A Study Of Online Beauty Community Members' Voices: EWOM Text Mining

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ABSTRACT

The Internet promotes the development of the social media, these new media offer open platforms for participants to share product/service reviews with each other. This study applied the theory of conformity behavior to explain online community members' information consumption behaviors by using text-mining techniques. NetBeans7.4 was used to conduct Chinese tokenization and data analysis. Next, factor analysis and correlation analysis were conducted to reduce the attribute size of products. Our findings demonstrate that more attributes a product/brand has more discussions found in an online community. The conformity phenomenon is seen in help to accumulate sufficient and complete eWOM to reach a sufficient quantity. Thus, brand is more likely to be mentioned. However, the few brand vendors with high product strength have the impact of conformity, in which, may result in a lower spread power with wrong marketing strategy. Therefore, we argue that the reputation bias generated by conformity will make a misleading purchase decision. Based on the conformity effect of eWOM, we establish the effectiveness of text mining technology applied to information search platform design and brand marketing strategy. Implications were proposed in the final section.

Keywords: electronic word of mouth, conformity behavior, information social influence, text mining.

INTRODUCTION

Nowadays, more and more people surf new media to gather product information, particularly, online reviews or electronic word of mouth (eWOM) before shopping. Compared to product recommendations of brand vendor, consumers tend to accept the experience sharing in online community. Asia belongs to collectivistic country, a conformity phenomenon in Taiwan is more obvious. "Consumer voice" will be more valuable when under the influence of social media and online community.

There are 38.8% people in Taiwan adopt eWOM of skin care products [28].Conformity behavior theory is widely used in financial issues, such as funds, the securities market, or discussion on personality and behavior of consumers, and rarely for beauty maintenance area. Past research topics are mainly focused on how conformity behavior affects consumer attitudes and behavior or explore the factors of conformity behavior[9][18][22][23]. However, a few studies used data-driven techniques to analyze customers' voice based on the theory of conformity behavior[15]. Previous studies examined customers' perception based on query-driven techniques, such as questionnaires and experiments[22][23], which might miss hidden trends and cues. To fill the gap, this study analyzed 2 years eWOM communications' influence on members' information consumption behaviors.

Therefore, we applied the theory of conformity behavior to explain online community members' information consumption behaviors by using text-mining techniques. Factor analysis and correlation analysis are used to extract primary factors of eWOM communication. The posts and replies of community members' comments are defined as "voice of customers".

Conformity Behavior

In Asch 's seminal studies [2][3][4][5], the individual in the group who tend to change his/her decision to match that of the group's. They wanted to go along with the crowd, even the decision is incorrect and contrary to his/her own understanding. There are different point of view to define a conformity behavior. Social psychologists believe that conformity behavior is a social behavior generated by groups [1]. Base on the perspective of asymmetric information, economic scholars argue that individual ignore personal information and copy the behavior of others expressing a less effective behavior [6][7]. Investors will affected to make a decision which conflicted with their own opinion by crowd psychology [16], and that will generate excessive volatility. In the field of marketing, researcher focus on the social influence of consumer behavior. Therefore, we define a conformity behavior is "consumers will change their intention and behavior for the purpose of obtaining the social identity" [19][27]. In other words, consumers use reference groups as a guide to revise their consumption decision process.

Deutsch and Gerard (1955) reinterpreted social influence by differentiating between informational and normative social influence. Informational social influence describes when individuals face with time constraints, possesses limited knowledge or perceives high risk in the action, they will observe others behaviors and access the information as an important source for their own choice. Normative social influence describes individuals will adjust their identity, attitudes and behavior to correspond with the attributes of their social groups, and conforms to the expectations of important others in order to receive a reward or avoid a punishment. In brief, the former is "influence to accept information obtained from another as evidence about reality," the later refers to "the influence to conform to the expectations of another person to group". Much past studies have shown out the influence of "informational social influence" and "normative social influence" on consumers' purchase decision in the traditional marketing, which 80% consumers purchasing decision come from the comments of specific persons or groups [26]. The impact of the conformity phenomenon on purchasing decisions has been extended to virtual environment [9][15][22]. When consumers face uncertainty case, consumers will depend on eWOM under the information social influence result in conformity behavior. While

internet without boundaries and immediacy, information can be quickly spread to online community, consumers become more likely to be affected and imitate others' choice by normative social influence (eg. tourist attraction, official recommendation, celebrity endorsements or hot sell product, consumers tend to buy the same product or brand). Thus, compared to the traditional word of mouth, the effect of eWOM is more extensive and significant [13]. Previous studies have demonstrated whether male or female consumers both have significant conformity behavior [23]. Positive and negative eWOM have different effects on consumer decision-making with the degree of participation [18].

eWOM and Conformity Behavior
Consumers browse experience and evaluation of products through the Internet, and they can share their experiences, ideas and knowledge with others in specific topics. The information what they share is called 'eWOM' , also referred to 'online word-of-mouth' [17] or 'word-of-mouse' [12]. Compared to traditional marketing, online shopping behavior is more complex, consumer has information searching behavior before buying [17]. The purchase decision process of consumers changes from passive(attention, interest, desire, memory, action, AIDMA) into active (attention, interest, search, action, share, AISAS).

