GROUP DECISION EXPERIMENTS USING BUSINESS GAME-PROBLEM SOLVING WITH CONFLICT

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ABSTRACT

This paper describes the results of two experiments using business game. The basic concept of this research was not for education but problem solving in a real business. The hypothesis was gaming with conflicts show more effective group decision making of new production launching game. Experiment A was done using four undergraduate students' teams. There were two scenarios, without conflict and with conflict. The effects were measured by questionnaire; however, there were no significant differences. Experiment B was conducted using ten experienced business school students. Although statistically no significant difference was observed, the conflict scenario showed causing more effective group decision.

INTRODUCTION

Researches on group decision making experience have been reported at Association for Business Simulation and Experiential Learning (ABESL) papers since 1970's. Most of the former researches were focused on improving education in class room. There are not many reports which clearly aiming group decision making problem and/or conflicts at the real business environments. This paper describes about two scenario experiments which simulate group decision making at the real business environment. My interest is if business gaming simulation method will be efficient for improving group decision making. The basic concept of this research was not for education but problem solving in a real business. Some papers approached the same problem solving using other decision making methods such as Nominal Group Technique (NGT), Dialectical Problem-Solving Technique (DPST), and Decision Support System (DSS). (Chanin 1983, Affisco and Chanin 1989, 1990) There are some researches about conflict solving in game simulation whose focus is real problem solving of each interested parties. Especially role playing game of city planning are one of good examples of problem solving game. Most of papers regard conflicts in gaming as problems to be resolved. (Lambert and Uhring 1981, Uhring and Lambert 1982)

Although there are lots of decision making and conflicts theories, at this paper, on the basis of group decision making theory (Ueda 1996), I designed two experiments using business gaming simulation to evaluate Ueda's decision making theory. The theory has been told that appropriate conflicts in the same team enhance the efficient group decision making. In short, some conflict helps deeper discussion and will change decision makers' world view. In other word, when there are not enough conflicts, the group decision may face into the risks that the members fall into compromise. This theory is unique, because most of former researches think conflicts of group decision making as obstacles of efficient decision. Ueda pointed out adequate volume of conflicts work as spices so that more effective mutual understanding will be accelerated.

HYPOTHESIS

Looking at experiment model, as shown in Figure 1, divergent process occur because each member's world view (value judgment) of decision making are not the same in a team. This divergent will make conflicts between members higher. Then they realize risks or conflicts of different views in the team. At the same time, they need to achieve winning against other teams. To solve conflicts and risks in a team, each member tries to change their own world view by themselves. This is called convergent process. Through the conflict solving process, the gain of group decision making will increase, while the loss of group decision making will decrease. This is because each member tries to understand of another member's world view. Those processes will enhance the efficiency of group decision making. The definition of group decision efficiency here is increase of interaction gain and/or decrease of interaction loss in a certain amount of time.

Scenario 1 is business game with no conflicts to decision making, scenario 2 is game with conflicts inside the same team. Two experiments were conducted to two different test subjects group. Experiment A's participants were under graduate students in business course, Experiment B's participants were well-experienced students of executive MBA class. Game with conflict (Scenario 2) will accelerate the efficiency of group decision making rather than game with no conflict (Scenario 1). To confirm this hypothesis precisely, several sub-hypothesis are shows as below and they correspond to items on figure 1.

Hypothesis 1

Game with conflict let participants' role of the team more perfectly than game with no conflict.

