Modeling Consumers' WOM (Word-Of-Mouth) Behavior with Subjective Evaluation and Objective Information on High-tech Products

하이테크 제품에 대한 소비자의 주관적 평가와 객관적 정보 구전 활동에 대한 연구

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Consumers influence other consumers' brand choice behavior by delivering a variety of objective or subjective information on a particular product, which is called WOM (Word-Of-Mouth) activities. For WOM activities, WOM senders should choose messages to deliver to other consumers. We classify the contents of the messages a consumer chooses for WOM delivery into two categories: Subjective (positive or negative) evaluation and objective information on products.

In our study, we regard WOM senders' activities as a choice behavior and introduce a choice model to study the relationship between the choice of different WOM information (WOM with positive or negative subjective evaluation and WOM with objective information) and its influencing factors (information sources and consumer characteristics) by developing two bivariate Probit models. In order to consider the mediating effects of WOM senders' product involvement, product attitude, and their characteristics (gender and age), we develop three second-level models for the propagation of positive evaluations, of negative evaluations, and of objective information on products in an hierarchical Bayesian modeling framework.

Our empirical results show that WOM senders' information choice behavior differs according to the types of information sources. The effects of information sources on WOM activities differ according to the types of WOM messages (subjective evaluation (positive or negative) and objective information).

Therefore, our study concludes that WOM activities can be partially managed with effective communication plans influencing on consumers' WOM message choice behavior. The empirical results provide some guidelines for consumers' propagation of information on products companies want.

Key words: Bivariate Probit, Information Choice, WOM, WOM sender, WOM Message, MCMC (Markov Chain Monte Carlo), Hierarchical Bayes Model

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I. Introduction

Most people are involved in the exchange of word of mouth (WOM) about the products and services we use everyday. WOM is not advertising in the purest sense, because it is unpaid communication. It is a voluntary exchange of subjective opinion (e.g., referrals, tips, anecdotes) and objective fact (e.g., price, product features). Over 40% of Americans seek the advice of friends when shopping for doctors, lawyers, or auto mechanics (*American Demographics* 1995). Moreover, word of mouth found to be the strongest form of advertising in the annual survey of most remembered by U.S. consumers - 55% of respondents indicated they try new products based on a recommendation by a friend or family member (*Beverage Industry* 2004). The importance of managing word of mouth is quite evident in the burgeoning prac- titioner literature on WOM. Many firms have recruited people to spread the word about their new product launches and asked them to talk to friends and family about the products (*Marketing Week* 2002). Those firms have also demonstrated their interest to teach brand managers about seeding marketing messages via influential consumers (*Advertising Age* 2003).

From the perspective of marketing managers who are interested in WOM management, the most important two questions on WOM activities are "what kind of messages on products consumers are more likely to spread over," and "how consumers react to messages from other consumers." In that sense, studies on WOM activities can be based on WOM activities of two types of consumers: consumers who send information to other consumers (WOM senders) and consumers who receive the information from other consumers (WOM receivers). While research on WOM from receivers' perspectives has been conducted extensively (e.g., Duhan 1997, Herr, Kardes, and Kim 1991, Maxham 2001, Murray 199), research on WOM from senders' perspectives has been relatively limited, which mostly examined the impact (positive or negative) of WOM messages (e.g., Feick 1987, Richins 1983, Ranaweera 2003). Not only the impact of WOM but also the message choice behavior of WOM senders are important but research on this issues has not been properly introduced so far.

In our study, we classify the contents of WOM senders' messages into two different types, i.e., subjective evaluation and objective information. Our research objective is to under- stand what type of information WOM senders are more or less likely to propagate to other consumers and to measure mediating effects of product characteristics and the types of infor- mation sources on consumer message choices for WOM. The objective of our study is to uncover what type of information consumers propagate through WOM activities and what accelerates their selective deliver of WOM

messages. We argue that WOM senders' selection of the information can be also regarded as consumer choice behavior. In many instances, senders deliver a mixture of information on products. For example, WOM senders choose (deliver) subjective evaluation and objective information simultaneously while they choose one of them only in other instances. In this case, it is interesting and important to understand which information they send and why. Thus, a choice model, in particular, a bivariate probit model, can be utilized as an analysis tool to understand WOM senders' information choice behavior.

While studies on consumer choice model have been very popular in the marketing literature, the main research avenue for consumer choice model has been limited to brand choice behavior such as "which brand to buy (brand choice)", "at when (purchase timing)," "how many (purchase quantity)," and "at which store (location choice)." However, another new avenue for consumer choice model is to study consumers' information choice for WOM activities. Choice models for consumers' information choice behavior are important in the choice model literature for two reasons. Firstly, consumers' purchasing behavior largely depends on the information on products they obtain because purchase decision is based on what they know. It is critical to understand consumers' information search or propagation for the study of consumers' purchase behavior. Secondly, consumers' information

search or propagation behavior is also another type of consumer choice behavior, which has not been well studied compared to the studies on brand choice behavior. A good example is the studies of consumers' internet browsing behavior based on click-stream data analysis.

