Discovering Interest Groups for Effective Marketing in Virtual Communities

– An Integrated Approach

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ABSTRACT

With the mature computing technologies, it is much easier for firms to obtain consumer network data than ever before. Although marketers are interested in social networks for WOM marketing or target marketing, they have previously ignored the importance of understanding network structures (Van den Bulte and Wuyts, 2007). This research proposes an integrated approach - the techniques of social network analysis (SNA) and web mining - to discover interest groups (networks) in virtual communities for marketing purposes. In an empirical study we demonstrate how a framework of discovering social networks can then be used to construct a recommendation system and provide an example of social network marketing applications for marketers. This research offers managerial applications and implications that can be used by marketers to effectively reach and communicate with consumers in virtual communities.

Keywords: Online community; Word-of-mouth (WOM) marketing; Social Network Analysis (SNA); Web Mining; Recommendation System; Advertising; Promotion
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1. Introduction

Due to today’s highly fragmented mass media, it has become increasingly difficult to reach consumers using traditional marketing strategies in the business-to-consumer (B2C) marketing settings. Thus, marketers have experienced difficulties reaching their consumers via print advertising, TV commercials and online banner advertising. However, the rapid growth of the user population on the Internet and web 2.0, emphasizing two-way communications between users, websites has attracted marketers’ attention and interest. Particularly, social networking sites have become very popular and continue to attract an increasing number of users. According to a recent report by eMarketers (2007), 37% of the adults and 70% of teenagers in the U.S. uses social networking sites. Those numbers are projected to increase to 50% of adults and 84% of teenagers.

Due to increasing popularity, these social networking sites have become resources and new platforms for marketing. World-of-mouth (WOM) marketing in the virtual communities is much more influential in terms of speed and scope than ever as information is transmitted instantly around the globe for virtually free (Godes et al., 2005). Marketers appreciate the importance of social networks, particularly in promoting new products. As such, they expect that word-of-mouth (WOM) marketing (also known as viral marketing) activities will succeed on consumer social networks. Evidence indicates that marketers often ignore network structures when applying such marketing strategies (Van den Bulte and Wuyts, 2007). That is, while large amounts of personal communication and social data have been aggregated and stored by firms, this valuable data has not been well organized, treated or used (Garton, Haythornthwaite, and
Wellman, 1997). This common problem that arises among practitioners brings about fundamental and important questions: What should marketers know about the application of social networks in the new computing technology era? Further, how do they combine the features of social networking sites with traditional business models to reach and communicate with consumers more effectively (Garton et al., 1997)?

During the past decade, marketing researchers have begun examining the impact of virtual communities on consumer behavior (e.g., Algesheimer, Dholakia, and Hermann, 2005) and have developed the method of netnography based on ethnographic research techniques in order to understand consumers and social networks in the virtual world (Catterall and Maclaran, 2002; Kozinets, de Valck, Wojnicki, and Wilner, 2010). For example, using a qualitative approach, Kozinets et al. (2010) focused on how WOM marketing campaigns engage consumers in regard to generating WOM advertising in personal blogs and demonstrating communication strategies among bloggers. Some marketing researchers have demonstrated the ways to apply network analyses to understanding brand switching behavior (Iacobucci, Henderson, Marcati, and Chang, 1996), WOM referral behavior (Brown and Reingen, 1987; Reingen and Kernan, 1986), organizational buying behavior (Ronchetto, Hutt, and Reingen, 1989) and other marketing areas (Iacobucci and Hopkins, 1992; Webster and Morrison, 2004). However, few marketing studies have updated the research methodologies to meet marketers’ needs in the rapid changing computing technologies and marketing environments. Therefore, more attention should be paid to methodology issues regarding how to effectively utilize the data on social networking sites for marketing campaigns in virtual communities given that consumer data on social networking sites and advanced analysis techniques are more accessible to marketers than ever before. Thus, the objective of this research is to demonstrate how to use the proper advanced techniques for
effective marketing in virtual communities and make these techniques more accessible to marketers.

In this research we propose using the techniques of social network analysis (SNA) and web mining to develop a framework of identifying consumer social networks in virtual communities. SNA is an essential tool to study the structure of social networks and web mining is the most suitable technique to analyze web contents. Further, in an empirical study we demonstrate how a framework of discovering social networks can then be used to construct a recommendation system and provide an example of social network marketing applications for marketers. This recommendation system is innovative since it is different from the systems based on traditional approaches (content-based and collaborative filtering) that most online stores (e.g., Amazon.com) adopt. This research offer managerial applications and implications that can be used by marketers to effectively reach and communicate with consumers on virtual communities.

