

# Discourse Analysis of Communication Generating Social Creativity

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**Abstract.** We have developed a table game named Innovation Game that supports users for thinking up ideas with social creativity. There are two types of players in the Innovation Game, innovators and consumers. While the innovators think up ideas and propose them to the consumers, the consumers criticize the ideas and make decisions whether they buy the ideas or not. In the Innovation Games, the innovators do not only propose their ideas to the consumers, but also improve the ideas using consumer's comments that represent negative impression to the ideas. Therefore, it is considered that ideas with social creativity are related to the negative comments from the consumers. However, the relation between them has not been cleared. In this paper, we analyze discourse texts of communication generating social creativity. The analysis method focuses on the negative comments obtained from the consumers. We analyzed discourse texts of the Innovation Game using the method, and it was verified that the more negative comments the innovators accept, the more ideas with social creativity are obtained.

**Keywords:** Discourse analysis, Positive/Negative comment, Innovation Game, Social creativity.

## 1 Introduction

In discussions for making new scenarios, people have to think many hours and exhaust themselves. Since it causes more stress to them, it is difficult for people to exchange their opinions frankly. In order to solve the problem, we have developed a table game named Innovation Game [1].

In the Innovation Game, there are two types of players, innovators and consumers. The innovators think up new business ideas using some cards in which descriptions about existing technologies are written with pictures, and propose the ideas to the consumers. The consumers criticize the ideas and make decisions whether they buy the ideas or not. The innovators do not only propose their ideas, but also improve their ideas referring to comments from the consumers. In communication of the Innovation Game, most of the players are encouraged to give the innovators negative comments that have not been encouraged in the previous brainstorming. Therefore, it is considered that ideas with social creativity are related to the negative comments from the consumers. However, the relation between them has not been cleared.

In this paper, we analyze discourse texts of communication generating social creativity. The analysis method focuses on the negative comments obtained from the consumers. The purpose of this paper is to discover how the negative comments from the consumers help the innovators to think up ideas with social creativity.

We define the social creativity as novelty and usefulness for people. In the Innovation Games, the social creativity of idea is evaluated by all of the players considering four measures: idea's cost, idea's utility, idea's reality, and idea's novelty.

## 2 Related Works

Many researches have been conducted on discourse analysis [2,3,7,8] in computer science. These researches have analyzed discourses with labels called dialogue acts that represent the features of utterance. However, these researches have not focused on negative impressions, and have not prepared such labels. Therefore, it is necessary to prepare a set of labels representing negative impressions in order to analyze the communication of the Innovation Game.

In ethnographic and social-psychological analyses of discourses, the search for features was guided by three analytic concepts characteristic of critical discursive psychology [9]. Though we can obtain the detailed features from discourse texts of the Innovation Game using the previous method manually, we will plan to propose an automatic analysis system for the players of the Innovation Game. Therefore, we do not use the previous method introduced in [9].

Creativity and its support systems have been studied in many fields [4,5,6]. Since the previous methods have supported users for thinking up many ideas not considering the quality of ideas, the ideas have not been made contributions to new businesses and new technologies. We have focused on the social creativity that means novelty and useful for social community. We have developed the Innovation Game as one of the support methods for generating the social creativity.

It is necessary for generating the social creativity to analysis the quality of ideas such as idea's risk, idea's cost, idea's utility, and idea' reality. Since the players are recommended to give the innovators negative comments for the ideas in the Innovation Games. It is useful to discover the relations between the social creativity and the negative comments.

## 3 Method

All of the procedure is operated manually. A discourse text is transcribed by listening voices of the players. (In the following experiment, we transcribed the discourse texts.) The method takes a discourse text as input. Utterances related to the proposal of ideas are extracted from the discourse text. The discourse text is separated into sub texts that include utterances about one idea. Then labels representing features of utterances are given to each utterance. (In the following experiment, we gave candidates of the label and decided the labels by majority vote of us.) Finally, relations between the ideas with social creativity and the given labels are analyzed.

In the following section, we explain the labels for utterances and the criterion of judging the social creativity of ideas.

### 3.1 Labels for Utterance

The labels for utterances in a discourse text are the following six ones. We have surveyed the previous researches and the features of utterance in the Innovation Game. Finally, we have constructed a set of labels for analyzing the Innovation Game.