In our study, we introduce another type of consumers' choice behavior, "consumers' message choice." Consumers make choices not only for which information to collect/search for product choice but also for which information to propagate/deliver to other consumers. Consumers need to decide what to tell other consumers about a particular product, which is called WOM activities. For WOM activities, consumers experience a mental process to collect information on a particular product, form their preference over a variety of information on a particular product, and to decide what to propagate others. Therefore, choice model is a proper tool to understand consumers' WOM activities. While studies on consumers' selective propagation of information on products are critical for WOM management, this field has never been studies in the choice model literature.

The rest of the paper is organized as follows. In the next section, we review the extant research on WOM behavior and present a conceptual framework. We then explain the mathematical model and the design of our study, and estimate the model on a set of field data and interpret the results. In the last section, we conclude with caveats and provide

directions for further research.

Ⅱ. Theoretical Background

From the perspectives of our research, the extant researches on WOM can be classified into two categories: (1) Studies on WOM receivers' behavior and (2) Studies on WOM senders' behavior.

2.1 Studies on WOM receivers' behavior

A variety of studies on WOM receivers' behavior have been conducted in the marketing literature. They can be classified into four different areas according to their research objectives. First, some studies focused on why consumers rely on WOM information for purchase decision. According to them, the more difficult it is to evaluate the product, the more likely consumers are to accept or search WOM information (e.g., Hill and Neeley 1988, Murray 1991, Murrary and Schlacter 1990). Specifically, receivers' WOM activities become more active for the evaluation of innovative products or intangible products to reduce the risk or information search costs.

Second, researchers have examined the differential effects of WOM sources on WOM receivers' behavior according to the types of sources, e.g., expert, friend (e.g., Duhan 1997).

Chung and Kim (2004) developed a hierarchical choice model to measure the influence of WOM on consumer choice by comparing the three different sources of WOM: WOM from experts, WOM from friends, and WOM from internet, with three sources of mass communications through TV, Newspaper, and Radio. The study showed that WOM from expert has less impact on consumer choice than WOM from friends and from Internet. Duhan(1997) stressed the importance of the relationship between receivers and senders for WOM activities. WOM sources can be classified into two groups according to the degree of social relationship between the WOM receivers and the sources of WOM: strong tie (sources which has strong relationship with the receiver such as friends) and weak tie (sources which has weak relationship with the receiver such as experts). The study showed that receivers rely on WOM sources for purchase decision according to task difficulty, the importance of affective evaluation cues and instrumental cues.

Third, researchers have studied the differential effects of the contents (positive or negative) of WOM messages (e.g., Maxham 2001, 2002, Mahajan 1984, Richins 1983). All studies in this area focus on whether the signs of WOM messages influence WOM receivers' brand choice with different impact. Most studies empirically showed that WOM receivers are more sensitive to negative WOM messages than to positive WOM messages.

Finally, researchers have investigated factors mediating the effects of WOM messages on receivers' behavior (e.g., Herr, Kardes, and Kim 1991). They are the vividness of WOM information, the prior knowledge of product value, the congruity of prior perception of the product and its WOM information, the perceived credibility and usefulness of WOM information, the self-relevancy of WOM message, the uniqueness.

2.2 Studies on WOM senders' behavior

Similar to the research on WOM receivers' behavior, the research on WOM senders' behavior can be classified into three different areas based on their research objectives. First, researchers have tried to explain why consumers as WOM senders propagate product information to other consumers. The motives for senders' WOM activities include product involvement (Richins 1983), consumer complaints (Richins 1983, Maxham 2001, 2002, Brown 1989), the attribution of the usage problems (Curren and Folkes 1987), and the relationship between consumers and the company employee (Gremler 2001). Product involvement increases consumers' opinion leadership, while situational involvement does not influence on consumers' opinion leadership but plays a role of a WOM motive (Richin 1988).

Second, researchers have examined the type of WOM senders. In particular, Dobele (2002) suggested five types of WOM senders: (1) opinion leader who wants to be the main source of information to others, (2) passive mercenary who propagate information for self-benefit only, (3) helpful friend who propagate information to others for help, (4) reciprocator who propagate information in a reward to receiving WOM information, (5) closed mouth who keep information and does not propagate WOM information. Feick (1987) emphasized on the role of a group of consumers who are called market maven for the diffusion of market information. Market maven implies a type of active WOM senders who have some experience and general knowledge about a variety of markets rather than a specific market or product only while opinion leaders are another type of active WOM senders who have experience and knowledge about only a specific market or product.

