on those two items for most of its rational influence. When looking at the distribution of IIR for each item in that group, oxygen on the other hand is the item with the least diverse IIR. Meanwhile, the item with the most diverse IIR, the heating unit, was discussed only in 5 utterances and 2 of them are rational influence.

As can be seen from Fig. 3, in the first half of the discussion they intensively used rational influence, while in the latter half non-rational influence was more dominant. One might think that the second half is probably the decision stage after they discussed the matters in the beginning. However, most of the other items appeared in the second half. It means that for these items they conformed to each other with few rational influences or even not at all. This happened regardless of the difference of IIR of these items. One possible factor is the time pressure. Reaching the latter half they realized that they do not have much time to make a decision. At that moment, they started to use the heuristic approach by conforming or influencing other member even without a logical reason. Most of the time in the latter half, some of the members mentioned their rank for some items and then other people conformed to it, or provided alternative rank without any argument.

However, a different pattern was found in group 3\_3. In the beginning, rational influence was not so intensive. When the content of the discussion was checked, it is found out that they began intensively using rational influence only after they found a difference of opinion against a certain rank or item.

Another fact that was observed from the discussion is the domination of the discussion. In group 5\_6, the discussion was dominated by two of the members. One other member almost never spoke or gave any opinion. When their IIRs were



**Fig. 3** Distribution of rational and non-rational influence of group 5\_6

compared to the expert rank [11], this least contributive member is on the other hand, had the closest rank to the expert rank. However, she did not try to influence other members to follow her rank. In some of the items, she converted or complied to the group rank. In the end the group score fell down and got further from the expert rank. Her IRR also became bad, and quite far from her IIR. However, in group 5\_7, the opposite situation was found. The member with best IIR was also the most talkative and the group score also become good, close to his initial rank.

## 4 Preliminary Findings

Even though at the current stage of research the supporting data are not enough and more of the videos in the data need to be analyzed, there were several interesting findings that can lead to further investigation or elaboration. From the analysis explained in the previous section, three preliminary results were found.

The first finding is that group members sometimes do not realize what is important to discuss and what is not. Moreover, in a time-constrained decision making situation where members are pressured to make a decision as fast as possible, they may skip the orientation process of understanding the differences of the topics. As found in the analysis, group 5\_6 discussed more about oxygen regardless of its low difference of IIR, while discussed less about a heating unit regardless of its high difference of IIR. This was triggered simply because oxygen was mentioned very early by one of the members, while nobody mentioned about a heating unit until the middle of the discussion. Similar situation was also found in group 5\_7, even though not as extreme as in group 5\_6.

The second finding is about the pattern of rational influence and non-rational influence. It is found that when the time pressure is higher (in this case, reaching the end of discussion time) members tend to use non-rational influence than rational influence. Since they do not have enough resources (time) to consider all facts, they may choose to rely on their partners' preference. When it comes to this situation, whose preference will be used will depend on various things such as the members' personality. However, sometimes when time pressure does not exist *and* they feel that the difference of opinion is not so significant, they still use non-rational influence. Such a case was found in the beginning of the discussion of group 3\_3. They did that probably to save resources, since argumentation requires resource (time, energy, and so on).

The third finding is the effect of the members' personality on the decision. As found in the analysis of group 5\_6, the member with the best answer is unfortunately the least contributive member. On the other hand, the answers of the dominant members were not so good. The opposite situation happened in group 5\_7. Since the groups relied on the heuristic approach for most of the items, then the dominant members were more influential regardless the level of accuracy of their answer.

Human decision making behavior under stress has been studied quite extensively [12]. However, there seems to be more to study about decision making under stress for group situations. The interaction and influencing process between the members, related to time or members' personality still need to be explored further. Such studies can later improve group decision making, particularly in an emergency situation.

## 5 Conclusions

In this paper, a model of group decision making has been proposed. The model emphasizes the aspect of individual influence towards each other in making a group decision. In the current stage of research, some issues were found. This paper wants to highlight that in a group setting, humans also tend to rely on a heuristic approach in decision making, just like in an individual setting. However, there is a mechanism that was not found in individual decision making, which are influence and conformity. Further research need to be done to ensure that group decision making in emergency situation will produce a good decision.

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