Park and Mittal (1985) points out that consumers search different characters of information depend on their buying purpose. As the number of online evaluation increase(eg. number of comments, the degree of concern, and the extent of the discussion), consumers' purchase intentions increase [21]. Therefore, we suggest that consumers will search eWOM aggressively based on their personal motivation or demands, and the conformity behavior will generate under the influence of eWOM. Hence, the following hypotheses are proposed.

H1: If there have more keywords are mentioned from eWOM, then have more keywords are involved in topics, which lead more higher informational conformity behavior.

H2: If there have more brands are mentioned from eWOM, then have more brands are involved in topics, which lead more higher informational conformity behavior.

EWOM communication is like a dendritic structure. The rate of participate is an exponential growth which has much more influence. Bone (1995) argued that when two (or more) views of the message are the same, the eWOM effects are higher than a single one. In other words, when there have more participants involved in online community, the eWOM has more impact on their behavior [25]. Thus, we argue that when eWOM communicated through the participant interaction, which may, in turn, affect the online members' behavior. Hence, the hypotheses is proposed.

H3：*If there have more participants in the topic, then more replies and cumulative brands discussions are generated, which lead more higher informational conformity behavior.*

According to previous conceptual and empirical literature, we build the research model by using the concept of informational conformity behavior [11](see Figure 1).
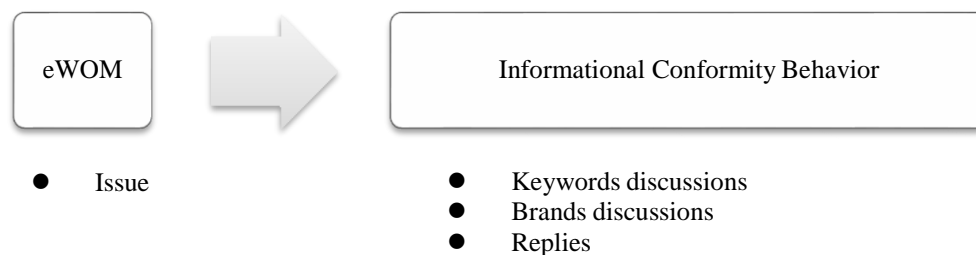

Figure 1. Research Model

METHODS
Text mining refers to the process of deriving high-quality information from text, also referred to as data mining. Shapiro(1991) define text mining to be a method to extract previously unknown and potentially useful information from numerous unstructured or semi-structured data. Text mining has been used widely in unstructured documents (such as blog, community etc…). In this study, text mining is used to extract core keywords for understanding "consumer voice".

Data Collection
The market research survey report indicates FashionGuide is the online beauty community which has a great number of visits in Taiwan. The online community has richness eWOM and interaction, more than sixty thousand items beauty care products published, product evaluation accumulated more than one million, a discussion more than eight million. There are various beauty care products' categories, include lotion, essence, eye cream, lip balm, etc. The number of mask use in Taiwan has more than 95 million (Nielsen 2014). We focus on 'facial mask' and mining related topic discussed online. Two years data were collected from

an online beauty community in Taiwan, which is categorized as collectivist country as other Asian countries culture. The official identity, sponsored brand and bloggers identity and some related topics were removed.
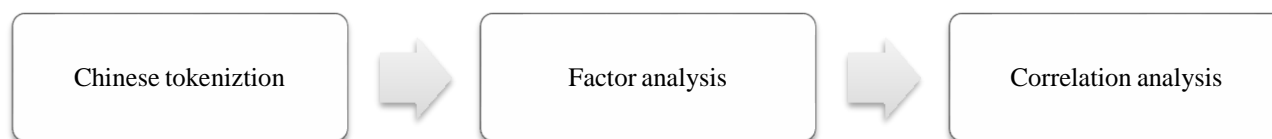
Data Analysis

Figure 2. Analysis Methods

NetBeans7.4 and SPSS19 were used to conduct Chinese tokenization and data analysis. Next, factor analysis and correlation analysis were conducted to reduce the attribute size of products(Figure 2). HTML(Hyper Text Markup Language) is the standard markup language used to create web pages. Unstructured file has a problem of data diversity that is difficult to analyze. So before Chinese tokenization, we convert message into TXT (text) format, in order to facilitate the subsequent steps. We create 'mmseg4j' and 'artificial' thesaurus for tokenization, then remove meaningless words by human check. The accuracy rate of MMSEG algorithm is as high as 98.41%. The mmseg4j combine 'sogou' and 'rmmseg' thesaurus, which has more than 14 million words [24]. The thesaurus is supplemented by using artificial methods to enhance the integrity, such as the brand and complete hyphenation. Unnecessary or meaningless words (eg. the official label, single word, unrelated products) are removed in the final step. By the semantic integration of product related words,196 keywords are captured from 5,510 terms. Next, the amount of discussion more than 40 is selected to perform cross over analysis between keywords and brands. Based on cross-comparision between keywords and brands, the keywords which has more than 40 discussions will be selected as the primary keywords of online community member discussion.