Finally, some researchers have studied what WOM senders propagate to others. For example, Richins (1983) focused that the more negative the responses of retailers to consumer complaints, the more negative the senders' WOM. The summary of studies on WOM senders' behavior is given by ⟨Table 1⟩ as below.

Research on WOM senders' behavior is important due to the following reasons. First, knowledge or information on what consumers propagate to others and what can activate or deactivate their WOM activities is essential for firms developing WOM management efforts. Second, it is also useful to understand the

The extant studies on WOM

	Studies on WOM receivers' behavior	Studies on WOM senders' behavior
Motivation (why)	The complexity of product evaluation (Hill, Neeley, 1988) Purchase Risk level, intangibility of products (Murray, Schlacter 1990) Perceived risk, Uncertainty (Murray 1991)	Involvement (Richins 1983) Attribution of consumer complaints (Maxham 2001, 2002, Brown 1989) attribution (Folks 1984, Curren and Folkes 1987) Relationship between consumers and employee (Gremler 2001)
WOM sources (from whom/who)	Expert, Friend, Internet (Chung, Kim 2004) Social ties (Duhan, 1997)	Opinion leader, Passive mercenary, The helpful friend, Reciprocator, Closed mouth (Dobele, 2002, King 1970) Market maven (Feick,1987)
WOM contents (what)	Positive/Negative WOM (Maxham 2001, 2002, Mangold, 1999, Richins 1983, Mahajan 1984)	Positive/Negative WOM (Ranaweera 2003, Richins, 1983)
Mediating factors (how)	Information Vividness (Herr, Kardes, and Kim 1991)	-

effects of WOM based on not only WOM receivers' behavior but also WOM senders' behavior while most prior research measured the effects of WOM from WOM receivers' perspectives. Third, WOM senders' activities should be considered an important component for calculating customer lifetime value in managing customer relationship. The customer's valuation must include the number of successful customer referrals that they have generated. In a recent Jupiter Consumer Survey, when asked why consumers go to a new web site, 57% cited word of mouth – indicating that satisfied customers have far greater impact than their own repeat visits might indicate (Jupiter Research 2000).

Researches on WOM sender's information choice behavior have been very limited for several reasons. Mainly, it is difficult to find the generalized classification framework for WOM messages because WOM senders deliver too many different messages on products for general classification. Besides, there is no quantitative model or analysis tool to understand WOM senders' information choice behavior so far because no quantitative model for WOM sender's information choice behavior has been introduced in the WOM literature.

Based on the extant studies in two different areas, we conclude that the extant studies on the sign of WOM messages have not covered the whole aspect of WOM messages. As previously described, most of the extant studies on WOM senders' message choices are inter-

ested in the sign (negative or positive) of WOM messages only. However, consumers propagate not only the subjective evaluation of products which can be negative or positive, but also the objective information on products such as its price and physical characteristics. The effects of WOM senders' subjective evaluation of products differ from those of WOM senders' objective information on products. For example, WOM with objective information on products is prior to WOM with subjective evaluation in WOM process and WOM with subjective evaluation contains more diagnostic information compared to WOM with objective information on products (Gershoff, 2001). In this regard, the negative or positive WOM discussed in the extant studies can be regarded as into subjective evaluation discussed in our study and WOM with the objective information on produce has not much been studied.

Ⅲ. Model

3.1 Conceptual underpinnings

We regard WOM senders' message selection as consumers' choice behavior. WOM senders make two different types of choices according to the characteristics of information contained in their messages: (1) Whether to deliver their subjective evaluation (information) on products

or not and (2) whether to deliver their objective information on products or not. In case of WOM activities with subjective information, WOM senders have to make another type of choice: whether sending positive evaluation or negative evaluation.

We conjecture that consumers' WOM choice behavior with subjective and objective information are likely to be differentially influenced by different types of information sources because consumers may obtain different information on the same product according to the information sources such as TV, internet, and friends. Therefore, the model considers the differential effects of the following information sources: (1) WOM from acquaintances, from experts, and from internet, (2) mass media (TV commercials and online AD), and (3) consumption experience by themselves. The main reason why we consider the effects of information sources on consumers' WOM activities is because the study of the differential effects of information sources on consumers' WOM activities are useful for companies which are interested in managing or maximizing consumers' WOM activities. Even though there are more different types of information sources, we focus on the main three sources: WOM communication, mass communication and their own consumption experience. .

Furthermore, the model consider the mediating effects of WOM senders' characteristics such as age and gender, and the relationship between

WOM senders and products such as product involvement and product attitudes. Note that we are interested in the main effects of information sources on WOM activities.