The remainder of this paper is set up as follows: Section 2 reviews theoretical background of virtual community, social networks, word-of-mouth (WOM) marketing, social network analysis (SNA) and techniques of web mining. Section 3 presents the research methodology, including research procedure and architecture, as well as data analysis techniques. In addition, an empirical study shows how a framework of identifying social networks can be built and how a recommendation system can be constructed. Section 4 discusses managerial applications and implications. Section 5 gives suggestions for future research.

2. Literature review

2.1. Social networks and word-of-mouth (WOM) marketing in virtual communities

Social networks refer to composites of a large number of individuals (actors) in groups and the interactions and relationships that exist among the groups and individuals (Iacobucci and
Hopkins, 1992). Marketers rely on social networks to spread marketing messages in both business-to-business (B2B) (Bianchi and Ostale, 2006; Mouzas 2006) and business-to-consumer (B2C) (Brown and Reingen, 1987; Reingen and Kernan, 1986) markets. Individuals in social networks act as WOM channels (Ryu and Han, 2009) and disseminate and exchange information (Brown and Reingen, 1987). Social networks influence consumer behavior in various aspects, such as information search strategies, decision-making processes as well as purchase and consumption decisions (Flynn, Goldsmith, and Eastman, 1996). Therefore, social networks are extremely important for WOM marketing. During the past decade, advanced computing technologies (e.g., Web 2.0) have brought people to virtual communities, which can be defined as groups of computer users who provide friendship, social resources, information and belongingness to each other. A social networking site (e.g., Facebook or Twitter) is an example of a virtual community. Information exchanges between consumers in these virtual communities have become increasingly easier and quicker. As such, an increasingly influential role in regard to networks on WOM marketing in virtual communities can be expected. Currently, many companies believe that virtual community is a valuable knowledge management system, and therefore make their effort in managing or collaborating with social networking sites (Hsu, Ju, Yen, and Chang, 2007).

According to recent research, firms spent more than $1.54 billion on WOM marketing activities in 2008, and it is estimated that these expense will increase to $3 billion by 2013. Research further indicates that spending in WOM online communities increased 26.6% in 2008 to $119 million (PQ Media, 2009). Given such a substantial allocation for WOM marketing, it is essential for firms to ensure that they execute WOM marketing campaigns effectively in order to gain the best return on their investment. As Van den Bulte and Wuyts (2007) stated, “Like
financiers, scientists, and entrepreneurs, marketers have long recognized the importance of social networks, but to a more limited extent.” They further indicated that marketers have focused on the role of opinion leadership and contagion processes in new product diffusion and adoption. However, the structures of social networks are often overlooked when executing marketing strategies (Van den Bulte and Wuyts, 2007). A recent research examines the relationship between consumer social networks and word-of-mouth effectiveness (Smith, Coyle, Lightfoot, and Scott, 2007). The findings contradict the commonly accepted notion that word-of-mouth influence comes from an elite, highly-connected few. Instead, those who are moderately connected are as willing as those who are highly connected to share marketing messages with others. If this is the case, then understanding the consumer social network structure and strengths of the relationships between network members becomes important since nearly everyone of the majority (moderately connected and highly connected people) would spread marketing messages.

This research proposes using SNA and web mining to discover social networks in virtual communities. As mentioned previously, a social network is usually formed and constructed by daily and continuous communication among members within a network and it includes different relationships among individuals and groups. In order to understand the network structure, social relationships and social behaviors of a social network, the use of SNA is essential and important. SNA can uncover the structure of a social network by aggregating its members into subgroups based on their relationship patterns (Wasserman and Faust, 1994). Thus, we used SNA to identify consumer social networks in this research. In addition, analysis targets were almost exclusively taken from the web and included such thing as the structure and content of the web. Among the information techniques that can be used for analyzing social networks in virtual communities, web mining is often reported to be the most suitable (Chakrabarti, 2003).
Therefore, after the initial SNA analysis was complete, we employed web mining techniques to discover the association rules between a blog’s content and the response content. These two analysis techniques are reviewed below.