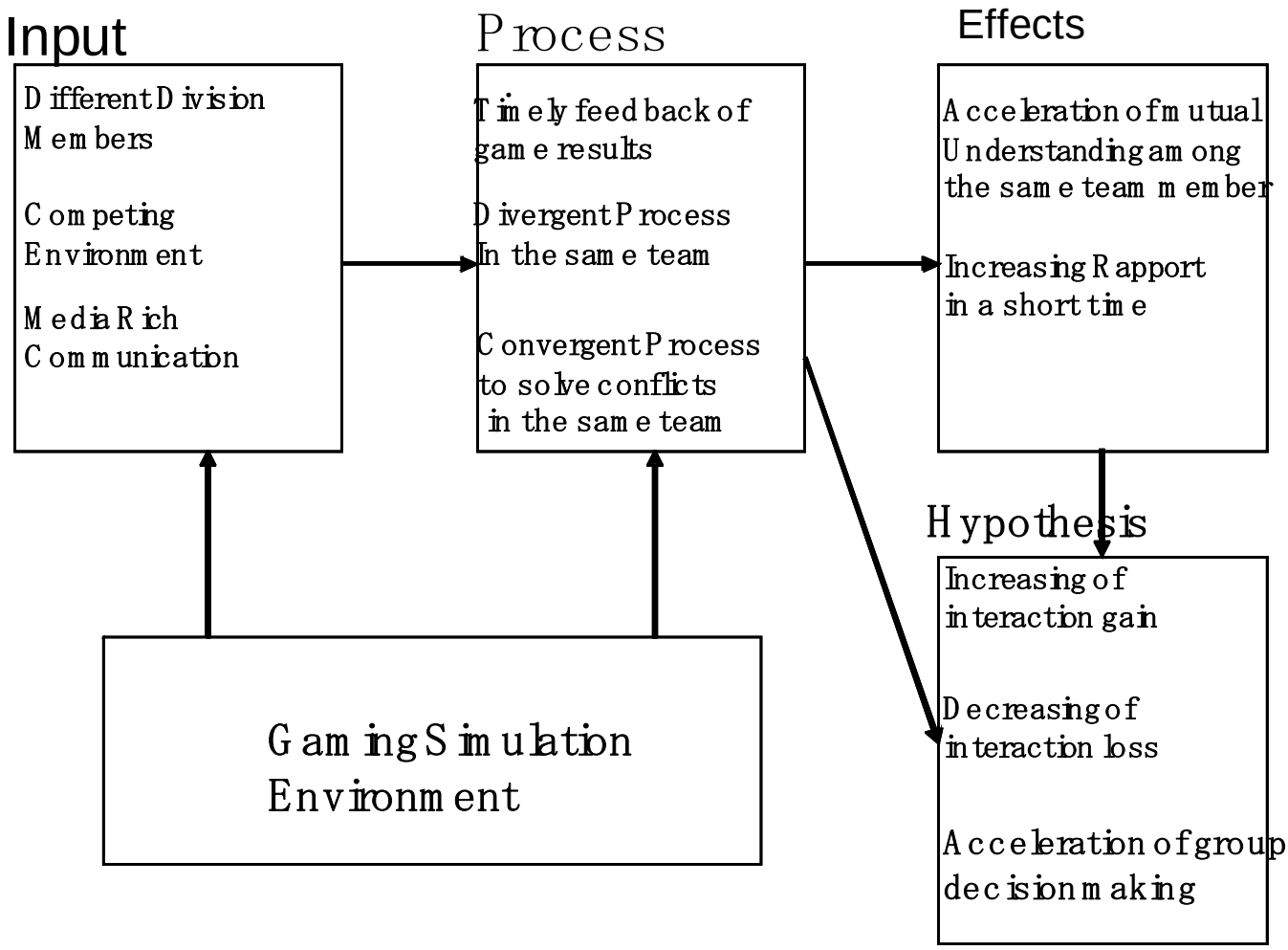

Figure 1 Experiment Design and Hypotheses

Hypothesis 2
Game with conflict accelerates convergent process of group decision making than game with no conflict.

Hypothesis 3
Game with conflict accelerates divergent process of group decision making than game with no conflict.

Hypothesis 4
Game with conflict will accelerate the efficiency of group decision making rather than game with no conflict.

EXPERIMENT MODEL

I designed this game by using YBG (Yokohama Business Game) development tool. The specification of business game is as show in table 1 (Shirai et al. 2003, Tanabu 2008).YBG offers gaming simulation development language and Web based gaming environment in Japanese language.