Second Step, principal component analysis is used, which follow the rule mentioned by Kaiser(1960). The result shows there has eigenvalues(>1) and proportions of variance for the seven potential factors(see Table 1). 78.163% of the variance in our items was explained by the 7 extracted components. After rotation the components together account for 78.163% of the total variance. Table2 displays rotated component matrix which variables load on components after rotation. All factors loadings should be greater than 0.7 (less than 0.7 are removed), and the components are named by group (see Table3).

Table1. Potential factors (Eigenvalues>1)

component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	%of Variance	Cumulative%	Total	%of Variance	Cumulative%	Total	%of Variance	Cumulative%
1	4.845	23.070	23.070	4.845	23.070	23.070	4.695	22.359	22.359
2	3.057	14.558	37.628	3.057	14.558	37.628	2.665	12.688	35.047
3	2.622	12.484	50.112	2.622	12.484	50.112	2.660	12.665	47.712
4	2.125	10.117	60.229	2.125	10.117	60.229	2.008	9.561	57.273
5	1.467	6.983	67.212	1.467	6.983	67.212	1.665	7.927	65.199
6	1.180	5.621	72.833	1.180	5.621	72.833	1.499	7.138	72.337
7	1.119	5.330	78.163	1.119	5.330	78.163	1.223	5.826	78.163

Table2. Rotated Component Matrix

	Component						
	1	2	3	4	5	6	7
Inexpensive	.924						
buy one, get one	.896						
special price	.879						
Price	.875						
Obedient	.831						
Function							
Flavor							
Stimulate		.938					
Allergy		.924					
Composition							
Maintenance							
Absorb			.931				
Essence			.921				
Thick			.789				
Whitening				.868			
Moisturizing				.840			
Repair					.760		
Bright							
Fresh						.810	
Snail							
Sheet							.886

Table 3. Naming the Factors

Component	Named	Attribute(Keywords)
Factor1	Price	Inexpensive, Buy one-get one, Special price, Price, Obedient
Factor2	Composition	Stimulate, Allergy
Factor3	Essence	Absorb, Essence, Thick
Factor4	Function	Whitening, Moisturizing
Factor5	Repair	Repair
Factor6	Fresh	Fresh
Factor7	Sheet	Sheet

In the final stage, we hope to provide advice for marketing, R&D and advertising through further analysis. The keywords have appeared in more than twenty topics will be selected for this stage, in which do the correlation analysis between keywords. Table 4 shows that if lift>1, there are a positive correlation between keywords; if lift=1, there are a independent events between keywords; if lift<1, the relationship between keywords is negative [29].

Table 4. The correlation coefficient between keywords and brands (unit:%

	Attribute1 Moisturizing			Attribute2 Whitening			Attribute3 Inexpensive			…
	Support	Confidence	lift	Support	Confidence	lift	Support	Confidence	lift	…
Brand1	38	68	2	36	72	2	36	84	2	…
Brand2	26	46	2	26	52	2	25	58	2	…
Brand3	21	38	2	20	40	2	21	49	2	…
Brand4	17	30	2	18	36	2	17	40	2	…
Brand5	15	27	2	14	28	2	14	33	2	…
Brand6	14	25	2	13	26	2	11	26	2	…
Brand7	18	32	2	19	38	2	18	42	2	…

RESULTS

eWOM and Informational Conformity Behavior

Text mining is used to verify the conformity phenomenon from eWOM. We find a positive correlation exists between product/brand attributes and quantity of discussion in the online beauty community. When more product / brand attributes keyword involved from eWOM, it will lead more topic discussion related to the product / brand. The quantities of keywords discussion display that active product / brand attributes in the topic will affect the community members to focus on the keywords discussion. Table 5 shows there are more product attributes mentioned, has more informational conformity behavior, such as 'Moisturizing', ' Whitening', ' Inexpensive' and' Function'; On the contrary, the keywords only be mentioned in specific topics, has less informational conformity behavior, such as 'Sheet' and 'Repair'.

On the other words, more numbers of participants in online community, more valuable information will be cumulative in related topic, include replies, keywords and discussion(See Figure 3). For example, the resplies and interaction in topic NO. 25 are more intense than other topic, it will lead to increased conformity behavior (H1~H3 is supported). There has the same result from the point of view of the brand. Brand1 has most adequate buzz, and most significant and widely discussed in various topics; conversely, the lower degree of buzz has a lower effect on conformity behavior(see Figure 5).