2.2. Social Network Analysis (SNA)

SNA was originally utilized in sociological research. However, it has been often used, in recent years, in regard to issues related to information science and social networking due to the development of information techniques and the requirements of data processing (Fu, Liu, and Wang, 2008). Marketing researchers also apply SNAs in order to understand consumer behaviors, such as brand switching behavior (Iacobucci et al., 1996) and WOM referral behavior (Brown and Reingen, 1987; Reingen and Kernan, 1986) The research methodology of SNA was developed to understand the relationship between “actors,” which can be used to describe a person, an organization, an event or an object (Borgatti, Everett, and Freeman, 2007). In a social network, each actor is presented as a node and each pair of nodes can be connected using lines to show relationships. The social network structure graph is a graph formed by these lines and nodes and a SNA is, therefore, a methodology that is used to understand the graph and the relationships between the actors in the social network (Borgatti et al., 2007; Freeman, 1979; Wasserman and Faust, 1994).

Three important elements exist within a social network: actors, ties, and relationships (Scott, 2002). The actors are the essential elements in the social network as they are the people, organization, events or objects being studied. Ties are used to construct the relationships, either directly or indirectly, between the actors by using a mean of path to establish the relationship directly or indirectly. Ties can also be divided into strong and weak tie according to the strength of the relationships and are also useful for discovering subgroups of the social network.
Relationships are used to illustrate the interactions and relationships between two actors. Different relationships may cause the network to reflect different characteristics (Hanneman, 2001; Mitchell, 1969).

2.3. Web Mining

Web mining is an application of data mining, which is used to discover and extract useful information from large datasets or databases. Thus, web mining can be defined as a technique to discover and extract useful information from the web (Cooley, Mobasher, and Srivastave, 1997). According to different analysis targets and resources, the web mining techniques can be divided into three different types: web structure mining, web usage mining and web content mining (Cooley et al., 1997). Web structure mining is used to analyze the links and structure of a website and usually employs graph theory to fulfill this purpose. In addition, it is essential in this research area to understand the structure of a website (Chakrabarti, 2000; Spiliopoulou, 2000).

Web usage mining is used to analyze how websites have been used, such as the navigation behavior of the website’s users (Buchner and Mulvenna, 1998). The main sources of information for this technique are the server-side clickstream data (logs files). However, client-side data (such as client-side log files and cookies) is sometimes used due to research concerns, such as being able to record the more complete behavior of the users (Han and Kamber, 2001; Cooley et al., 1997). Web content mining is used to analyze the contents of a website, such as the text, graphs, graphics, etc. (Joshi and Hoshi, 1999). Recently, the majority of web content mining research has focused on text data processing whereas some studies have focused on mining multimedia data. These three types of web mining techniques usually are not used alone. In order to analyze the structure and contents of social network data in virtual communities, web structure and web content mining techniques were used in this research.
3. Methodology

This research presents how to combine the techniques of SNA and web mining in order to analyze consumer network data at one type of social networking websites, a Weblog or, more commonly, a blog. After completing the analyses, groups with different characteristics were classified in order to discover a suitable recommendation mechanism to use based on the consumer networks. The research procedure, architecture, and analyses are described as follows.

3.1. Research procedure

According to the research purpose, a research procedure has been designed as shown in figure 1. In the procedure, four steps are included. The first step is to obtain the sample from a social networking site. Step 2 and step 3 are to analyze the data with different techniques. Specifically, in step 2 SNA was used and in step 3 web mining, including web structure and web content, techniques were employed. The last step was to develop a recommendation mechanism and to construct a recommendation system.

3.2. Research architecture

According to the research purpose, the research architecture is presented in figure 2 and described as follows:

3.2.1. Data preparation

We wrote computer programs in order to collect data from a social networking site. The target sample was the community that shares interests in cosmetics.

3.2.2. Consumer social networks development
We identified influential bloggers who have a higher browsing and response rate from the cosmetics community. Using their blog article attributes, characteristics, response frequency, citations and recommendations, we identified consumer social networks. According to the interest characteristics of the users, interest groups were classified and the relationships between the networks (different groups) were discovered.

3.2.3. Association rules and recommendation strategy development

After classifying the initial cosmetics network groups using SNA, web mining techniques were applied to discover the association rules of the blog and response content. In addition, we also identified the common characteristics within a group. Based on the association rules, we developed corresponding recommendation strategies.

3.2.4. Recommendation system construction

Based on recommendation strategies, a consumer social network based recommendation mechanism can be developed in order to construct a recommendation system. Such a system can save consumers time when searching and navigating in the blogspace. Further, firms can use the classified groups to promote or to distribute products. This system can enhance the effectiveness of WOM marketing and also achieve the objective of target marketing.