The game scenario is that assuming 4 or 5 developing team next generation music player (i.e. i-pod). Each team consists of two people, one is working for marketing division, and another is for R&D division. In the same team, two different division persons are competing limited internal budget aiming maximizing their incentive bonus. In a real business, usually marketing person and R&D person have the different world view (value judgment). On the other hand, as a team, they need achieve maximizing each team's profit competing with other teams. This complex situation will elaborate certain conflicts to game players. With regards to marketing group decision experiment of division and R&D divisions, Souder (1977) conducted experiment using nominal- interacting group decision method. The results showed effective improvement.

METHODS

Gaming trials were conducted two times at each experiment. The first experiment is scenario with no conflict (Scenario 1) and the second one is Scenario 2 with conflict. The pair of the team is

Table 2 Gaming simulation specification

Gaming Development Tool	YBG (Yokohama Business Game)
Product	Next generation music player
Market	Consumer market in Japan
Number of teams	4 team x 2 people (Marketing person and R&D person)
Number of input	1 quarter x 5 periods
Input variables	Selling price, number of production, R&D expense, marketing expense
Output report	Income statement (including incentive bonus of all game participants)
Exodus variables	Market growth curve

Table 2 Goal of experiment 1 and 2

	Scenario 1 (with no conflict)	Scenario 2 (with conflict)
Goal of game	Maximizing team's cumulative net income	Maximizing each individual's incentive bonus

different at each experiment. It took approximately one hour to conduct each experiment. The number of decision inputs is five times by quarterly bases at an experiment. There are four input variables, selling price, amount of production, marketing expenses and R&D expenses. Basically marketing person has responsibility to marketing expenses and R&D person has responsibility to R&D expenses. Other variables should be discussed and decided by two people. There are different goals are set at two games. The first game goal is winning as team, simply aiming maximizing the cumulative net income. The second game goal is winning as individual, maximizing incentive bonus to individual. At each period, the amount of money they can spend at as marketing expense and R&D expense is fixed. So marketing and R&D persons need to negotiate with each partner about the spending ratio. When the team gets net profit, 10 (Experiment A) or 30% (Experiment B) of the profit will be paid as incentive bonus. The ratio of the bonus is paid according to the ratio of marketing and R&D expenses (see table 2).

QUESTIONNAIRES

Participants were asked several times (Experiment A was four times, after input of the second quarter and the fourth quarter of two game trials. Experiment B was two times, after input of the fourth quarter of two game trials.) After two game trials, each of them had interview and input the comparison of two games. The data of each game input and output were recorded.
The questions during game input are as follows.

q1: "Did you proceed with your partner friendly?"
q2: "Did you act your role perfectly?"
q3: "Did your partner proceed with you friendly?"
q4: "Did your partner act his/her role perfectly?"
q5: "Did you have collusion with your partner?"
q6: "Did you achieve better decision making with your partner than without him/her?
All six questions were five points scare (experiment A) or ten points scare (experiment B).

The interview questions after games are as follows.
Q1: "Which game did you feel larger collusion with your partner?" (1 = Scenario 1, 2 = Scenario 2, 3 = don't know).
Q2: "Which game did you feel sharing decision making opinion with your partner?"
Q3: "Which game did you satisfied with?"
Q4: "Do you think these games enhance the mutual understanding to partner with different role?" (Five points scale, 1 = strongly disagree, 5 = strongly agree).

Here are relations of hypothesis and questionnaires.

H 1
Game with conflict let participants' role of the team more perfectly than game with no conflict.
(q2, q4: Scenario 2 > Scenario 1)

H 2
Game with conflict accelerates convergent process of group decision making than game with no conflict.
(q1, q3, Q2: Scenario 2 > Scenario 1)

H 3
Game with conflict accelerates divergent process of group decision making than game with no conflict.
(q5, Q1: Scenario 2 > Scenario 1)

H 4
Game with conflict will accelerate the efficiency of group decision making rather than game with no conflict.
(q6, Q3: Scenario 2 > Scenario 1)

EXPERIMENT A (using under-graduate students)

Experiment A was pretest and undergraduate students of management major from two universities joined. The purpose of this experiment is testing validity of method, scenarios of conflict and non-conflict games. Participants are eight junior and/or senior students from different universities. The different school students were paired up as the same team. It was the first time to meet each other. Book gift coupon was the number one prize at two games.