Table 5. Keywords statistic

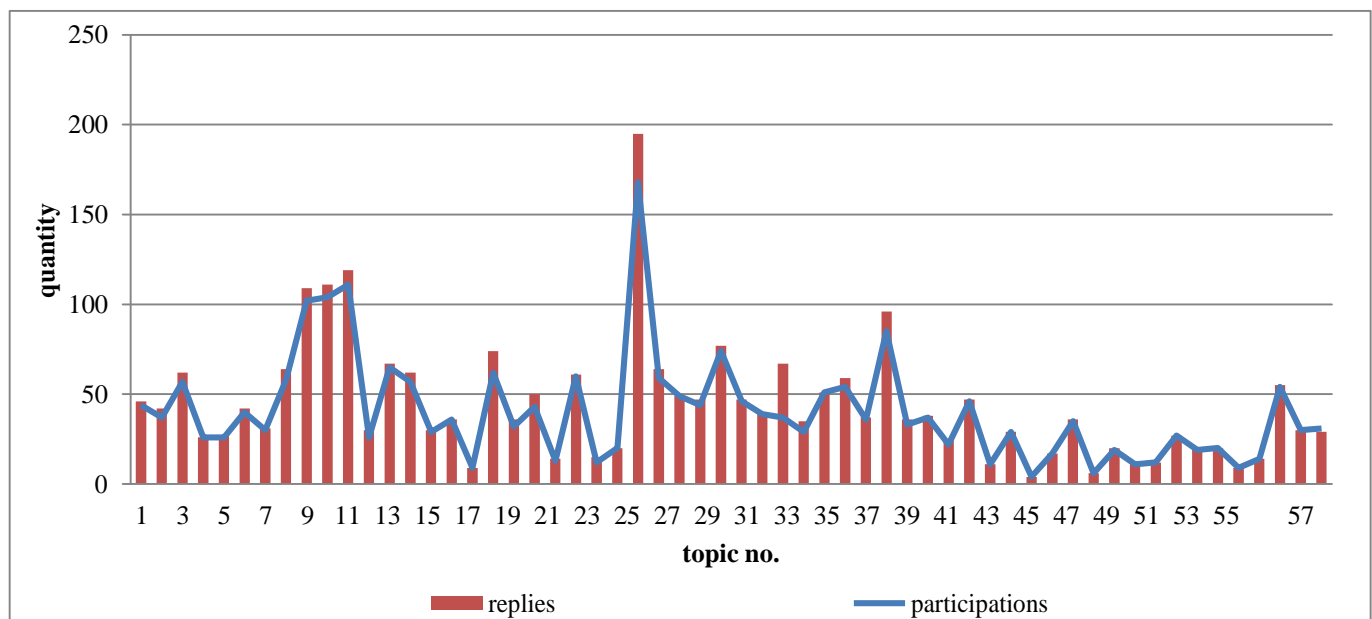| Attributes (Keywords)	Quantities of discussion	Cumulative keywords from topic	Attributes (Keywords)	Quantities of discussion	Cumulative keywords from topic
Moisturizing	23	97	Obedient	2	50
Whitening	12	88	Composition	2	50
Inexpensive	11	76	Allergy	2	40
Function	10	95	Stimulate	2	31
Essence	6	72	Snail	1	31
Maintenance	5	67	Buy one-get one	1	36
Price	4	66	Thick	1	28
Sheet	4	40	Bright	1	38
Special price	3	52	Fresh	1	33
Repair	3	48	Flavor	1	28
Absorb	3	47			