3.2 Mathematical Model

We study WOM senders' information choice behavior by modeling the relationship between the choice of different WOM information (WOM with positive or negative subjective evaluation and WOM with objective information) and its influencing factors (information sources, product characteristics, and consumer characteristics). WOM with subjective evaluation is likely to be associated with WOM with objective information. For example, if a consumer does not know about a particular product to others, she does not propagate either her subjective evaluation or objective information on the product. Since a consumer make two different choices on propagation of subjective evaluation and objective information respectively, we develop two different choice models(probit). However, we use bivariate probit models which can incorporate the correlations between WOM senders' selection behaviors of subjective evaluation and objective information since it is often the case that consumers propagate their subject evaluation and objective information on the product simultaneously. In addition, consumers are highly likely to show different choice behaviors with positive and negative evaluations on products, as discussed in most of previous studies on WOM behaviors. Therefore, we separate responses into two data set A and B, consisting of responses from consumers who have positive and negative evaluation on products, respectively.

Therefore, we develop two bivariate Probit models: Model A for WOM activities by consumers who have positive evaluation (positive WOM senders) and Model B for WOM activities by consumers who have negative evaluation on products (negative WOM senders). We employ the random utility model. Individual i propagates her subjective evaluation on product j ($Y^{PE}_{ij} = 1$, $Y^{NE}_{ij} = 1$) if the utility (U_{ij}) of propagating her subjective positive or negative evaluation is greater than a threshold value 0 and does not propagate ($Y^{PE}_{ij} = 0$, $Y^{NE}_{ij} = 0$) otherwise, respectively. In addition, she propagates her objective information on product j ($Y^{OI}_{ij} = 1$, $Y^{OI}_{ij} = 1$) if the utility (V^{OI}_{ij}) of propagating her objective information is greater than a threshold value 0, and does not propagate ($Y^{OI}_{ij} = 0$, $Y^{OI}_{ij} = 0$) otherwise, respectively.

The utilities of WOM with subjective evaluation and with objective information by individual i for product j are determined by the types of information sources, product characteristics, individual characteristics, and the error terms. So the utilities can be expressed as below:

<Positive WOM senders>

$$U_{ij}^{PE} = \mathbf{X}_{ij}\boldsymbol{\beta}_i^{PE} + \varepsilon_{ij}^{PE}$$

$$V_{ij}^{OI} = \mathbf{X}_{ij}\boldsymbol{\beta}_i^{OI} + \varepsilon_{ij}^{OI}$$

<Negative WOM senders>

$$U_{ij}^{NE} = \mathbf{X}_{ij}\boldsymbol{\beta}_i^{NE} + \varepsilon_{ij}^{NE}$$

$$V_{ij}^{OI} = \mathbf{X}_{ij}\boldsymbol{\beta}_i^{OI} + \varepsilon_{ij}^{OI}$$

$$\mathrm{E}[\varepsilon^{PE}|\mathbf{X}] = \mathrm{E}[\varepsilon^{NE}|\mathbf{X}] = \mathrm{E}[\varepsilon^{OI}|\mathbf{X}] = 0$$

$$Var[\varepsilon^{PE}|\mathbf{X}] = Var[\varepsilon^{NE}|\mathbf{X}] = Var[\varepsilon^{OI}|\mathbf{X}] = 1$$

$$Cov[\varepsilon^{PE}, \varepsilon^{OI}|\mathbf{X}] = \rho_{PE,OI}$$

$$Cov[\varepsilon^{NE}, \varepsilon^{OI}|\mathbf{X}] = \rho_{NE,OI}$$

where U_{ij}^{PE} and U_{ij}^{NE} are the utilities of propagating her positive and negative evaluations on product j by individual i, respectively. V_{ij}^{OI} is the utility of propagating her objective information on product j. Note that the two different bivariate probit models share the same component V_{ij}^{OI}. $\mathbf{X}$ is a matrix for the predictors representing the effects of three different types of information sources: (1) WOM from acquaintances, from experts, and from internet, (2) TV commercials and online AD, and (3) Use experience. (**β**, **β'**) are column vectors of the corresponding coefficients. The corresponding error terms, (ε_{ij}^{PE}, ε_{ij}^{OI}) and (ε_{ij}^{NE}, ε_{ij}^{OI}), are assumed to follow the bivariate normal distributions with a mean of zero, a variance of one, and its correlation $\rho_{PE,OI}$ and $\rho_{NE,OI}$, respectively. Mass communication, WOM communication, and consumption experience provide diverse product information to each

consumer in different situations, it is possible that the influence from each group might also differ. To investigate the differential influence of information sources, information collection activities by information sources were measured using an effects coding method. In the case of WOM by friends, its' effects on product utility can vary depending on whether a WOM sender is provided with other consumers' positive or negative evaluation on a product. Thus, variables of WOM sources are coded as 1 or 0 according to whether or not WOM sender has been exposed to subjective evaluation made by friends, experts, and anonymous on the internet, respectively. For the analysis of mass communication effects, the type of advertisement was divided into two different channels: TV commercials and online AD. WOM senders' exposures to TV commercials and online AD are coded as 1 or 0 according to whether or not WOM sender has been exposed to the corresponding mass media, respectively. Finally, consumption experience is coded as 1 or 0 according to the WOM sender has used the product or not, respectively.