3.3. Sample

The most popular type of social networking site now is a Weblog, or a blog (Scott, 2000; Wellman, 1996). Most of weblogs are personal websites on which users post articles or share stories about their day. Other users, usually, with similar interests, then post replies on these blogs. Those individuals may then connect with each other via other online resources as well and,
as such blogs have become good resources by which to understand the virtual communities and interest groups. Blogs have become a finest platform for advertising, promotion and WOM marketing. Our target sample came from the most popular social networking site in Taiwan, Wretch (http://www.wretch.cc/). This social networking site has the highest browsing rate and most members in Taiwan. We collected the blogs that related to cosmetics as the analysis target. The data collection duration was from January 2008 to March 2009.

3.4. Analysis

3.4.1. Social network analysis (SNA)

This research uses the three measurements to measure the relationship of the cosmetics community, which are responses, citations and recommendations. Before performing SNA, a relationship matrix has to be established according to the three measurements. Each member of the community is presented as a node in the network, and the link between any two nodes means the relationship. The relationship value was denoted as 1, if the value of the measurement was larger than 3 else was denoted as 0. The relationship matrix was then entered into a network program UCINET 6 (Borgatti, Everett, and Freeman, 2007) for data analysis. The SNA result is presented in table 1 and the social network graph is shown in figure 3.

As shown in table 1, the network size is 30, which means that there are 30 members who interact with each other. The density measures the connectivity degree of the nodes and links in a social network. A higher level of density represents a higher level of connectivity in the network. The density of the network is 0.55, which means that a moderately high level of connectivity exists. The network distance represents the communication distance between the members in the
network. The average distance in this network is 1.44 (What does 1.44 mean? Close or far?). The cohesion indicator in this network is 0.78, indicating a relatively higher cohesion.

The SNA identified the three most influential bloggers from the 30 members, identified as Bloggers 1, 2 and 3. Each blogger’s influence on the other members of the network is shown in table 1. For example, 28 members responded to, cited, or recommended Blogger 1. Degree centrality was used in order to measure the interactions of a member with the others in the network. The degree centrality of Blogger 1 is 0.97, indicating that this blogger had a high level of interaction with the other members and also revealed the blogger’s relative influence in the network.

The closeness centrality analyzed the centrality structure of the network based on the geodesic distances among the nodes in the social network (Cross and Parker, 2004). A higher closeness centrality means that the member is closer to the center of the network and, therefore, closer to the other members and, thus, able to transmit information faster. In addition, betweenness measures the capacity of the member to be a mediator and mediate information exchanges between the members. These three bloggers have a high betweenness, indicating that they control information transmission and business opportunities more so than the other members. In addition, these three bloggers have highest influence on the other members and, as such, would be ideal product endorsers and key members for WOM marketing.

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Insert Table 1 about here

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This research also used the position and role analysis of the SNA in order to calculate the distance between the relationships for the group classifications. The purpose of this analysis is to find out the position of each member in the network structure and identify his/her relationships.
With this analysis, we can place members with the similar interests in a group. The result is shown in figure 4. For example, in figure 4, the shortest distance of the tree is 4, which can be found between members 1 and 20, which means that members 1 and 20 have the most similar interests and can be assigned into a group. Similarly, member 28 is also assigned to this group (need further explanations). Using this classification method, four other groups were identified as shown in figure 5.

3.4.2. Web mining

The focus of the research then shifted to analyzing the content of the blogs. We applied the techniques of web structure and web content mining in order to discover the association rules from the response topics and contents. As mentioned, web mining techniques usually are not used alone. For example, in this research we have to use structure mining to analyze the structure of the blogs in order to identify blog contents and blog responses. Furthermore, we also identified common characteristics within a network by cross-checking the recommendations among the bloggers. The result of this analysis is shown in table 2. With the association rule, the hidden relationships between the nodes within or across the networks can be identified. In table 2, according to the association rule (Foundation → Eye makeup → Lip makeup → Makeup tools), the members in group 1 have been assigned to the makeup group within which the members discussed makeup related topics. According to the association rule (Skin care → Skin conditioning → Care accessories), the members in group 2 have been assigned to the skin care group within which the members discussed skin care topics. As stated by the association rule (Hair style → Hair designing → Hair styling tools), the members of group 3 have been assigned to
the hair-style group within which the members discussed hair style and designing topics. The association rule (fashion information $\rightarrow$ clothing information $\rightarrow$ shoes information) showed that the members of group 4 should be assigned to the fashion information group within which the members discussed fashion information.