Figure3. Statistic of topic
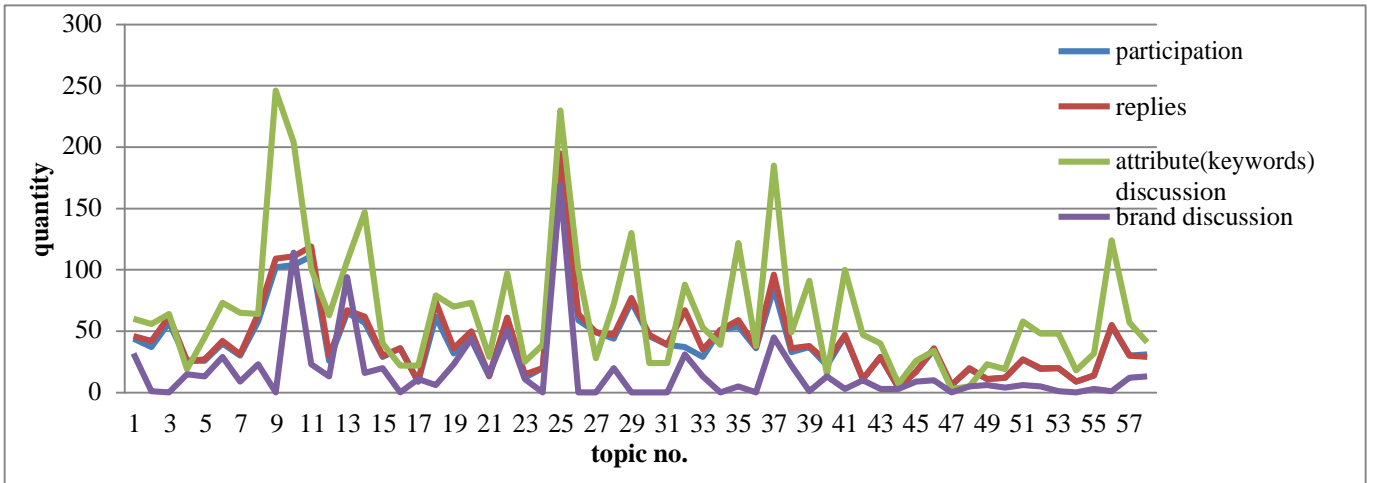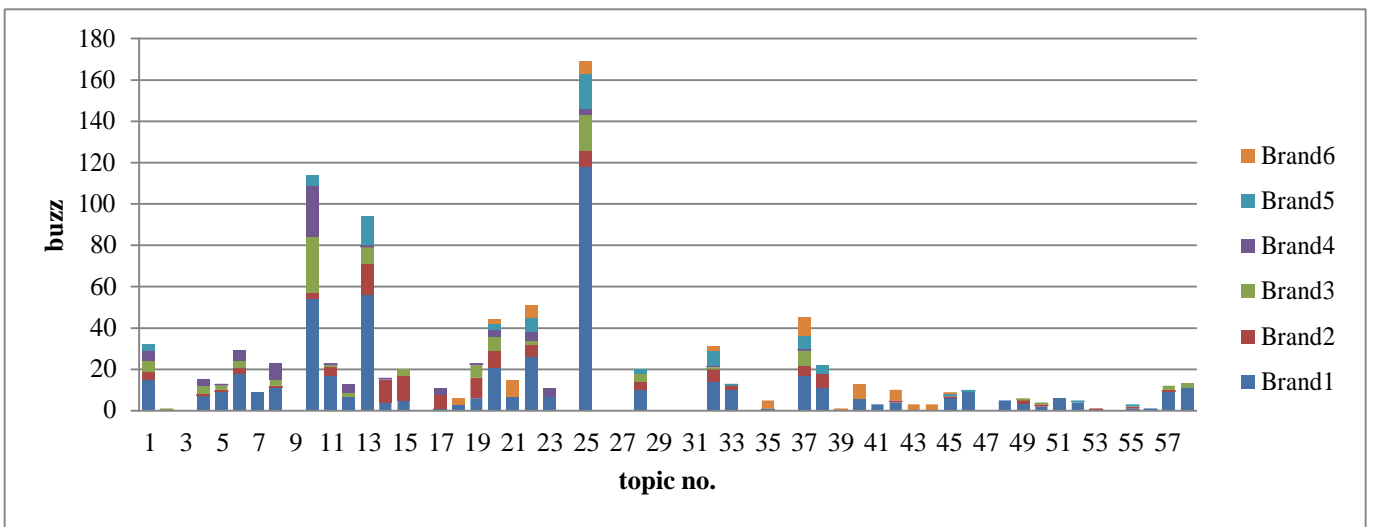
Figure4. Statistic of topic
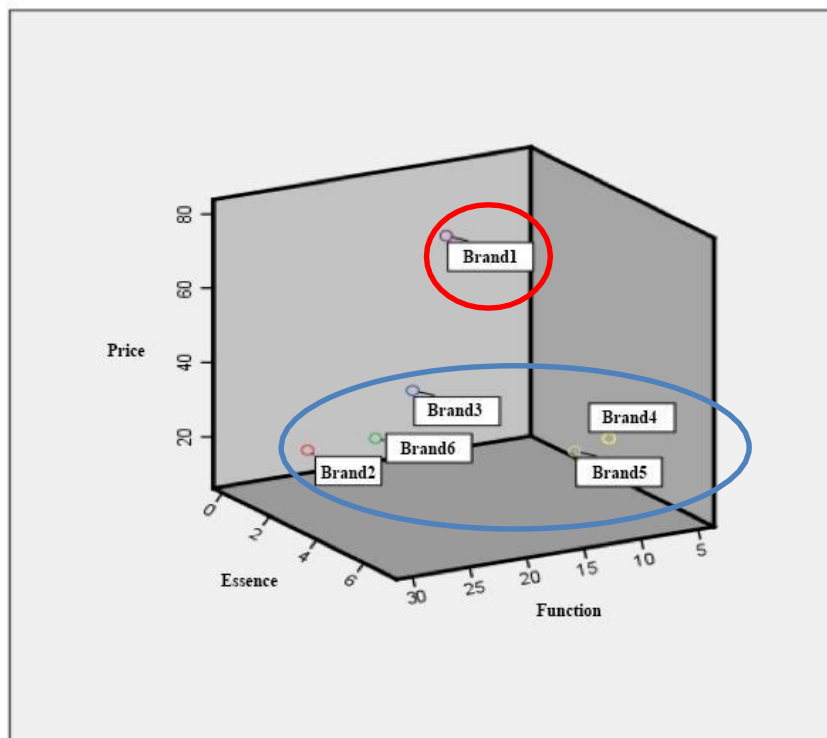