- *Positive*: This label represents positive impression for the last utterance.
- *Neutral*: This label represents non-relation to the last utterance. This also represents an answer for the last question utterance.
- *Negative 1*: This label represents suspicious impression to proposed ideas.
- *Negative 2*: This label represents non-agreement to proposed ideas.
- *Negative 3*: This label represents non-agreement to proposed ideas with questions for innovators.
- *Negative 4*: This label represents non-agreement to proposed ideas with questions for innovators. The consumers point out the weakness of the idea.

### 3.2 Criterion for Judging the Social Creativity of Ideas

It is considered that the ideas with social creativity are bought by many consumers because such ideas are encouraged in the Innovation Game. Therefore, the criterion for judging the social creativity of ideas is the earnings of each idea from the consumers. We have found correlations between the earnings of ideas and the levels of four measures (idea's cost, idea's utility, idea's reality, and idea's novelty) for evaluating the social creativity of ideas. Therefore, we equaled the ideas with high earnings and the ideas with social creativity.

## 4 Experiment

We analyzed discourse texts of the Innovation Game using the method. Table 1 shows sets of data used for the experiment. We used two sets of data that are the discourse texts obtained from twice Innovation Games. We instructed the innovators to think up ideas considering social creativity: novelty and usefulness for people. The presented ideas were voted by all of the players considering four measures: idea's cost, idea's utility, idea's reality, and idea's novelty. The consumers were instructed to choose ideas for possessing the ideas with high social creativity. The players are university students, university professors, company employees, and so on. Since they were not always friends, it is considered that a decision bias for idea selection was not much.

Table 2 shows the proposed ideas in the Game 2. Some innovators combined two cards for creating a new idea, and the others combined one card and their own idea proposed in the previous turns (examples are idea O and idea S).

We surveyed the following three relations.

- (1) Relation between the social creativity of ideas and the number of utterances.
- (2) Relation between the social creativity of ideas and transition of positive/negative labels.
- (3) Relation between the social creativity of ideas and the rate of positive labels.

**Table 1.** Summary of data sets for experiment

	# of innovators	# of consumers	# of utterances	# of proposed ideas
Game 1	3	3	317	16
Game 2	4	3	453	20

**Table 2.** Proposed ideas and cards used for a new idea in Game 2

Id	Proposed idea	Card 1	Card 2
A	3D-radar for jet plane	3D-rader	Jet Plane
B	Barber service with dancing	Barber	Dancing robot
C	Package design for cup noodle	Photo printer	Mug
D	Control system of human resource	PDO system	RFID system
E	Bath putting bath salt automatically	Unit bath	Pump
F	Robot saving environment	Dancing robot	Eco system
G	Recycle system using a jet plane	Jet plane	Eco system
H	Propeller with carbon heater	Partition	Carbon heater
I	Towel and make up kit	Make kit	Towel
J	Extraordinary sofa	Carbon cloth	Cleaner
K	Electronic ruler	Ruler	Static electricity
L	Wood work kit for children	Microscope	Paper craft
M	Nano-ruler	Ruler	Laser pointer
N	Robot for controlling temperature	Dancing robot	Carbon heater
O	Bath for relaxation	Carbon cloth	J: extraordinary sofa
P	Bath for massaging	Unit bath	Vibrating bed
Q	Health check kit at home	Tongue cleaner	Health check kit
R	Big EL-theater made of glass	Partition	All in one projector
S	Cleaning robot	Dancing robot	K: electronic ruler
T	Bar in tunnel	Map of great spot	Tunnel

## 5 Results and Discussion

We show the analysis results and discuss the relations between the social creativity of ideas and the negative comments.

### 5.1 Relation between the Number of Utterances and the Social Creativity of Ideas

Fig. 1 shows the correlation between the number of utterances and the amount of earnings of each idea. The amount of earnings was a product of the price of idea and the number of its sales. The value of correlation was 0.64. The value was high because ideas with the high earnings were obtained after a long communication. In such communications, the innovators and the consumers discussed the weakness of ideas and the innovators improved their ideas using comments from the consumers. Therefore, the correlation between the number of utterances and the social creativity of ideas was obtained. It was verified that there is a relation between the number of utterances and the social creativity of ideas.

