Correlation between Word-of-Mouth Effects and New Media: Simulations of Japanese Media Environment Using Artificial Neural Network

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Abstract

This study tries to discover new correlation patterns between word-of-mouth generation and other media effects through a computer simulation model by artificial neural network. First, authors conducted an empirical consumer survey in Japan regarding purchase behaviors of compact automotives, an example of typical consumption behaviors. Authors focused on each consumer's media contact including conventional mass media, internet media, and communication through dealer activities. Second, based on this survey result, a computer simulation model was built to examine a variety of virtual settings of media environment surrounding current Japanese consumers. In building the model, authors used an artificial neural network system and manipulated each medium's parameter.

By observing the simulation results, authors tried to establish a new general pattern of media usages from the viewpoint of marketing practitioners to accelerate word-of-mouth effects. Today, although marketers notice that the word-of-mouth effects can have a great power in building an effective marketing strategy, they do not sufficiently understand collaborations between conventional marketing communication media and consumer-generated-media such as blogs and word-of-mouth activity. This experimental simulation study provides some basic hints to understand this collaboration.

1. Introduction and Motivation

In the area of marketing studies, due to the wide penetration of information communication technologies, the influences of word-of mouth (WOM) effects have been focused as a new marketing technique. The original meaning of WOM is a behavior among people to communicate each other without any intentions or purposes. However, in marketing businesses, a new meaning of WOM is a type of new communication media that conveys information with particular intentions or purposes.

We should be careful with this translation when we think of media environments. In the original meaning, it is spontaneous that WOM is an external element for media businesses. In fact, WOM is conventionally considered as one of the major reasons of the network effect, or the network externalities (Liebowitz 1994), and its behavior or result looks relatively random and uncontrollable (Arthur 1994). However, in this new meaning, we should think that WOM is one of the internal elements of marketing communication businesses. Assuming that WOM can be an internal element, we should consider that WOM can be amplified by the correlation with other media, including conventional mass media and new information communication technologies. This research stands on this viewpoint, and tries to examine correlations between every major medium and "touchpoint" (or marketing communication channels).

That said, we must think that WOM still has two aspects from the viewpoint of marketing practitioners: "external" and "internal." There are some unavoidable risks to harness WOM as a marketing medium, because an external aspect of WOM is not entirely manipulative. Thus, classifying various WOM communications into a few types based on characteristics and also understanding basic behaviors of each type of WOM can be an important first step to minimize risks. Because WOM is one of the basic reasons of the network effect, there is a limitation to simulate its behaviors by using conventional linear statistical planning models. Therefore, we decided to build a dynamic simulation model using a complex information system technology that can deal with multi-correlations among a variety of touchpoints and some consumer norms.

2. Previous Studies

Word of Mouth and its Effect

The Internet has broadened the area of WOM influences from interpersonal communication among acquaintances to online communication to general public (e.g. posting reviews). Harrison-Walker (2001) defined WOM as "informal person-to-person communication between a perceived noncommercial communicator and a receiver regarding a brand, a product, an

organization, or a service." Marketing practitioners try to encourage such "informal" communication in a positive manner, and several approaches such as "viral marketing" (Wilson 2000) and "buzz marketing" (Rosen 2000) have been developed.

Some former studies have reported the positive effect of WOM. Chevalier and Mayzlin (2006) suggested "the addition of new, favorable reviews at one site results in an increase in the sales of a book at that site relative to the other site," comparing Amazon.com and Barnesandnoble.com. They also found "customer reviews tend to be positive at both sites." It is also suggested that the amount of WOM information at the Yahoo Movies Web site has explanatory power for box office revenue both in aggregate and for the early weeks (Liu 2006).

Motivation behind WOM

Several researchers have suggested motives for traditional WOM communications. Many suggested motives can be categorized as involvements with product or oneself, which are supposed to arise from experiences in using products. For example, Dichter (1966) categorized Product-involvement motive as a mean to reduce the tension caused by the consumption experience, and Self-involvement motive as a way to gratify some emotional needs.