3.5. Recommendation system construction

The identified interest groups helped us to develop a mechanism by which to construct a recommendation system based on the networks. According to the discussed topics and recommended contents in this online cosmetics community, five categories were identified: makeup, beauty salon, hair design, collocation and fashion guide. A recommendation system can be constructed as shown in figures 6 and 7. When searching for information, consumers can check items in which they are interested and the recommendation system will locate popular bloggers’ blogs containing product recommendations or product trial experiences via a built-in mechanism. This process will help consumers save time navigating the blogosphere and enhance firms’ capabilities to find potential consumers for marketing.

4. Managerial applications and implications

With the mature computing technologies, it is much easier for firms to obtain consumer network data than ever before. Although marketers are interested in social networks for WOM marketing or target marketing, they have previously ignored the importance of understanding network structures (Van den Bulte and Wuyts, 2007). Thus, this research studies the important issue of how marketers can take advantage of the features available on social networking sites and integrate them into their traditional business models in order to reach more consumers.
This research proposes and demonstrates a methodology to combine the techniques of SNA and web mining in order to discover interest groups in virtual communities (e.g., a blogosphere). Using a huge network database, we discovered the existence of interest groups among popular bloggers, participating bloggers and visitors. We also calculated the relationships between members and identified relationship strengths. In addition, common characteristics within the groups and differences between groups were discovered using web mining techniques. As such, potential consumer networks were found and used in order to develop the recommendation mechanism. The mechanism was then used to construct a recommendation system. Marketers can use this methodology for numerous marketing purposes, some of which are discussed below.

4.1. Recommendation system

As shown in figure 6 and figure 7, a recommendation system prototype was constructed in this study to show how the mechanism works. A recommendation system based on the interest group categorization mechanism is user-friendly, simplifying the searching process and saves users time. In addition, this method will also help service providers effectively classify consumer networks and enhance their service quality. By utilizing an easy to use navigation function and providing useful information, these sites can attract more users. Similarly, the same recommendation system can be used by firms for marketing purposes in order to effectively identify target groups (networks) to implement marketing activities, such as advertising, promotions and product trials.

4.2. Advertising

According to a recent report, marketers will spend $1.3 billion to advertise on social networks worldwide in 2010 (eMarketers, 2009). Therefore, firms need to effectively allocate these
expenses and communicate with consumers. Using the results from this research, marketers can utilize consumer networks that encompass different interests. As such, marketers can select a specific interest group that matches the product category in which to advertise products or services. The advertising messages could be delivered by emails or be placed blogs of the key members in a consumer network. This advertising strategy will reach target consumers more efficiently and effectively than current strategies.

4.3. Promotion and product trials

Firms can use the classified groups to promote their products or distribute trial products. The results of this research will help marketers discover the relationships between members within a network. As such, marketers can approach influential members of a network in order to request possible product or services endorsements after a product or service trial ends. An influential blogger’s comments on products or services will have a significant impact on WOM marketing. Consumers trust people they know, such as family members and friends and are more likely to try or purchase products or services recommended by a person in their social network. WOM marketing in virtual communities could be executed successfully in this manner.

This research advances our understanding of the mechanism and applications of social networks in marketing and provides valuable contributions to the fields of marketing and information systems. It unveils the phenomenological mechanisms involved in the social networking phenomena and provides useful insights for managerial applications. This research shows marketers and scholars how the mechanism works with available social network data in the new technology era. We expect this research to be an initiative for practitioners and researchers who wish to explore this exciting innovative area.

5. Limitations and future research
Despite the progress made by this research, it has some limitations, and a number of issues remain unanswered. First, we analyzed the network data from a blogosphere. Users visit these social networking sites for various purposes. For example, Flickr is used for online photo sharing; YouTube is used for online video sharing and LinkedIn is used to connect with colleges. Other portal-based online social networking sites, such as Facebook and MySpace, contain multiple functions. Thus, future researchers may want to apply the methodology when analyzing different network data and resources in virtual communities as the social networking sites have different characteristics. Second, this research did not empirically test the system’s performance. As such, future research should measure the recommendation system’s performance in order to validate the effectiveness of such a system.