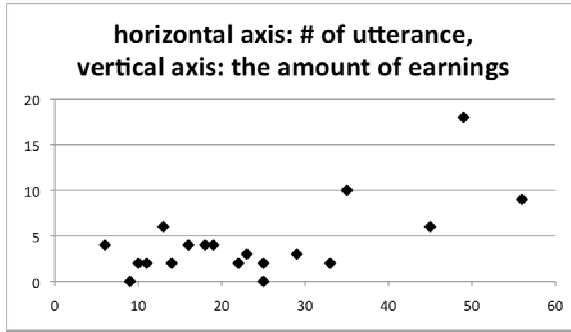


Fig. 1. Relation between the number of utterances and social creativity of ideas

### 5.2 Relation between the Social Creativity of Ideas and the Transition of Positive/Negative Labels

We surveyed the transitions of labels for utterances. Fig. 2 and Fig. 3 show the transitions of the labels in sub texts. Fig.2 was obtained from a sub text in which the idea obtained high earnings (idea T in Table 2), and Fig. 3 was obtained from a sub text in which the idea obtained low earnings (idea A in Table 2). In Fig. 2 and Fig.3,

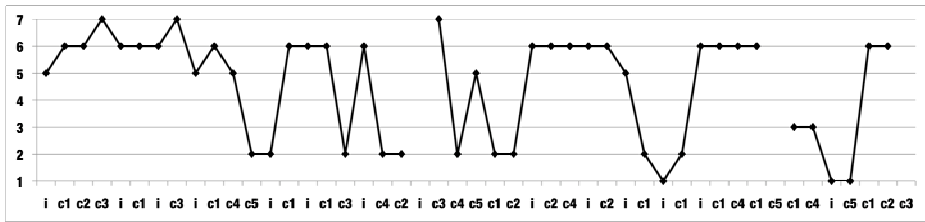


Fig. 2. Transition of the positive/negative labels given to each utterance in a proposal of idea T in Table 2. The horizontal axis denotes the time series. i, c1, c2, and so on denote the players. The vertical axis denotes the label. Number 1, number 2, number 3, and number 4 denote the Negative label. Number 5 denotes the Neutral label. Number 6 denotes the Positive label. Number 7 denotes laugh of players. The idea was about a bar in a tunnel. The idea obtained 10 dollars from the consumers.

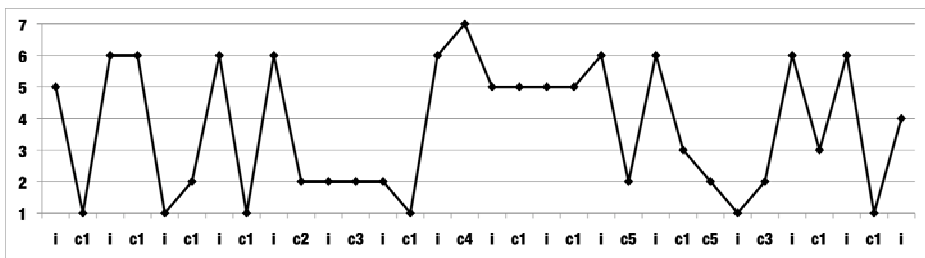


Fig. 3. Transition of the positive/negative labels given to each utterance in a proposal of idea A in Table 2. The idea was about radar of jet plane. The idea obtained 1 dollar from a consumer.

divergences (between the positive label and the negative labels) and convergence (to the positive label and the negative labels) are observed.

In Fig. 2, the transition begins with a divergence from upside to downside, and ends with a convergence to upside. On the other hand, in Fig. 3, the transition begins with a divergence from downside to upside, and does not end with a convergence. From the examples, the transitions are divided with the four features: the divergence, the convergence, upside, and downside. Therefore, we set four patterns as follows:

- Pattern 1: Divergence from upside.
- Pattern 2: Divergence from downside.
- Pattern 3: Convergence to upside.
- Pattern 4: Convergence to downside.

