Abstract: With cosmetics, one cannot determine at a glance exactly what product a person is using. This paper analyzes the impact of a consumer network on cosmetics, which are goods that are not conspicuous. Comments in word-of-mouth websites for cosmetics is used as a proxy variable for purchasing behavior, and the relationship between a consumer network and purchasing behavior in a social network is analyzed. In cosmetics, which are not conspicuous, this paper has confirmed that consumers exhibit the same purchasing behavior as when they are in a relationship with structural equivalence within a network and not just in relationships with cohesion.

Keywords: social network analysis, word-of-mouth, structural equivalence, cohesion
Introduction

Coleman, Katz, and Menzel (1957) focused on a network of adopters, as to social contagion that results from information propagation, while showing that social relationships are important. They surveyed adoption of new drugs among physicians, showing that the pathway of adoption begins by propagation through a network of those that have specialized discussions, then through a network of friends, and finally among physicians that are not well connected to a network. Burt (1987) analyzed the relationship between the structure of the network of physicians surveyed by Coleman et al. (1957) and the adoption of new drugs and showed that social contagion is more easily created by structural equivalence than by cohesion. Cohesion refers to the fact that two actors are direct acquaintances, and structural equivalence is the concept (Figure 1) that “actors A and B in the same network are in the same relationship as others in the network” (Yasuda, 2001).

<table>
<thead>
<tr>
<th>A and B are SE</th>
<th>A and B are not SE</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="" alt="Diagram" /></td>
<td><img src="" alt="Diagram" /></td>
</tr>
<tr>
<td><img src="" alt="Diagram" /></td>
<td><img src="" alt="Diagram" /></td>
</tr>
</tbody>
</table>

**Figure 1.** Cohesion and structural equivalence (SE)
Does the assertion of Burt (1987) hold regardless of whether a product is conspicuous? Veblen (1899) noted that consumers perceive not only the private utility of products they buy but also the way those products are perceived by others. In other words, Veblen noted that consumers also consume a social utility of products where “they are seen by others to be using expensive products” and termed this “conspicuous consumption.” In an analysis of highly conspicuous products, Kuwashima (2016) divided subgroups in structurally equivalent relationships in a network of friends and acquaintances while examining the positional relationships of those that have the same brand of bags. Word-of-mouth has traditionally been explained by using cohesion alone, but Kuwashima has clarified that for highly conspicuous products, behavior is propagated in a relationship with structural equivalence but no cohesion.

But does this hold true for goods that are not conspicuous? This paper analyzes the impact of network structure in cosmetics. It is not immediately possible to determine which cosmetic products a person is using at first glance. This is certainly true for foundational cosmetics such as lotions and creams, but those that use the same makeup products do not have the same results since skin color and body temperature vary from person to person.

To provide visibility into what products consumers use, comments in a word-of-mouth website, @cosme, are used and the relationships between purchasing behavior and the network characteristics of cohesion and structural equivalence were analyzed.

Analysis

@cosme is a word-of-mouth website for cosmetics with 14 million monthly users as of September 2016. This site shows user nicknames, skin types, ages, posting dates, and product reviews
(number of stars) for each product, and users can also add their own comments. Cosmetics come into direct contact with skin, and whether a product reacts well with one’s skin is very important. Thus, comments are mostly added after purchase of a product. Some are entered after using a sample, though this is a preparatory behavior prior to purchase and used to determine whether a purchase will be made. Thus, in this paper, the entry of a comment on a product is defined as a proxy variable for purchasing behavior.

In addition, this website offered a bulletin board\(^1\) in 2005, and users with the same interests gather in groups there for thread-based discussions. For example, this bulletin board has threads entitled “Office Workers in Their 20s That Love Cosmetics!” and “Those That Love Dior Cosmetics.” A thread that is in use over a very long period of time can become serialized, as can be seen with “Office Workers in Their 20s That Love Cosmetics!” and its successors, “Office Workers in Their 20s That Love Cosmetics! 2” and “Office Workers in Their 20s That Love Cosmetics! 3.” These threads show user IDs rather than actual names, though it is possible to identify users in conversations, and one can see the formation of user networks within threads as well as observe actual physical meetings that take place based on conversations in those threads. In this paper, “comments” refers to product word-of-mouth, and “conversations” refers postings on the bulletin board (as these conversations recognize individuals).