In addition, future research is encouraged to compare the effectiveness of recommendation systems based on different approaches (social networks, collaborative filtering, vs. content-based filtering). Many online firms, including Yahoo!, Amazon, and Movie Critic, recommend documents and products to consumers. Most of the recommendation systems are based content or collaborative filtering methods (Ansari, Essegaier, and Kohli, 2000). The content filtering method makes recommendations based on consumer preferences for product attributes. The collaborative filtering method mimics word-of-mouth recommendations. This method predicts a person’s preferences as a linear, weighted combination of other people’s preferences. Future research can further explore the strengths and weaknesses of each approach in regard to marketing applications. Moreover, the effect of cross-cultural (Davis, Bagozzi, and Warshaw, 1989; Fong and Burton, 2008) and gender (Garbarino and Strahilevitz, 2004) differences on WOM marketing should be taken into consideration in the future research. For instance, prior research indicates that social influence may occur through normative pressures (Davis et al.,
1989). However, normative contagion varies across customers and products. For example, countries with a culture exhibiting a higher level of collectivism tend to have higher social influence than countries with a culture showing a higher level of individualism (Van den Bulte and Stremersch, 2004). We expect that the effectiveness of social network based recommendation systems may vary across cultures. Further, the extent to which a product conforms to existing norms also affects the extent of its social influence on the product adoption (Rogers, 2003). Thus, cross-product differences in regard to the recommendation system performance might also occur. These suggested future investigations will have important managerial implications as the findings will provide marketers with guidelines for developing marketing strategies by using social network data from virtual communities.

6. Conclusion

The maturity of computing technologies has rapidly changed the marketing environment. With the prevalence of social networking sites, marketers have to learn new ways communicating with their customers. Thus, it is of practical and theoretical importance to develop effective marketing strategies to communicate and maintain relationships with customers in today’s market environment. This research proposes and demonstrates an integrated approach to help marketers execute WOM marketing in virtual communities. Future research is encouraged to investigate the issues mentioned and further explore innovative research methods in this area.
References


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Table 1

The SNA Results

<table>
<thead>
<tr>
<th>Member</th>
<th>Link</th>
<th>Degree</th>
<th>Closeness</th>
<th>Betweenness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blogger 1</td>
<td>28</td>
<td>0.9655</td>
<td>0.8056</td>
<td>0.2032</td>
</tr>
<tr>
<td>Blogger 2</td>
<td>27</td>
<td>0.9310</td>
<td>0.8056</td>
<td>0.2638</td>
</tr>
<tr>
<td>Blogger 3</td>
<td>26</td>
<td>0.8965</td>
<td>0.7073</td>
<td>0.2441</td>
</tr>
</tbody>
</table>

Size=30  Density=0.5483  Distance=1.443  Cohesion=0.779
Table 2

Grouping Result and the Association Rules

<table>
<thead>
<tr>
<th>Groups</th>
<th>Members</th>
<th>Association Rule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>M1, M20, M28</td>
<td>Foundation → Eye makeup → Lip makeup→ Makeup tools</td>
</tr>
<tr>
<td></td>
<td>M7, M2, M27, M6, M8, M13, M29</td>
<td></td>
</tr>
<tr>
<td>Group 2</td>
<td>M17, M10, M16, M5, M9</td>
<td>Skin care → Skin conditioning → Care accessories</td>
</tr>
<tr>
<td></td>
<td>M19, M18, M30, M12</td>
<td></td>
</tr>
<tr>
<td>Group 3</td>
<td>M3, M15, M25</td>
<td>Hair style → Hair designing → Hair styling tools</td>
</tr>
<tr>
<td></td>
<td>M26, M24</td>
<td></td>
</tr>
<tr>
<td>Group 4</td>
<td>M4, M14, M23</td>
<td>Fashion information → Clothing information</td>
</tr>
<tr>
<td></td>
<td>M11, M21, M22</td>
<td>→ Shoes information</td>
</tr>
</tbody>
</table>
Figure 1

The Research Procedure

Step 1
Data Collection
Data Collection from a virtual community

Step 2
Social Network Analysis
Discovering consumer networks

Step 3
Web Mining
Web structure and web content mining
Association rules
Construction of recommendation strategies

Step 4
Recommendation system construction
Construction of recommendation mechanism
Implementation of recommendation system
Figure 2

The Research Architecture

Data Collection

Log and Content Analysis

Data Processing

Social Network Analysis

Networks Construction

Web Mining Analysis

Connecting Customer Networks

Customer Networks Categorization

Recommendation System

Interest Group 1

Potential Customers

Association Rule

Customized Recommendation

Interest Group 2

Potential Customers

Association Rule

Customized Recommendation

Interest Group n

Potential Customers

Customized Recommendation
Figure 3

The social network graph of the cosmetics community
Figure 4

Distance Tree
Figure 5

The classification result tree
Figure 6

Blog Recommendation System (1)
Figure 7
 Blog Recommendation System (2)