Table 3 shows the results of dividing the transitions. The transitions for ideas obtaining high earnings had two patterns, Pattern 3 after Pattern 1. Table 4 shows an example of the transitions. Pattern 1 is observed from 1<sup>st</sup> utterance to the 4<sup>th</sup> utterance and Pattern 3 is observed from 5<sup>th</sup> utterance to 8<sup>th</sup> utterance after the innovator (I) agreed with the consumer (C2) at the 4<sup>th</sup> utterance. It is considered that the Pattern 1 denotes acceptance of the negative comments from consumers, and the Pattern 3 denotes agreement of the social creativity of ideas. The change from Pattern 1 to Pattern 3 was made by the 3<sup>rd</sup> comment from the consumer C2. The comment improved the idea to be useful and novel for many people. After the 4<sup>th</sup> utterance from the innovator, the consumers (C2, C3) commented positively to the innovator. Therefore, the idea was bought by many consumers. From the results, it is verified that the convergence to upside is observed after the observation of the divergence between positive labels and negative labels for obtaining ideas with the social creativity.

### 5.3 Relation between the Social Creativity of Idea and the Rate of Positive Labels

We surveyed the relation between the social creativity of ideas and the rate of positive labels. Table 5 shows the results. The higher earnings the ideas obtained, the more the rate of the positive labels was. It is because the ideas with social creativity are thought up and improved in a comfortable communication between the innovators and the consumers. It is verified that ideas with social creativity are obtained in a frank communication in which positive comments for ideas are uttered.

**Table 3.** Dividing results of transitions using patterns and the number of ideas. The high earning idea is the idea obtaining less than three dollars. The low earning idea is the idea obtaining more than three dollars.

	# of high earning ideas	# of low earning ideas
Pattern 1: divergence from upside	1	4
Pattern 2: divergence from downside	0	2
Pattern 3: convergence to upside	6	2
Pattern 4: convergence to downside	1	0
Pattern 5: Pattern 3 after Pattern 1	12	2
Pattern 6: including Pattern 5	2	1

**Table 4.** Example of transitions Pattern 5 (that denotes the transition of Pattern 3 after Pattern 1). C denotes the consumer and I denotes the innovator. The discourse text is obtained a part of idea presentation shown in Fig. 2.

#	Player	Utterance	Label
1	C 1	Why do not use the real tunnel? It is boring only to show the view of tunnel on the screen.	Negative 2
2	I	It is difficult to use the real tunnel for this business, because tunnels are not shown in the center of city.	Negative 2
3	C 2	Would you use the tunnels in dead track? Though you think the tunnel bar only for bar, I think the tunnel bar will become one of the tourist spot like hot spring in Japan.	Negative 2
4	I	I see. That is interesting idea. I agree your comment.	Positive
5	C 2	Do you make one tunnel bar? That is very waste.	Negative 2
6	I	OK. I make tunnel bars as many as possible. I also sell a map for traveling tunnel bars.	Positive
7	C 3	It is very exciting to drink in the real tunnel. If the tunnel bars are built, I certainly visit some tunnel bars in holidays.	Positive
8	I	The safety in tunnels are guaranteed by helmet for construction.	Positive
9		(Players are laughing)	

**Table 5.** Rate of positive labels for each idea in Game 2

Id	Price	# of sales	# of earnings	Rate of positive comments
A	0	0	0	0.32
B	2	3	6	0.85
C	2	2	4	1.00
D	3	1	3	0.65
E	1	2	2	0.52
F	2	1	2	0.72
G	1	2	2	0.71
H	2	2	4	0.50
I	0	0	0	0.11
J	2	3	6	0.51
K	1	3	3	0.52
L	1	2	2	0.50
M	2	1	2	0.33
N	2	2	4	0.78
O	2	5	10	0.64
P	3	6	18	0.79
Q	1	2	2	0.55
R	2	2	4	0.58
S	2	1	2	0.70
T	3	3	9	0.66

## 6 Conclusion

In this paper, we analyzed discourse texts of communication generating social creativity. The analysis method focuses on the negative comments.

We have developed a table game named Innovation Game for people to think up ideas with social creativity. In the Innovation Game, negative comments to ideas are encouraged. Therefore, we focused on negative comments to ideas obtained from the consumers in the Innovation Game, and prepared a method for discourse analysis. We used the method and analyzed two data sets of discourse texts that were obtained from the Innovation Games. We discovered that it is important for the innovators to accept the negative comments from the consumers, and to improve their ideas referring to the negative comments.

We will search conditions that encourage the negative comments from the consumers. The conditions are considered that combinations of the players, prices of the proposed ideas, and so on. We will design the environment of communication generating social creativity using the conditions.

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