In order to consider the mediating effects of WOM senders' product involvement, product attitude, and their characteristics (gender and age), we develop three second-level models for the propogation of positive evaluations, of negative evaluations, and of objective information on productsnegative WOM sendersin an hierarchical Bayesian modeling framework as below.

$$\beta_i^{PE} = \alpha_0^{PE} + \sum_{l=1}^{4} Z_{il}\alpha_l^{PE} + \xi_i^{PE}, \quad E\left[\xi_i^{PE}|Z\right] = 0, \quad Var\left[\xi_i^{PE}|Z\right] = \sigma^{PE}$$

$$\beta_i^{NE} = \alpha_0^{NE} + \sum_{l=1}^{4} Z_{il}\alpha_l^{NE} + \xi_i^{NE}, \quad E\left[\xi_i^{NE}|Z\right] = 0, \quad Var\left[\xi_i^{NE}|Z\right] = \sigma^{NE}$$

$$\beta_i^{OI} = \alpha_0^{OI} + \sum_{l=1}^{4} Z_{il}\alpha_l^{OI} + \xi_i^{OI}, \quad E\left[\xi_i^{OI}|Z\right] = 0, \quad Var\left[\xi_i^{OI}|Z\right] = \sigma^{OI}$$

Z_i indicates WOM sender i's product involvement(5 point scale), product attitude, and their characteristics (gender and age). Product involvement is a 5 point scale measure of how much involved a WOM sender is in a product. Product attitude is also a 5 point scale measure of how much a WOM sender likes a product. female and mail respondents are coded as 1 and 0, respectively. (β^{PE}, β^{NE}, β^{OI}) are column vectors of the corresponding coefficients. The corresponding error terms, (ε_{ij}^{PE}, ε_{ij}^{NE}, ε_{ij}^{OI}) are assumed to follow the bivariate normal distributions with a mean of zero and a variance of one, respectively. Besides, we estimate the correlation $\rho_{PE,OI}$ and $\rho_{NE,OI}$ for two bivariate probit model.

3.3 Model Estimation

To analyze the choice data, we use a random-effects hierarchical Bayesian bivariate probit model. We assume a hierarchical shrinkage specification for the parameters at the individual level, where a priori,

$$\beta_i \sim N(\bar{\beta}, \Lambda) .$$

This specification allows for individual-level parameter estimates β_i but still permits an estimate of the aggregate or average parameter $\bar{\beta}$, as well as an estimate of the amount of heterogeneity for each parameter Λ. On the basis of the model performance, we use a simplified version of the model by assuming that Λ is a diagonal matrix. Furthermore, we assume diffuse conjugate priors for $\bar{\beta}$ and Λ to ensure proper posteriors but also allow the data to primarily govern the inferences.

We use simulation-based inferences called MCMC (Markov Chain Monte Carlo) by drawing simulated samples of parameter values from posterior distributions through Gibbs Sampler (Albert and Chib 1993). We tested a range of different prior values to ensure that the reported results were invariant to the prior specification. In addition, we assessed the convergence properties of the Markov Chain Monte Carlo (MCMC) analysis to ensure that the algorithm had converged to the target density, as induced by the model specification, before making marginal summaries of the posterior density.

IV. Empirical Analysis

4.1 Study Design

A pilot study was conducted before the questionnaire survey for the empirical analysis.

The objective of the pilot study is to determine the relevant products for our study. Based on the pilot survey with 52 persons in Korea, eight products were selected for the empirical analysis: Megapass (wired Internet service), Motorola Lazer (cellular phone), Sony VAIO (notebook), iPod (MP3 player), Cannon Digital Camera, PlayStation2 (Microsoft), SHARP dictionary (Electronic Dictionary), Nespot (wireless Internet service). The products are all information technology-related products. One of the main reasons for using these products is that WOM activities for such products are relatively active in online and offline markets.

Four out of eight products were randomly selected for each type of questionnaires. Each questionnaire has the same structure with the same questions, except for the products used for the WOM questions. Questionnaires were designed to measure undergraduate students' WOM information decisions for response variables and respondents' perceptions on the products for predictor variables, respectively.