On the other hand, it is also suggested that marketing communication can arise WOM. Message-involvement (Dichter 1966) refers to discussion stimulated by advertisements or other marketing communications. Message intrigue (Engel, Blackwell and Miniard 1993) is defined as a motive of entertainment resulting from talking about certain ads. We noticed these entertainment motives from marketing communications and decided to examine how marketing communication on each touchpoint affects the occurrence of WOM.

Motives for electric WOM (eWOM) have also been suggested. Henning-Thurau et al. (2004) pointed out "Social benefits" factor such as "it is fun to communicate this way with other people in the community" as well as "Platform assistance" factor, which is specific to eWOM. Phelps et al. (2004) listed top 3 motives for Sending Pass-Along Email, all of which are related to entertainment motives.

3. Hypotheses

Since the advent of eWOM, WOM has played an important role for many marketing practitioners. Word of Mouth Marketing Association (WOMMA) distinguishes Amplified WOM from Organic WOM, which "occurs naturally when people become advocates because they are happy with a product and have a natural desire to share their support and enthusiasm." This definition implies Organic WOM can arise from experiences in using products. On the other hand,

Amplified WOM, which "occurs when marketers launch campaign designed to encourage or accelerate WOM," does not necessarily need product usage.

Our first step is to examine that marketing communication can amplify WOM. According to WOMMA, the definition of WOM marketing is 1) "giving people a reason to talk about your products and services" and 2) "making it easier for that conversation to take place." We focus on this first step and try to find out which touchpoints can convey people a reason to talk about effectively.

H1: The occurrence of WOM behavior is influenced by which touchpoints of brand/product information a person pays attention to.

Our basic and the most important hypothesis is that there are two types of WOM, "gap WOM" and "common WOM". Gap WOM is defined as communication to fill the information gap among communicators. This type of WOM can arise when a person possesses information advantages and finds a self-enhance motivation. We think utilizing gap WOM is similar to influencer marketing (Kelly and Berry 2003). Common WOM is defined as communication about common information. This type of WOM can arise when communicator share common information and talking about this brings entertainment. From the above definitions, we hypothesize that gap WOM can be amplified by touchpoints conveying a lot of information to give information advantages to a relatively small number of people and that common WOM can be amplified by touchpoints reaching a majority of people at a time.

H2: Gap WOM and common WOM can be amplified by certain touchpoints.

According to Phelps et al., advertisers strive to accomplish the tipping point (Gladwell 2000), which occurs when any social phenomenon reaches critical mass. We further research if there is a tipping point by simulating information experiences under different touchpoints circumstances.

H3: If H1 and 2 are true, certain dynamic correlation patterns between each type of WOM and consumer norms, such as preferences, and purchase willingness should be observed when marketing practitioners manipulate each touchpoints.

Moreover, if H3 is supported, we can build a general framework that explains the dynamic relation between each type of WOM and various consumer norms. This framework can help marketing practitioners build marketing strategies, working as an important standard to utilize WOM as manipulative marketing tools.

4. Methods

Empirical Consumer Survey

We conducted an empirical consumer survey using on-line survey system that collects responses from all over Japan. In this survey, we asked respondents to declare his or her recent experiences, opinions, sentiments, and feelings regarding compact automobile purchase activities. There are two major purposes of the survey. First, by confirming respondent's viewership and readership toward each content or advertisement of compact automobiles in 34-type medium (Table 2), we obtained the actual correlation rate among each medium's viewership or readership rate. Second, we also examined the consumer's awareness rate, preference rate, and purchase willingness rate toward each particular compact automobile products, including *Toyota Vitz (same as Yaris in EU), Nissan March (same as Micra in the US and EU), Nissan Cube, Mazda Demio* (same as *Festiva mini-wagon* in the US), and *Honda Fit*. The same data is used as the training data for an artificial neural network simulation model in the following examination. The detail of the survey is shown in Appendix1.

From our empirical research, gap WOM is gauged by the questionnaire of "Do you advice your family, friends or online friends about automobile purchase decision?" (WOM_{advice}) In previous studies, it is supposed that influencers are 10% of any target market who frequently offer and are elicited for category-related advice by friends and colleagues (Marsden, Samson, and Upton 2005). Feick and Price (1987) investigated that "Market Maven" groups are good information diffuser recommending particular brands and products. Washida (2005) also showed that, in the Japanese marketplace, certain types of consumer communities can work as the influencers even though the community is not located in the initial stage of the diffusion process. Therefore, in this survey we decide to utilize this question to define the gap WOM.