Figure5. Statistic of brand

Figure6. Cluster Analysis

The statistic result shows that there are three major factors 'Price, Essence and Function' always be focused on by community members. The relationship between brands and factors assessed from cluster analysis results are discussed. The results illustrated in Figure 6~7 indicate there has significant differences in 'Price' and 'Function' factor. Compared to other brands, community members are satisfied with the price and promotion strategy of Brand1; in addition, they tend to consider functional value of the product of Brand2. The results mean that consumers are very sensitive to price volatility; second, 'Moisturizing' and 'Whitening' are primary demands of consumers.
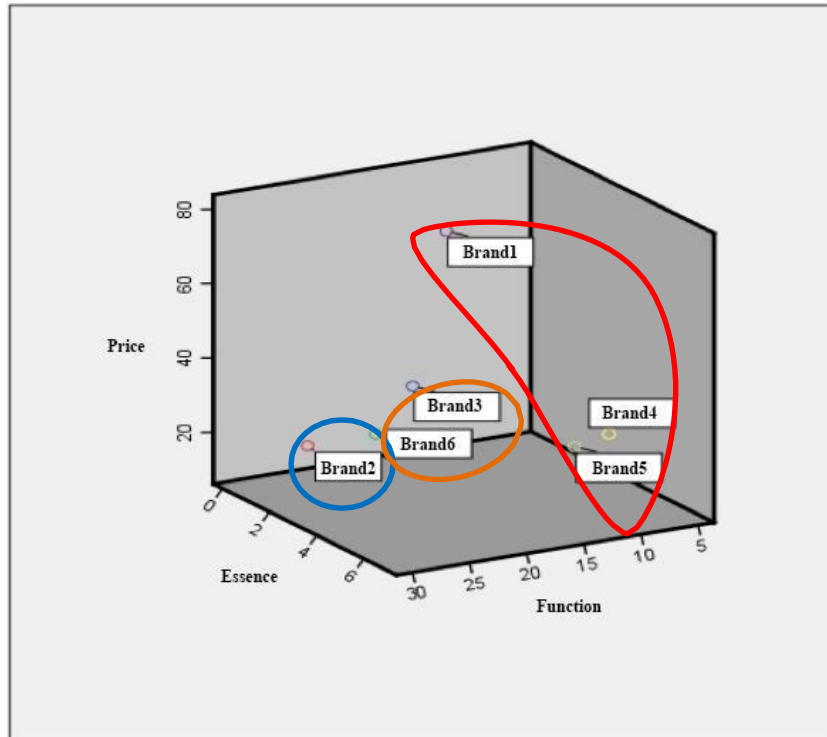