We explicitly consider the data structure collected as follows. An individual was asked if s/he had delivered subjective evaluation and/or objective information on four products respectively (for response variables). In addition, s/he was requested to answer to the following 6 questions (for predictor variables of the level 1 model): (1) whether s/he had received any information on the product from friends (WOM from friends), (2) from experts (WOM from experts), (3) whether s/he had been exposed to any information on the product on the internet, provided by anonymous internet users (WOM from Internet), (4) whether s/he had been exposed to TV commercial, (5) on-line ads on the product, and (6) whether s/he had experienced the product(user experience). For variables for level 2 model, we measured product involvement (five-point scale), product attitude(five-point scale), and demographics (gender and age).

A sample of 270 undergraduate students participated in this study. Data are collected by a self-administered questionnaire.

4.2 Model Estimation

We estimate the model developed using the data about WOM senders' behavior with subjective evaluation and WOM senders' behavior with objective information on four randomly selected products out of eight products per respondent. Parameter estimates for the model have been included in ⟨Tables 1 and 2⟩ for subjective evaluation and objective information, respectively.

After 10000 iterations of burning period simulation, 5000 draws of MCMC simulation were used to calculate the means and standard deviations of the model parameters. ⟨Table 1⟩ shows the estimates of parameters for the first level models. Note that the estimation of two bivariate probit models are not independent

since the two different bivariate probit models share the same component V_{ij}^{OI}. Therefore, the ⟨Table 1⟩ contain parameter estimates from three different model equations.

The results show that correlation between WOM activities with negative evaluation and with objective information was much higher than that between WOM activities with positive evaluation and with objective information. This means that WOM senders who propagate negative evaluation on products are more likely to propagate objective information too, compared to WOM senders who propagate positive evaluation on products. WOM senders who try to provide negative opinions on products seem more likely to provide objective information as evidences.

Not surprisingly, consumption experience is the most important source for any WOM activities. WOM from friends is the 2nd most influential source for the propagation of objective information and of positive evaluation. However,

WOM from internet was more important than WOM from friends for the propagation of negative evaluation on products.

The estimated parameter of the main WOM communication source, WOM from friends, was highest (0.652) for negative evaluation model, while the estimated parameter of the main mass communication source, TV commercial, was highest (0.342) for objective information model. In other words, the effects of WOM from friends was most influential for the propagation of negative evaluation, while the effects of TV commercial was most influential for the propagation of objective information.

The second level parameter estimates for the model of the propagation of objective information, of positive evaluation, and of negative evaluation on products information are summarized in ⟨Table 2, 3, and 4⟩ as below.

⟨Table 2⟩ shows some interesting results. Firstly, product involvement amplifies the effects of WOM from internet and online AD

⟨Table 1⟩ Parameter Estimates for 1st level models for Positive and Negative WOM Senders

	ojjective Info.	Positive S.I.	Negative S.I.
Inntercept	0.356(0.168)	0.364(0.243)	-0.635(0.314)
WOM from Friends	0.453(0.087)	0.565(0.092)	0.652(0.152)
WOM from Experts	0.238(0.074)	0.158(0.110)	0.112(0.043)
Wom from Internet	0.331(0.036)	0.231(0.336)	0.711(0.187)
TV Commerciasls	0.342(0.057)	0.119(0.025)	-0.027(0.033)
Onlive AD	-0.128(0.142)	0.053(0.135)	0.127(0.033)
Use Experience	0.773(0.142)	0.838(0.1615)	1.767(0.233)
* Correlation:		0.370(0.0412)	0.526(0.110)

(standard deviation)

<Table 2> 2nd level parameter estimates for objective information model

	WOM from Friends	WOM from Experts	WOM from Internet	TV Commercials	Online AD	Use Experience
Product Involvement	0.212 (0.0659)	0.111 (0.017)	0.526 (0.168)	-0.116 (0.048)	0.222 (0.056)	-0.121 (0.118)
Product Attitude	0.582 (0.089)	0.113 (0.022)	0.411 (0.043)	0.386 (0.055)	0.132 (0.129)	0.998 (0.377)
Gender (0=male, 1=female)	0.449 (0.098)	0.212 (0.102)	-0.312 (0.042)	0.286 (0.019)	-0.035 (0.012)	-0.541 (0.115)
Age	-0.012 (0.001)	0.111 (0.081)	-0.259 (0.017)	-0.011 (0.001)	0.002 (0.001)	0.017 (0.003)
intercept	0.356 (0.075)	-0.221 (0.112)	0.123 (0.087)	0.225 (0.042)	-1.839 (0.328)	0.5434 (0.033)

(standard deviation)

on WOM activities with objective information than any other information sources. It implies that the more a consumer is involved in a product, the more likely she is to rely on information obtained from the internet to propagate objective information. Female consumers are more likely to propagate objective information obtained from friends, while male consumers are more likely to progapate objective information obtained from their use experience and internet. The younger consumers are more likely to rely on WOM from friends and from internet, while the older consumers are more likely to rely on mass communication and WOM from experts.