In this paper, posting on the same thread indicates belonging to the same network, and five threads used over a long period of time were selected. In threads used over a long period of time, there are many conversations wherein users are identified. Within a thread, user IDs may be specified (for example, “to Ms. A”), and users that converse even only once are connected. In this manner, networks are created within threads, five of which have been created from users that have

\(^1\) However, pages with comments are kept separate from this bulletin board, thus there is no relationship between the two.
Structural equivalence explains contagion conversations on multiple threads. Figure 2 shows such a network and was created using NetDraw.

Using a block model from UCINET's\textsuperscript{2} CONCOR, this network can be divided into four subgroups (Figure 3). The block model is based on similarities in relationship structure among actors, with actors having similar relationship structures placed near one another. The CONCOR algorithm is frequently used today by those analyzing networks (White, Boorman, & Breiger, 1976). In a block model, the same block, i.e., users in the same subgroup, can be said to be in a structurally equivalent relationship among themselves.

Moreover, a survey of comments regarding a product, Foundation A, with a great deal of word-of-mouth was done. Within this network, four users have made comments on Foundation A. The user IDs of these four users are 12, 14, 23, and 27, and the dates of their

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{personal_network.png}
\caption{Personal network}
\end{figure}

\textsuperscript{2} Standard software for calculating metrics in an analysis, and sold by Analytic Technologies.
Figure 3. The date of typing and SE

word-of-mouth comments are shown in Figure 3. Of these four users, 12, 14, and 27 belong to the same subgroup and are in a structurally equivalent relationship. Only 14 and 27 are in a relationship with cohesion. In other words, we can see from this that users that comment on the same products are not necessarily connected in a relationship with cohesion but are in a relationship with structural equivalence.

Thus, we can say the following.

**Fact:** Three of the four users that commented on the same product in a bulletin board network with direct conversations are in a relationship with structural equivalence. Of those users, two (one pair) are in a relationship with cohesion.

**Discussion**

In regard to word-of-mouth, Arndt (1967) defined “word-of-mouth
communication” as “oral, person-to-person communication between a receiver and a communicator whom the receiver perceives as non-commercial, regarding a brand, product or service.” In other words, word-of-mouth only applies where those in a network are in relationships with cohesion, and relationships with structural equivalent have not been considered. Kuwashima (2016) showed that for goods that are highly conspicuous, structural equivalence positively effects contagion, while cohesion has a negative effect. This study has shown, however, that for goods that are not conspicuous as well, structural equivalence impacts contagion more than cohesion. This result is believed to be the same as Burt (1987), who showed that structural equivalence has a greater impact than cohesion in networks of new drug adoption among physicians.

Why and how does this occur? As an example, Fiske (1989) stated that “any sense of individuality is constructed upon the pleasure of similarity and difference” and argued that humans create individuality in their interpretation of imitation and differentiation. In addition, Baudrillard (1972) noted that “product function not only fulfills individual desires but also ties individuals to a social structure.” Accordingly, consumers are believed to simultaneously be pressured to conform and to differentiate in a network, and the products owned show the level of individuality within a network. The pressure to conform in a network is created not only by relationships with cohesion but also by those with structural equivalence. When analyzing the purchasing behavior of consumers, it is important to consider networks to which products belong and not focus merely on individuals.

In this paper, the propagation of one product in a network of 34 people was observed. The author would like to expand the number of products in a study of larger networks to see if the discovery made in this paper can be generalized.
Acknowledgments

This work was supported by JSPS Grant-in-Aid for Publication of Scientific Research Results, Grant Number JP16HP2004.

References