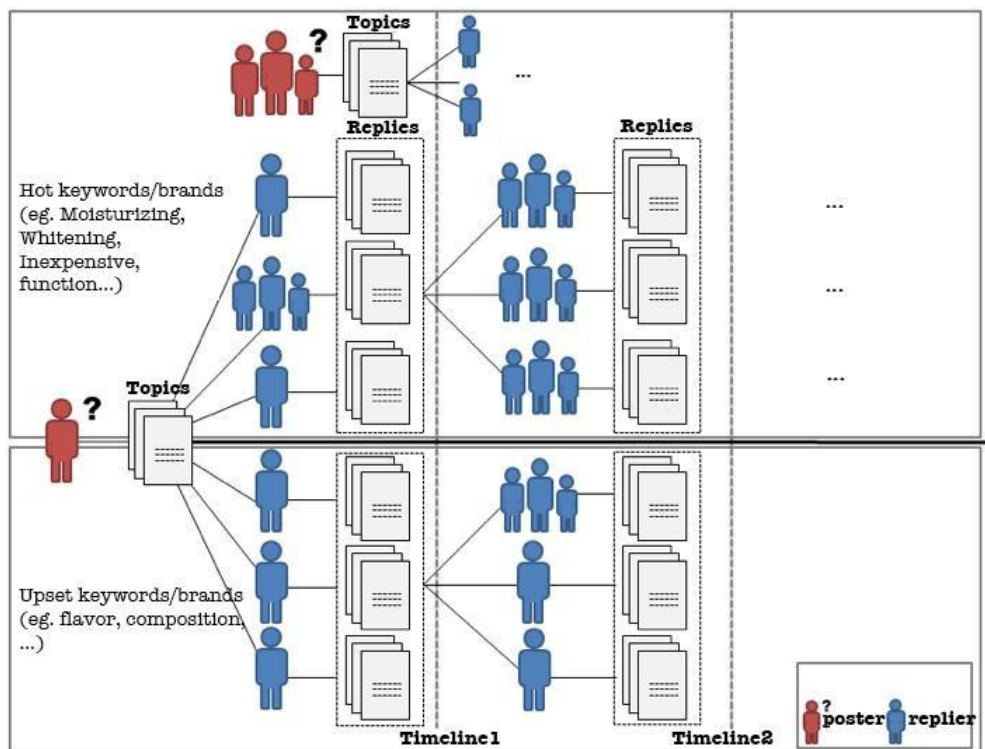Figure7. Cluster Analysis

Figure 8. A dendritic structure of eWOM

eWOM System

According to the results, popular keywords and brands may be discussed in a high frequency, online community members will repeatedly seek such topics and result in the conformity behavior (Figure 8). In view of this, we simulated eWOM system with the feature of conformity(Figure 9~10). There are three blocks of interface design, the left column is the product items, the right column is the product keywords (including keywords, brand and self-searching function), in the middle of the block is the topic display. This system provide a sort function by analysis of posting date and replies. It display topics according to users' demands, and calculate the popular keywords as an information guide for displaying content of each main topic. However, the system can be added the theme of the keyword ratio analysis charts, that provide users quickly understand what information the topic has. In the context of replies, 'text mark' conducive for convenience of information searching and browsing, further reduce their search time.
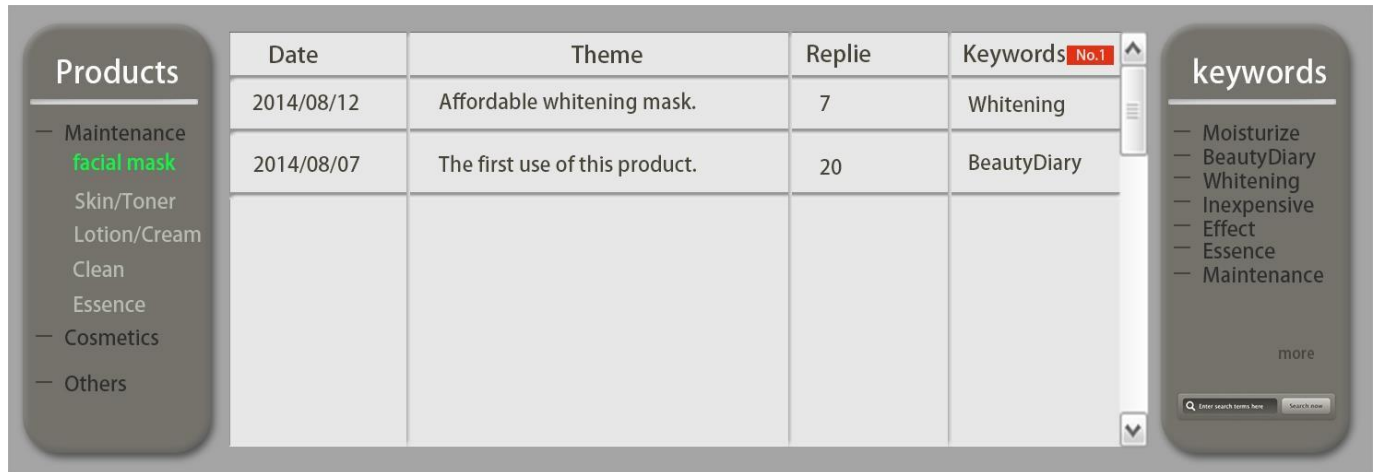

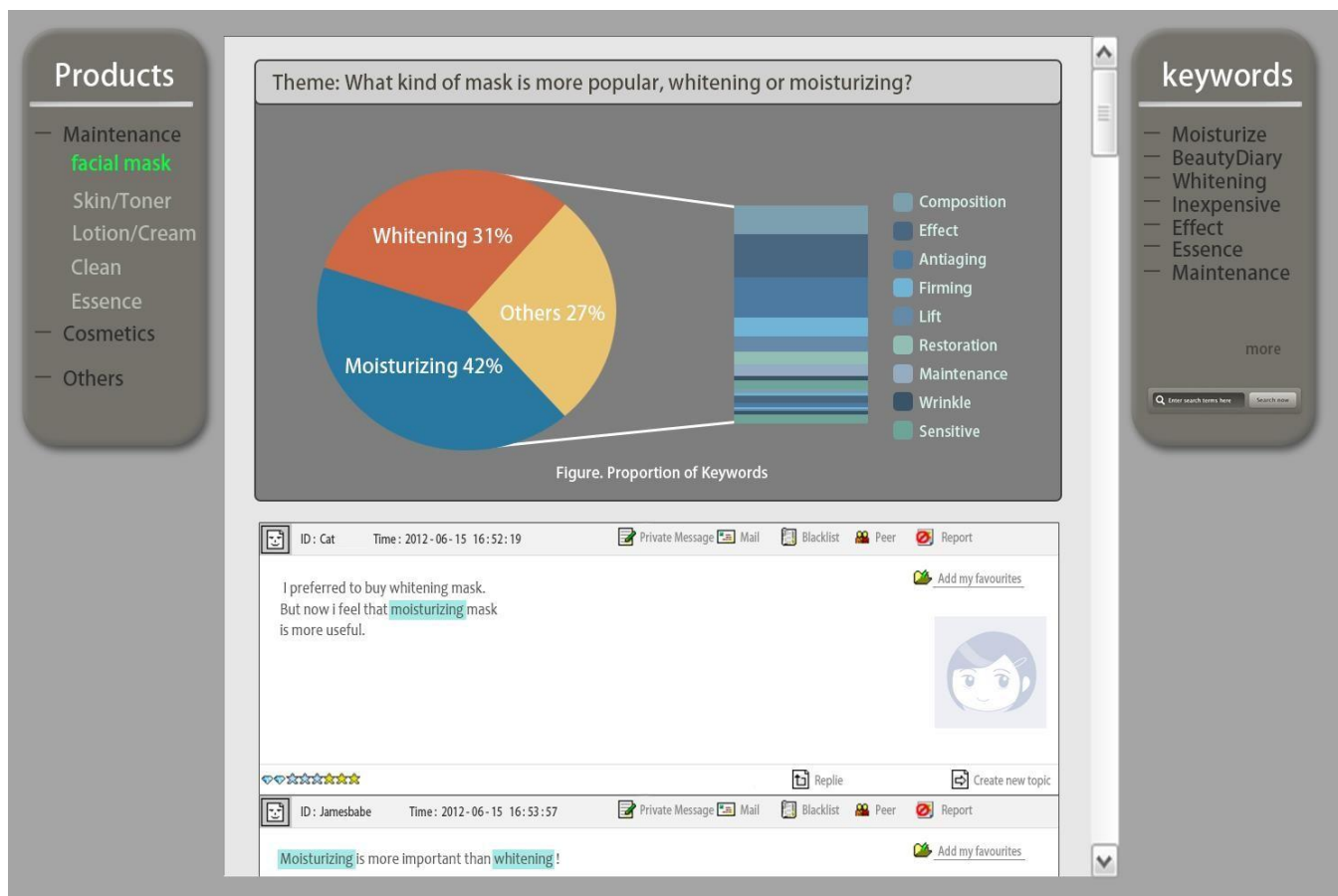Figure 9. Interface and Keyword Searching Mechanism

Figure 10. Subject Browsing

CONSLUSION

Our findings demonstrate that more attributes a product/brand has more discussions found in an online community. When the amount of information discussed to reach a sufficient quantity, brand is more likely to be mentioned. In other words, when the product/brand covers more attributes, the more chance to be seen, which was affected by conformity phenomenon occurred during eWOM delivery process. The phenomenon is seen in help accumulate sufficient and complete information of eWOM.