Similarly, the common WOM is gauged by the questionnaire of "Have you talked about (the brand) with your friends during the year?" (WOM_{brand})

Based on the survey data, we conducted a series of multinomial logit model analyses. This method examines the marginal effect of each subject variable, comparing correlations between object variables and every subject variable. The result of these analyses should examine our hypothesis H1 and H2.

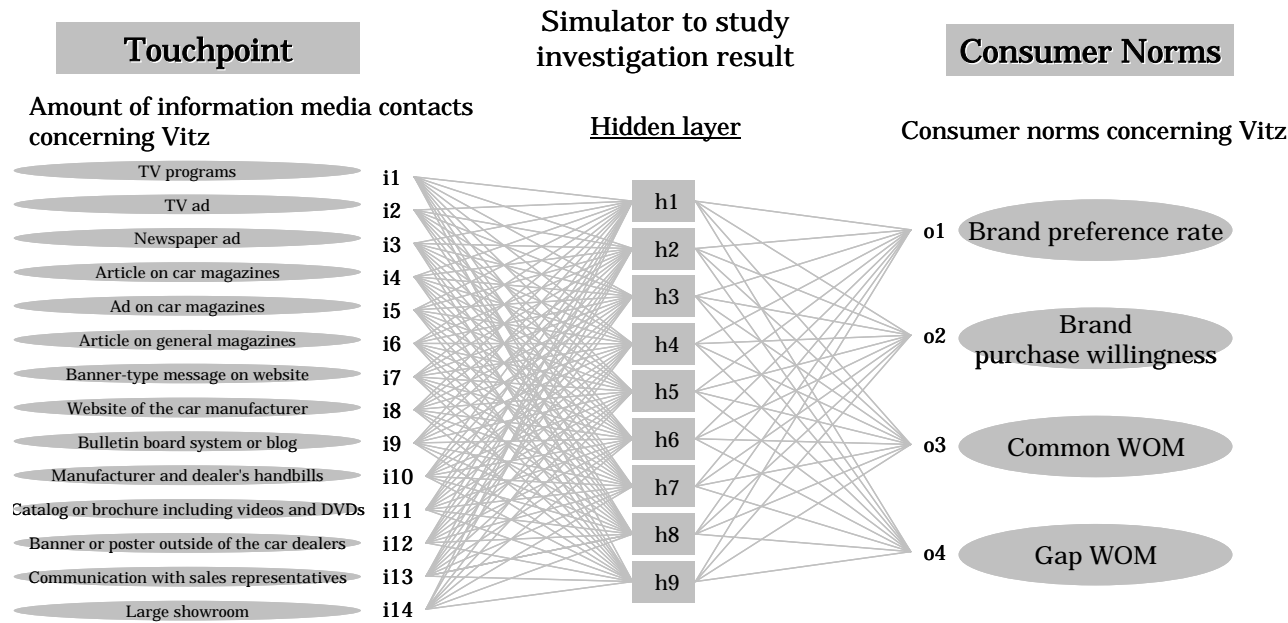*Simulation Model Using an Artificial Neural Network System*

To simulate complicated correlations among various media and consumer norms, we used an artificial neural network system. An artificial neural network (ANN) is an interconnected group of artificial neurons that uses a mathematical model or computational model for information processing.

In most cases an ANN is an adaptive system that changes its structure based on external or internal information flowing through the network; thus, it realizes non-linear statistical data modeling. In this research, we used a "feedforward-type" ANN, an acyclic model, with 14 input variables, 4 output variables, and 9 variables in one hidden layer, shown in Figure 1.

To utilize this simulation model, we need to define inputs and outputs referring the Japanese consumer media environment. Based on the empirical consumer survey, we chose 14 media touchpoints as the input variables. Also, we settled 4 elements as the output variables that consist of consumer preference rate, purchase willingness rate, gap WOM experience rate, and common WOM experience rate.