<Table 3 and 4> show the 2nd level parameter estimates for positivie and negative evaluation model as below.

Product involvement has some different effects on consumers' WOM activities with positive and negative evaluation on products. Specifically, regardless of types of information sources, exposures to any information sources stimulated highly involved consumers to propagate positive evaluations on products. However, mass communication failed to provoke WOM activities of consumers who have negative evaluation on products. It implies that mass communication is not a good stimulus for WOM senders with negative opinions.

Interestingly, in case of the propagation of positive evaluation on products, female consumers who have positive opinions on products are more willing to propagate information obtained

〈Table 3〉 2nd level parameter estimates for positive information model

	WOM from Friends	WOM from Experts	WOM from Internet	TV Commercials	Online AD	Use Experience
Product Involvement	0.344 (0.099)	0.116 (0.088)	0.356 (0.168)	0.031 (0.015)	0.011 (0.128)	0.393 (0.087)
Product Attitude	0.453 (0.074)	0.100 (0.021)	0.411 (0.099)	0.155 (0.032)	0.132 (0.001)	0.845 (0.102)
Gender (0=male, 1=female)	0.222 (0.069)	0.113 (0.080)	0.173 (0.074)	0.311 (0.092)	-0.138 (0.074)	0.111 (0.074)
Age	-0.213 (0.074)	0.112 (0.023)	-0.328 (0.074)	0.011 (0.003)	0.008 (0.001)	0.039 (0.004)
intercept	-0.431 (0.111)	0.746 (0.122)	0.342 (0.033)	0.238 (0.084)	-0.238 (0.054)	0.211 (0.043)

(standard deviation)

〈Table 4〉 2nd level parameter estimates for negative evaluation model

	WOM from Friends	WOM from Experts	WOM from Internet	TV Commercials	Online AD	Use Experience
Product Involvement	0.233 (0.023)	0.011 (0.007)	0.526 (0.168)	-0.116 (0.048)	0.222 (0.056)	-0.121 (0.118)
Product Attitude	-0.982 (0.129)	-0.034 (0.002)	-0.522 (0.043)	0.002 (0.001)	-0.021 (0.004)	-0.898 (0.377)
Gender (0=male, 1=female)	0.464 (0.088)	0.212 (0.102)	-0.312 (0.042)	0.286 (0.019)	-0.035 (0.012)	-0.541 (0.115)
Age	0.212 (0.001)	0.111 (0.081)	-0.259 (0.017)	-0.011 (0.001)	0.002 (0.001)	0.017 (0.003)
intercept	-0.512 (0.191)	-0.111 (0.112)	0.237 (0.044)	-0.300 (0.131)	1.549 (0.228)	0.6434 (0.143)

(standard deviation)

from all of information sources, while, in case of the propagation of negative evaluation on products, there are some gender difference: WOM from internet and online AD are more likely to stimulate male consumers' WOM activities with negative evaluations on products, while WOM from friends, TV commercials and WOM from experts are more effective stimulus for female consumers to deliver their negative eduation.

⟨Table 3 and 4⟩ show that no age difference between the mediating effects of information sources on WOM activities with positive and negative evaluation except for the effect of WOM from friends. The younger consumers are more likely to be influenced to propagate positive evaluation by WOM from friends, whereas the older consumers are more easily influenced to to negative evaluation on product by WOM from friends.

V. Summary and Directions for Future Research

We can conclude from the empirical results that WOM senders' information choice behavior differs according to the types of information sources. Furthermore, the effects of information sources on WOM activities differ according to the types of WOM messages (subjective evaluation (positive or negative) and objective information). Therefore, based on the results,

companies can develop effective communication plans to influence on consumers' WOM message choice behavior and also activate their propagation of information on products companies want.

Our empirical study provides companies interested in WOM management with some interesting guidelines as summarized below. Firstly, use/concumption experience is the most important source for any WOM activities. Secondly, WOM senders who propagate negative evaluation on products are more likely to propagate objective information too as evidences. Thirdly, WOM from friends is the 2nd most influential source for the propagation of objective information and of positive evaluation. However, WOM from internet was more important than WOM from friends for the propagation of negative evaluation on products.

Forthly, the effects of WOM from friends was most influential for the propagation of negative evaluation, while the effects of TV commercial was most influential for the propagation of objective information. Fifthly, the more a consumer is involved in a product, the more likely she is to rely on information obtained from the internet to propagate objective information. Lastly, Female consumers are more likely to propagate objective information obtained from friends, while male consumers are more likely to progapate objective information obtained from their use experience and internet. The younger consumers are more likely to rely on WOM from friends and from internet, while

the older consumers are more likely to rely on mass communication and WOM from experts.