When community members focus on a few brands mentioned frequently, consumers will realize that they get effective purchase information, and rationalize their purchase decisions. Consumers no longer receive media messages passively in the current media environment. They tend to avoid uncertainty and perceived risk of pre-purchase information search others experience or popular degree of products. In an attempt to promote brand discussions degree and exposure, most brand vendors decided to take in cooperation with the blogger / internet celebrity / keyword advertising, or title sponsor with the broadcast. However, domestic information search interface is most design by using the amount of click and comments, which easily lead to erroneous information touted and advertising proliferation exaggerated.

Based on the findings above, the effect of eWOM on purchase behavior is no doubt. However, the few brand vendors with high product strength have the interference of conformity phenomenon, may result in a lower spread power with wrong marketing strategy. Therefore, the reputation bias will make a misleading purchase decision. Based on conformity with eWOM, we establish the effectiveness of text mining technology applied to information search platform design and brand marketing strategy. Platform vendors can do detailed industry analysis toward information topics, and add search engines / label / text prompts mechanisms with keywords extraction. Brand vendors will get richer hidden market information from the text mining results, whereby connect brand and product attributes for building brand association.

We recommend that future studies can further explore the impact of positive and negative eWOM of conformity behavior; Second, do cross over analysis to find the differences between "opinion leaders" and "eWOM User" message content; Third, use computing performance mode for the correlation analysis with the content of the information search platform (product attribute keywords), then provide guidelines for eWOM users "which topics have higher knowledge value? (the maximum amount of information/ the most adequate keywords)"; Fourth, use the mining result to improve information search platform or electronic catalog label.

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APPENDIX

Table. The study of online conformity behavior

Reference	Purpose	Methodology	Finding
[9]	This study integrated the concepts of conformity tendency and perceived playfulness into the technology acceptance model to explain why people continue to use an SNS.	This study used structural equation modeling (SEM) to evaluate the causal relationship between variables in the structural model.	1. The results indicated that SNS perceptions of ease of use and usefulness both significantly affected usage attitudes and intentions. 2. The results also suggested that perceived playfulness helped to increase user intentions to continue using SNSs; a high degree of perceived ease of use promoted perceived playfulness, thereby improving attitudes and intentions.
[15]	This study analyze the nonconformity under local nonconformity and a global nonconformity. The former is a behavior related only to the social circle of each agent, but not to the whole population. This concept means that a nonconformist agent takes the minority opinion of its social circle, but it prefers to have the same opinion of majority of the population.	By analyzing complex topologies of the agent network (scale-free networks &small-world networks).	The result is that conformity is an important behavior in these dynamics as it strongly affects the outcomes of the proposed model.
[18]	This study investigates the effects of negative online consumer reviews on consumer product attitude.	The elaboration likelihood model is used to explain the persuasive effect of the proportion and quality depending on product involvement.	1. Consumers conform to online consumer reviews and their attitudes become unfavorable as the proportion of negative online consumer reviews increases. 2. High-quality negative online consumer reviews influence consumer attitude more than low-quality negative online consumer reviews. 3. The degree of negative change in the attitude towards a product as a result of low-quality and high-quality negative online consumer reviews is greater for high-involvement consumers than for low-involvement consumers.

			4. The proportion of negative online consumer reviews could be a central cue to high-involvement consumers because of the recommendation role of online consumer reviews. A simple negative recommendation can influence the attitude of consumers under high-involvement condition as well as under low involvement condition.
[22]	This study examines shoppers' buying behaviour when exposed to a high, low or no number of previous purchases on a daily deal website, and whether this behaviour is different when the shopper is influenced by the snob or bandwagon effect.	1. Shoppers were exposed to the same daily deal website, offering the same product, with only the number of purchases manipulated—high, low, or no information. 2. A pre-experimental test with six students, who were a sub-sample of the main sample, was conducted to ensure some rules. 3. Post-experiment, respondents were measured on their need for uniqueness using a nine-item Likert-type scale.	1. Study 1: The need for conformity/uniqueness as having an effect on purchase likelihood. The bandwagon/snob effect can influence purchase likelihood. 2. Study 2: The purchase likelihood continues to increase for services as they are increasingly discounted is contrary to previous studies that have looked at services in more traditional price promotion contexts.
[23]	This study investigate if and how people conform when using the Internet, exercising social influence only via computer-mediated communication (CMC).	A quasi-experimental approach	This study found the conformity in a CMC context and a social presence felt. In particular, for male, the result indicated that one's self-esteem could play an important role in the desire to keep an image of oneself as knowledgeable and able to reason logically.