As shown in Table 3 and 4, q2 "your role" were not larger than 3.0 (neutral) in both scenarios. Participants' sell judgment was they could not play perfect role, conversely, q4 "partner's role" was 3.7 which showed positive. In either q2 or q4, there were no significant differences between two scenarios. So Hypothesis 1 was rejected. Both q1 "your cooperativeness" and q3 "partner's cooperativeness" were high score in two scenario games. However, there was no significant difference. Q2 "share opinion" did not show difference either. So H2 was rejected.q5 "collusion" was around 2.0 and enough divergent process didn't occur in both scenarios. There was difference neither in q5 nor in Q1 "collusion". So H3 was rejected. q6 "group decision making" showed between 3.0 and 4.0, which was partially supported. However there were no differences in either q6 or Q3 "satisfaction". So H4 was rejected.

Table 3
Experiment A participants score

	Scenario 1 (with no conflict)	Scenario 2 (with conflict)	difference [a]	*p*-value
q1	4.75	4.81	0.06	.718
q2	2.75	3.00	0.25	.483
q3	4.69	4.69	0.00	1.000
q4	3.75	3.69	-0.06	.879
q5	2.06	1.88	-0.19	.530
q6	3.81	3.75	-0.06	.927

Note. N=8, the number of participants joined at gaming simulation. All six questions were five point scale, (1 = strongly disagree, 2 = slightly disagree, 3= neutral, 4 = slightly agree, 5 = strongly agree). [a] Mean of Scenario 1 – Mean of Scenario 2.

Table 4
Number of participants of game scenario preference (Ex. A)

	Scenario 1	Scenario 2	Don't know
Q1 Collusion	1	2	3
Q2 Share opinion	3	2	1
Q3 Satisfaction	3	3	0

Note. N=6, the number of participants joined at interview after gaming simulation. Mean score of Q4 "mutual understanding acceleration" was 3.0.

In the end, mean score of Q4 "mutual understanding acceleration" was 3.0 (N=6), which didn't support this Experiment A accelerated the mutual understanding between different role players.

EXPERIMENT B (using EMBA students)

I conduct experiment B after improving several methods to experiment A which was pre-test. Ten participants (five teams) of experiment B were Executive MBA students who were manager or director of well-known companies of Japan. Comparing with the participants of experiment A, these participants have been working for different companies' different position, so they should have different world view. Teaming was randomized at Scenario 1 & 2 and role of game (Marketing or R&D) was also randomized.

At this experiment, all participants could see the result of each member's bonus at the screen at each end of period. The percentage of bonus was raised from 10 to 30%, so that, giving more incentive. However, at Experiment B, no top prize was prepared, because the participants were relatively elder and richer than under-graduate students. There was no change to text of questionnaires but scale. The scare was changed from 5 points to 11 points to measure more detail.

Results were shown in Table 5 and 6. q2 "your role" showed relatively high score and statistically significant difference between scenario 1&2. Conversely, q4 "partner's role" was high but no difference between two scenarios. Hypothesis 1 was partially supported. Both q1 "your cooperativeness" and q3 "partner's cooperativeness" were high score in both scenarios. But, there was no difference. Q2 "share opinion" did not show difference either. So H2 was rejected. q5 "collusion" was around 5.0 (neutral) or lower and enough divergent process didn't occur in both scenarios. Although not significant, there was some difference in q5 and Q1, which showed conflict scenario yielded more collusion among the same team members. So H3 was not fully supported. q6 "group decision making" showed very high score around 9.0, but no significant differences in q6 or Q3

"satisfaction". So H4 was rejected.

Mean score of Q4 "mutual understanding acceleration" was 3.6 (N=10), which support this Experiment B accelerated the mutual understanding between different role players to some extent.

