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The word-of-mouth effect on the web

A case of the network of message board in site A

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1 Introduction

People are affected by others in buying behavior because they do not live alone. Since the 1950's, marketing studies have demonstrated that the word of mouth effect exists. Today, there are large numbers of on-line communities, and they have much more opportunities to give the effect to each other. The purpose of this study is to do a research on how buying behavior transmits among consumers by seeing the relationship between the network structure and the buying behavior. We studied the network in the cosmetic word of mouth site. The variables are users' comments about items (regarded as proxy variable of buying behavior) and their talking there. Two classes of network models are used for the analysis, cohesion and structural equivalence model. Two fact findings are drawn: (a) In cosmetics, which is not conspicuous, cohesion is not the dominant factor in taking the same buying behavior. (b) Where there is an evidence of cohesion and structural equivalence, many people take the same buying behavior. From these fact findings, cohesion and structural equivalence may be the dominant factor that drives contagion of buying behavior.

2 Research background

In this section, we review studies on information transmission: word of mouth communication, studies about network, studies about on-line communities.

2-1 Word of mouth communication:

Classification of goods

In the field of word of mouth communication research, we looked at which goods are easily affected by others.

Whyte(1954) compared the private goods of which consumption is invisible and the public goods of which consumption is visible, and showed that reference group has much more effect on public goods. Furthermore, Bearden & Etzel(1982) showed differences in reference group influence between publicly and privately consumed products and between luxuries and necessities.

To sum up, people's buying behavior is affected by others in different ways depending on the publicly or private goods. In this study we focus on cosmetics which is private necessarily goods.

2-2 Network:

Adaptation of innovation in the network

People are not always affected by those who have direct relations. So, we take into account the case in which they do not have direct relations. We looked up the adaptation of innovation in the network.

Coleman(1957) investigated the diffusion of a new drug among physicians. At first the influence of these social networks operated only among doctors who were integrated into the community of their colleagues through ties of a professional nature. Then it spread through the friendship networks, finally there came a phase during which most of the remaining doctors. In short, the social linkage affected the adoption of the innovation in the early stage. This is because, according to Coleman(1990), 'for purchase for which the cost of a bad decision is high, a rational actor will engage in a search for information before deciding. But along with his information search, he will place trust in the judgment of others.' Since effectiveness and safety of the new drug are not clear, the judgment of others is taken seriously for the time being. Burt(1987) also investigated the adoption of the new drug and the network structure, and indicated that social contagion occurred through structural equivalence,

but not through cohesion. Cohesion is that A and B is a direct acquaintance. Structural equivalence is that A and B have the same relationship to other people in the network. (Table 1)

2-3 Studies about on-line communities

The internet user keeps steadily increasing. According to internet white paper of 2004 by the foundation internet society, the internet population of Japan is the 63 million people in the end in February, 2004, and 48.1% of the internet utilization household is connected with the broadband in Japan. Many on-line communities exist, and it is possible that the consumer hears users' opinion on product and service.

There are many papers which studied the on-line community. For example, Miyata(1997) examined the internet's interactive-ness, and classified the interactions among users. Mathewick(2002) classified the users in the on-line communities. And, the research on on-line community and sales and marketing result of the brand force recently increases. Most studies in the on-line community have used the questionnaire. Especially, the research of the on-line shopping site has analyzed visit frequency and purchasing probability using the purchasing data on the site.

There are studies about the structure between blog sites, there are few studies that conducted the social network analysis of the structure of consumers in on-line community in one specific site.

In this study, we will analyze the relationship between the between the buying behavior and the network structure of the consumer in site A.

3 The network in the site A

3-1 Hypothesis

Site A is a word of mouth site about cosmetics. The number of users is over 0.5 million, and their comments are over 2.5 million. The displayed information is user's handle name, skin type, age, the date of her comment, and an assessment of a certain item (by the number of stars). We take these comments as proxy variable of buying behavior.

Comments about items and the message board are on different pages in the same site. That is, they form two distinct networks. In the message board, users have talks with others who have the same interests. Some of these topics have continued for a long time, so the members of the topics comprise

networks. In this site, we can see the relationship between word of mouth communication (as proxy variable of buying behavior) and the network of users (as consumers). In this paper, ‘comment’ refers to the word of mouth communication in this site, and ‘talk’ refers to the writing in the message board (because when they write in the message board, they recognize who they are talking to).

We regard the fact that the users have talks as their networks, but it is difficult to investigate the whole topics, because there are over 4000 topics in the last three months.