To adapt the simulation model into the practical environment, we trained a lot of simulators by inputting all survey data and compared each simulator's outputs with the actual numbers of 4 elements obtained through the same survey. If a simulator outputs relatively close to the actual numbers, we can consider that the simulator works well. However, many simulators could not precisely simulate the actual results. Simulators suffer the path dependence effects of the training process and over-fitting phenomenon of the ANN. It is a well-known weak point of ANN system. Therefore, in this research we built more than 100 simulators and chose the best fitted simulator, referring the fitness level to the actual output numbers. The result of the simulation should examine our hypothesis H 3.

Figure 1: Structure of Artificial Neural Network System

Touchpoint	Simulator to study investigation result	Consumer Norms

Amount of information media contacts concerning Vitz

Hidden layer

Consumer norms concerning Vitz

TV programs — i1
TV ad — i2
Newspaper ad — i3
Article on car magazines — i4
Ad on car magazines — i5
Article on general magazines — i6
Banner-type message on website — i7
Website of the car manufacturer — i8
Bulletin board system or blog — i9
Manufacturer and dealer's handbills — i10
Catalog or brochure including videos and DVDs — i11
Banner or poster outside of the car dealers — i12
Communication with sales representatives — i13
Large showroom — i14

h1
h2
h3
h4
h5
h6
h7
h8
h9

o1 Brand preference rate
o2 Brand purchase willingness
o3 Common WOM
o4 Gap WOM

5. Result

Analysis for Empirical Consumer Survey

Here, we only used the empirical data regarding *Toyota Vitz,* because *Vitz* is the most successful compact automobile product in Japan and the data seem to represent the general tendencies of the Japanese automobile marketing practices.

TABLE 1

Key Statistics

	%	Correlation Coefficient	Men	Average Age
Total			50.0%	41.1
WOM$_{advice}$	38.5%	0.2107	66.0%	43.9
WOM$_{vitz}$	29.7%		47.5%	42.4

In order to examine H1 and H2, the following logit regression model is estimated:

Gap WOM:

$$\text{Probability of WOM}_{advice} = \frac{e^{(CONSTANT + \sum a_n TOUCHPOINT_n)}}{(1 + e^{(CONSTANT + \sum a_n TOUCHPOINT_n)})} \qquad (1)$$

Common WOM:

$$\text{Probability of WOM}_{vitz} = \frac{e^{(CONSTANT + \sum a_n TOUCHPOINT_n)}}{(1 + e^{(CONSTANT + \sum a_n TOUCHPOINT_n)})} \qquad (2)$$

where e is the natural logarithm base, a_n is coefficient, and touchpoint$_n$ is a dummy variable (1 = a person paid attention to the car's information of the touchpoint).

Table 3 and 4 report the regression results. Model I to III consist of touchpoints of mass media, IV those of the Internet media, and V those of dealer activities. Coefficients of several touchpoints are significant, while others are not. Joint tests of Model I to V show that the occurrence of WOM behavior is influenced by touchpoints of mass media, the Internet media, and dealer activities respectively. As to common WOM analysis, while CMAGAD is significant in model II, it becomes insignificant in model III. To examine each touch point's robustness, especially to avoid the

omitted variable bias, model VI and VII were built both for gap WOM and common WOM. Model VII shows robust touchpoints.

In order to examine H2, the marginal effects of each touchpoint on the probability of WOM_{advice} and WOM_{vitz} were tested and we compared model VII of WOM_{advice} and that of WOM_{vitz} (Table 5 and 6). According to the result of each model VII, seven touchpoints are robust in both models. TVAD, which can reach the largest number of people at a time, has significant effect on the probability of WOM_{vitz}, while it doesn't on the probability of WOM_{advice}. From this result, we conclude that common WOM can be amplified by touchpoints reaching a majority of people at a time.

On the other hand, coefficients of CMAGAD and BBSBLOG are significant in WOM_{advice} model VII, while not in WOM_{vitz} model VII. Moreover, the marginal effect of CMAGAR, which usually contains a lot of automobile information, has the largest effect. Since car magazines are targeted media and bulletin board systems or blogs have relatively narrow reach, this result may show that touchpoints with a lot of information but relatively narrow reach can give information advantages; thus, gap WOM can be amplified by these touchpoints.