Table 5
Experiment B participants score

	Scenario 1 (with no conflict)	Scenario 2 (with conflict)	difference [a]	*p*-value
q1	9.00	9.00	0.00	1.000
q2	6.10	7.70	1.60[†]	.091
q3	9.50	9.20	-0.30	.434
q4	7.80	7.90	0.10	.901
q5	4.00	5.70	1.70	.277
q6	9.30	8.80	-0.50	.381

Note. N=10, the number of participants joined at gaming simulation. All six questions were ten point scale, (0 = strongly disagree, 5= neutral, 10 = strongly agree).
[a] Mean of Scenario 1 – Mean of Scenario 2.
[†] $p<.10$

Table 6
Number of participants of game scenario preference (Ex. B)

	Scenario 1	Scenario 2	Don't know
Q1 Collusion	1	4	5
Q2 Share opinion	4	4	2
Q3 Satisfaction	6	4	0

Note. N=10, the number of participants joined at interview after gaming simulation. Mean score of Q4 "mutual understanding acceleration" was 3.6.

Comparison of Experiment A & B are shown in Table 7. This comparison is just a reference, because two experiments were conducted under different environment. From view of group decision making process, Experiment B indicated better results. Because the convergent of participants (q1 & q3) of Experiment B was lower than Experiment A, while divergent process (q5) of Experiment A was higher. The role of player (q2) of Experiment B was higher than Experiment A. Finally the participants of Experiment B showed higher in q6 "group decision making".

Table 7
Comparison of Experiment A &B participants' mean score (Scenario 2)

	Experiment A[a]	Experiment B[b]
q1 your cooperativeness	4.8	4.1
q2 your role	3.0	3.5
q3 partner's cooperatives	4.7	4.2
q4 partner's role	3.7	3.6
q5 collusion	1.9	2.6
q6 group decision making	3.8	4.0

Note. Scenario 2 is game with conflict. For the experiment B, 11 points scales are transformed to 5 points scale. (0&1 is 1 in 5 point scale, 2&3 is 2, 4-6 is 3, 7&8 is 4, 9&10 is 5 respectively).
[a] n=8, [b] n=10.

DISCUSSION AND CONCLUSION

As shown in two experiments results, the most of hypothesis were completely rejected. One exception was H 1 of experiment B. It showed that scenario with conflict made the participants' role more than scenario with no conflict. The basic objective of this research was the problem solving with business gaming simulation. It is important to players act their role seriously. Some conflict in the team will be an effective stimulate and make its group decision more vital.

Comparison of two experiments indicated that experiment B whose participants were EMBA students produced the more divergent discussion in the same team in scenario 2. It is difficult to specify the reason whether the EMBA students had better understanding of playing role and/or they had originally different world view or other reasons. However, the fact was that the evaluation of well-experienced business people showed the tendency of hypothesis support results than the evaluation of under-graduate students.

The numbers of experiments' subjects were not enough to get the statistically significant results. The experiment game was designed as actual business decision model, that is, not many participants in the same team. It will be possible increase the numbers of team from two to four or five, however, the more team member, the more difficult to interpret results of experiments. How to increase the number of subjects and how to measure the group decision results should be studied as the next research topics.

The implication of these two experiments and comparison analysis were that some conflicts possibly help more effective group decision making in the business environment. In former research of gaming simulation, conflict had been treated as obstacles to be solved. However, this research intentionally introduced conflicts so that the discussion in the team more

active and promote the mutual understanding of each member's world view or core value. Finally they might achieve the more effective group decision making. At the real business environment, it is not unusual working people spend more time to coordination of other division of the same company than competition to other companies. In the end the quality of group decision making get near-sighted and low. These experiments could simulate the effectiveness of problem solving by using experienced business people.

Think of further improvement a method of experiment, between-group experiments are more reliable than within- group experiment. This time the same participants were tested two scenario gaming simulation. Between-group experiment to two randomly sampled from population such as EMBA students group should be tested. On the other hand, there are some limitations of size of experiment using business gaming simulation. The scenario assumed two persons pair in a team, but more people join in actual group decision making of business. The more the member of a team increase, the more the model of group decision making become complicated. Considering the simplicity of model and data sample size, it is necessary to conduct the more number of experiments.

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