Lastly, the characteristics of WOM senders (consumers) also influence on WOM activities. The younger consumers are more likely to be influenced to propagate positive evaluation by WOM from friends, whereas the older consumers are more easily influenced to to negative evaluation on product by WOM from friends. Interestingly, in case of the propagation of positive evaluation on products, female consumers who have positive opinions on products are more willing to propagate information obtained from all of information sources, while, in case of the propagation of negative evaluation on products, there are some gender difference.

Our research developed a new research avenue, "consumer's WOM message choice behavior," which has not been studied in the quantitative modeling literature. This research is important at least for two reasons. First, our study provides companies for WOM management some managerial implications based on the empirical findings such as "what type of messages consumers are more likely to propagate" and "what type of communication plans are more desirable to activate consumers' WOM activities." Our study uncovered some factors activating or deactivating senders' WOM activities. In addition, the empirical results are helpful to companies planning WOM campaigns because the model approach in our study can provide a guideline for which media should be

used for WOM management. Second, our study suggests consumer choice model can be used for consumers' information choice behavior, particularly consumers' message choice for WOM activities, which has never been studied in the literature. Multivariate Probit model introduced in our study can be applied to any type of message choice by WOM senders regardless of how to classify the information choice for WOM.

Nevertheless, there are several limitations of our model for future research as follows. First, the results of our empirical analysis are limited for generalization because respondents are relatively homogeneous in terms of age and job (mostly students). Therefore, the empirical analysis did not utilize the value of our model which is designed to consider individual characteristics fully.

Second, the model in our study is for only the two types of WOM information, objective information on and subjective evaluation of products. It is necessary to conduct further studies on senders' information choice behavior with more diverse and specific types of WOM information. It is also desirable to study WOM with objective information by using more specific classification of objective information for WOM. Then such problem can be studied with a nested version of multivariate choice model.

Third, the results of the empirical analysis are also limited for generalization because all products used in our survey are IT (Information Technology)-related products. For genera-

lization of the results, it is necessary to apply the model to other types of products.

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하이테크 제품에 대한 소비자의 주관적 평가와
객관적 정보 구전 활동에 대한 연구

정 재 학*

요 약

소비자들은 때로 특정 제품에 대한 정보들을 다른 소비자에게 전달하여 그들의 제품 선택에 영향을 미치는 전달자 역할을 한다. 본 연구는 구전 전달자로서 소비자가 다른 소비자에게 전달하는 제품 정보를 주관적 (긍정적 또는 부정적) 정보와 객관적 정보로 구분하여, 소비자가 어떤 정보를 어떤 경우 더욱 활발히 전달하는 지를 분석하고자 한다.

본 연구는 이를 위해, 소비자의 메시지 전달 행위를 제품 선택과 같이 또 다른 형태의 선택 행위로 보고, 고객의 제품 구매 선택 행위를 연구하는 데 주로 적용되어 온 소비자 선택 모형(consumer choice model)를 이용하여 소비자의 메시지 전파(구전) 활동을 분석하였다. 소비자 선택 모형을 이용하여, 구전 전달자들이 제품에 관한 객관적 정보와 주관적 평가를 언제 더욱 많이 확산 시키는 지를 알아보고, 더 나아가서는 소비자들이 제품 관련 정보를 확산하는 과정에 구전 활동을 더욱 활성화 또는 약화시키는 요인이 무엇인지를 살펴 보았다.

본 연구는 실증 분석 결과를 통해, 구전 전달자의 메시지 확산 행위는 정보를 획득하게 된 경로/원천(source)의 유형에 따라 더욱 활발해 지거나 위축될 수 있다는 점을 발견하였다. 또한, 이러한 구전 활동은 전달하는 제품관련 메시지가 주관적 제품 평가에 관한 것인지 아니면 제품에 대한 객관적 정보인지에 따라 그 정도가 달라진다.

본 연구의 결과가 의미하는 바는, 소비자의 제품에 관한 메시지 확산 활동은 소비자의 구전 메시지 선택 행위에 영향을 미치는 효과적인 커뮤니케이션 계획을 통하여 더욱 확산 또는 위축시킬 수 있다는 점을 보여준다. 본 연구는 기업이 확산되기를 바라는 제품 정보가 구전을 통하여 효과적으로 확산되도록 계획을 수립하는 데 필요한 방법론을 제공하고 있으며, 실증 분석 결과를 기반으로 제품 구전의 성공적인 확산을 위한 커뮤니케이션 전략 수립에 필요한 가이드라인을 제공하여 준다.

핵심개념: 양변량 프로빗 모형, 정보 선택, 구전, 구전 메시지, MCMC(Markov Chain Monte Carlo), 구조화된 베이지안 모형

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