As the first step in our analysis, we picked up 5 topics to build a hypothesis. Some users have talks in more than one topic. Figure 1 is the network drawn by Netdraw.

To capture the structure of this network, we use the block model by CONCOR in Ucinet¹. Four subgroups are found, and the members of each group are structurally equivalent. The users who wrote comments on one certain item are found to be structurally equivalent (see Figure 2: the date is the day when the user wrote the comment). Therefore, following hypothesis can be deduced.

Hypothesis : Some consumers take the same buying behavior not only because they are cohesion (they have a talk) but also because they are structural equivalence in the network.

3-2 Method

To verify the hypothesis, it is necessary to investigate the central structure, because part of the network is not enough to consider the whole network. Generally in marketing, 20% of consumers are said to take over 80% of sales, and 35% of users who have talks in message board take over 70% of talks. That is, we can see the rough structure of their communication by checking frequent users.

We took out two networks: network of buying behavior (network A), network of talks (network B). We picked up top 250 users who have many talks on the message board in terms of top 100 items (Network A), and 100 topics (Network B). To put it more concretely, Network A is made by matrix in which row is user id and column is item id. Network B is made by matrix in which row is user id and column is topic id (Network A : Figure 3, Network B : Figure 4).

QAP correlation of these matrix is 0.014. When there is a tie between two users in Network A, it means they bought the same item. And when there is a tie in Network B, it means they have a talk in the same topic. Low correlation means that they bought rarely the same item if they have talks.

¹Borqutt, S. P., M. G. Everett, and L. C. Freeman. 2002. *Ucinet for Windows: Software for Social Network Analysis*. Harvard: Analytic Technologies

Therefore, following fact finding can be drawn.

Fact finding 1 : Users don't take the same buying behavior when there is a tie between two users.

What type of network structure derives the same buying behavior?

We repeated the same procedure with which we built the hypothesis, and we found that Network B consists of 9 subgroups. We examined the features of every subgroup in network B. For each item, we calculated a percentage of users who commented on the item (i.e., all comments divided by all users). We also calculated the percentages for each subgroup. There are some popular items whose percentages in a certain subgroup are higher than that in the whole network. We counted the number of these items. For example, we count one when the proportion that has commented on item A in the whole is 10% , and 20% user has commented in group 1.

The correlation between the density of each subgroup and the number of popular items was 0.9. It means that the higher the network density, the higher the proportion they write comment on the same items.

Being the member of the same subgroup means that they are structurally equivalent. And the high density means most of them are directly connected (cohesion). Therefore, following fact finding can be drawn.

Fact finding2 : Many users take the same buying behavior when they are structurally equivalent and cohesion.

This finding may not be surprising if the comment and talks are not separated. However, since he comment for item and conversation in message board is originally carried out and they make different networks, this fact finding is fascinating.

4 Conclusion and discussion

Two-person relation of conversation in the message board directly cannot explain comment to the same goods (fact finding 1). However, structural equivalence (i.e., users have conversation with others of the same interest in the message board), leads to the increase of the comments on the same goods (fact finding 2). Therefore, the following conclusion can be drawn from these fact findings.

Conclusion : In the goods that is not conspicuous, consumers who are not cohesion but structural equivalence, or not structural equivalence but cohesion do not take the same buying behavior. Many consumers take the same buying behavior only when they are both structural equivalence and cohesion.

Word of mouth research so far have focused only on the case there is cohesion (Table 2). Little is known about the relationship between the network structure and the buying behavior. This study reveals that as for the goods which are not conspicuous, the word of mouth effect works when people are both cohesion and structural equivalence. The effect is weak when they are cohesion without structural equivalence.

With the network analysis, Kuwashima(2004) demonstrated that the contagion of the buying behavior is happening when consumers are structurally equivalent without cohesion (Table 3). That is to say, word of mouth is related to not only cohesion but also the consumer's position in the network.

Why will such things do happen ?

According to Fiske (1989), people establish their identity in imitation and discrimination. Baudrillard (1981) claimed that the function of goods not only satisfies the individual need, but also connects the individual to the social system. Thus, the consumers receive pressure towards homogeneity and discrimination in the network. Goods they possess represents the identity in the network to some extent. This indicates that in analyzing the consumer network, it is important to consider not only cohesion but also the whole network structure. Not only cohesion but also structural equivalence produces the pressure towards homogeneity. In the previous research, in explaining the contagion of buying behavior, they have taken into account only the existence of cohesion, so the pressure towards homogeneity from structural equivalence could not be explained. The conclusion of this study emphasizes the importance of consumer networks for the analysis of the buying behavior.

This study analyzed the buying behavior by the concept of cohesion and structural equivalence in the network on Web. It was indicated that different kinds of buying behavior could be explained by structural equivalence and cohesion as a tool of the analysis. It may be possible that this finding can be generalized to actual networks. In the future research we will apply the current model to actual consumer network and construct the new framework in explaining the consumer buying behavior.

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Table 1 Cohesion and Structural Equivalence

	Structural Equivalence ○	Structural Equivalence ×
Cohesion ○		
Cohesion ×		

Figure 1

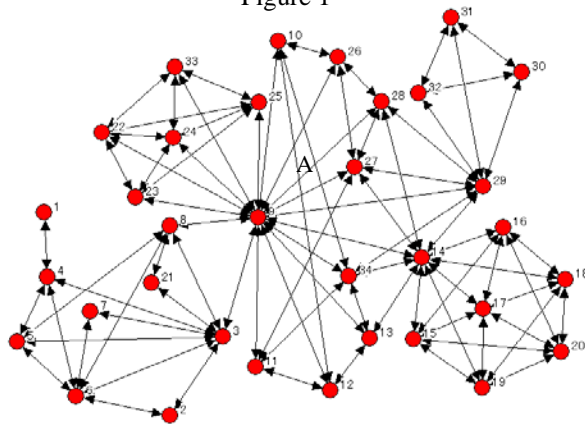


Figure 2 The network and the buying behavior

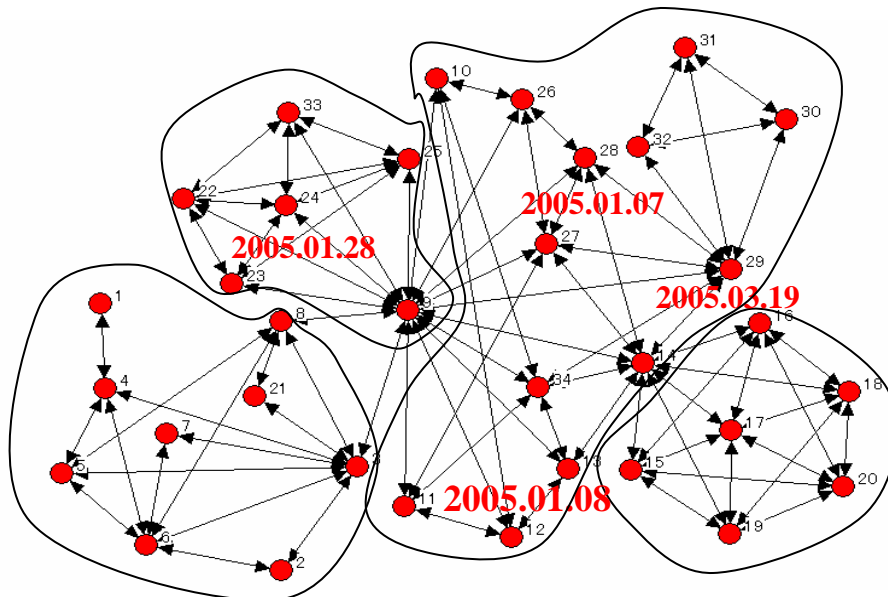


Figure 3 Network A : network of buying behavior

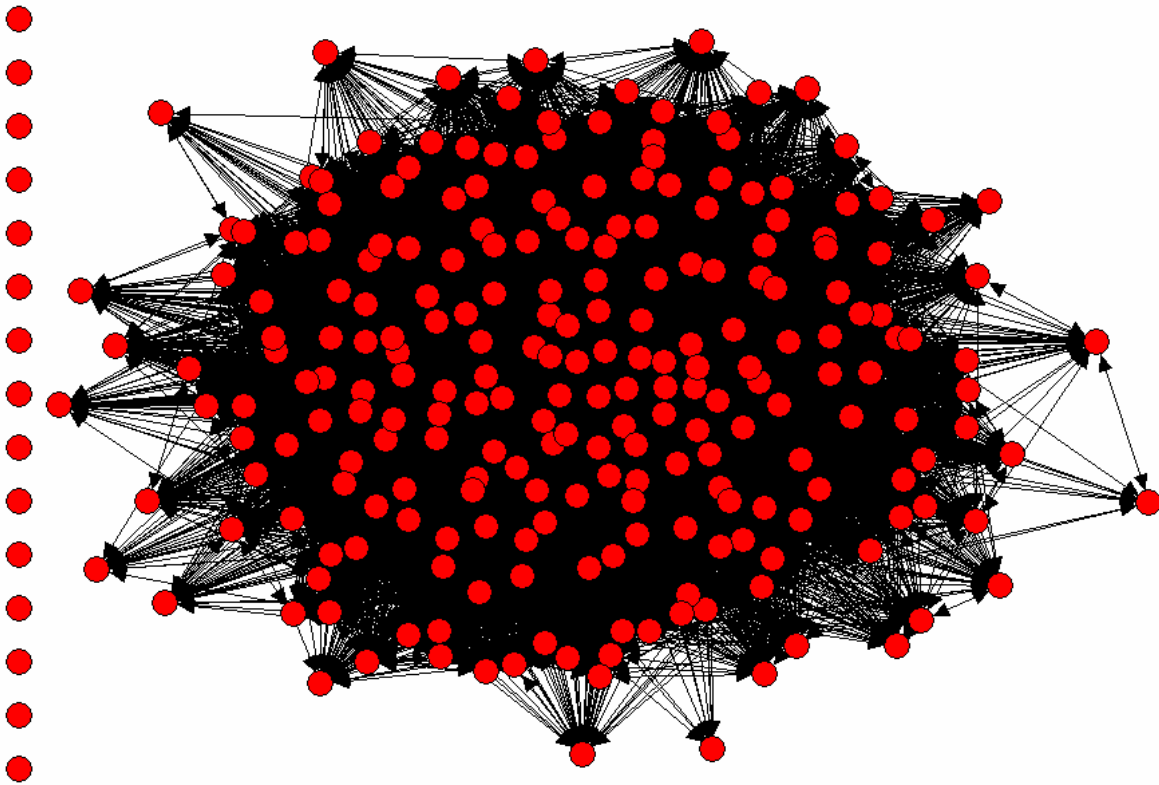


Figure 4 Network B : network of talks

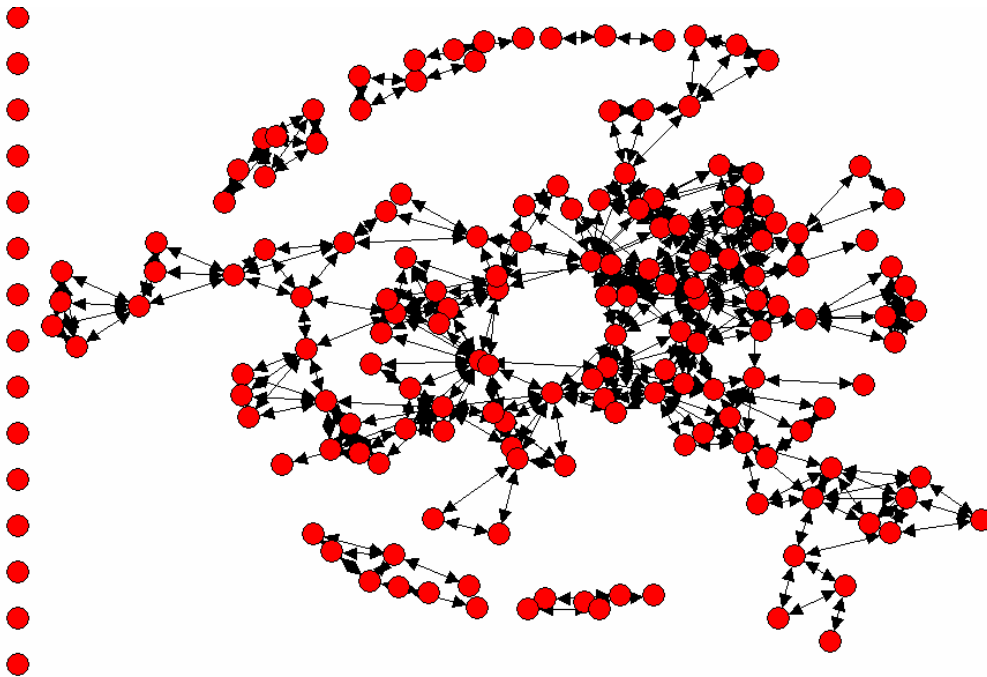


Table 2 Characteristics of subgroups

group	density	item/user
1	0.238	1.40
2	0.385	2.15
3	0.051	0.37
4	0.364	3.00
5	0.359	2.00
6	0.333	1.75
7	0.221	1.18
8	0.279	2.60
9	0.009	0.00

Table 3 Previous research

	SE ○	SE ×
Cohesion ○	Word of mouth studies	
Cohesion ×	not considered	

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