These results imply that our hypothesis H1 and H2 are supported. According to the analyses result, we observe significant correlations between viewership or readership and the emergence of each WOM. It means that WOM can be controlled at a certain degree by orchestrating consumers' media environment. And we also observed clear contrast of emergence pattern between gap WOM and common WOM. It strongly implies that gap WOM and common WOM is qualitatively different from each other.

TABLE 2

List of Variables (Touchpoints) Used in the Analyses and their contact ratios

Variable Name	Meaning	%
TVPRO	Information on TV programs	7.8
TVAD	TV ad	40.4
NPAR	Article on newspaper	6.3
NPAD	Newspaper ad	11.4
CMAGAR	Article on car magazines	7.0
CMAGAD	Ad on car magazines	2.4
MAGAR	Article on general magazines	4.5
MAGAD	Ad on general magazines	4.3
RDAD	Ad on radio	1.3
BANWEB	Banner ad on websites	2.1
WEBMAN	Website of the car manufacturer	10.9
BBSBLOG	Bulletin board system or blog	2.8
FLIER	Flier of the car manufacturer or the car dealers	8.4
DM	Direct mail from the car manufacturer or the car dealers	2.1
CARDIS	Car displayed at the car dealers	4.3
CATALOG	Catalog or brochure including videos or DVDs	3.5
POSOUT	Banner or poster outside of the car dealers	3.2
POSIN	Poster or video clip inside of the car dealers	1.3
SALESREP	Communication with sales representatives	3.2
TDRI	Test drive	2.9
SHOW	Large showroom	1.6

TABLE 3

Gap WOM Logit Regression Results: The coefficients of touchpoints

	Model I	Model II	Model III	Model IV	Model V	Model VI	Model VII
TVPRO			0.5533 **			0.4813 **	0.4621 **
TVAD	0.0696	0.0560	0.0600			-0.0154	
NPAR			0.1039			-0.1274	
NPAD	0.5663 **	0.5166 **	0.4451 **			0.3516 **	0.3753 **
CMAGAR			1.6527 **			1.4862 **	1.4844 **
CMAGAD		1.7351 **	1.2097 **			0.9759 **	0.9574 **
MAGAR			0.5721 **			0.4740 *	0.5005 **
MAGAD		0.0831	-0.1305			-0.3388	
RDAD		0.6718	0.6211			0.6843	
BANWEB				-0.0417		-0.4397	
WEBMAN				0.9954 **		0.6828 **	0.6533 **
BBSBLOG				1.2206 **		0.7899 **	0.7815 **
FLIER					0.5325 **	0.2353	
DM					0.4838	0.4408	
CARDIS					0.5004 **	0.1002	
CATALOG					0.2725	-0.2170	
POSOUT					0.1574	0.1775	
POSIN					0.2247	0.2070	
SALESREP					0.6876 **	0.7105 **	0.7487 **
TDRI					0.2657	0.0260	
SHOW					1.0919 **	1.0660 **	1.0601 **
Constant	-0.5490 **	-0.5889 **	-0.7458 **	-0.5981 **	-0.5956 **	-0.8137 **	-0.8057 **
Log Likelihood	-1348.0	-1331.1	-1282.5	-1320.2	-1327.9	-1257.5	-1262.5
Joint Test	**	**	**	**	**	-	-

** P < .05, * P < .10

TABLE 4

Common WOM Logit Regression Results: The coefficients of touchpoints

	Model I	Model II	Model III	Model IV	Model V	Model VI	Model VII
TVPRO			0.9586 **			0.7824 **	0.8356 **
TVAD	0.7964 **	0.7744 **	0.7830 **			0.6555 **	0.6916 **
NPAR			0.1669			-0.1834	
NPAD	0.7692 **	0.6800 **	0.5850 **			0.4317 **	0.4996 **
CMAGAR			0.8001 **			0.4433 **	0.5693 **
CMAGAD		0.9354 **	0.3944			0.1806	
MAGAR			0.7768 **			0.6329 **	0.7421 **
MAGAD		0.7316 **	0.5148 **			0.1383	
RDAD		-0.1388	-0.3265			-0.4359	
BANWEB				3.4900 **		0.6217 *	
WEBMAN				8.3700 **		0.8194 **	0.8678 **
BBSBLOG				2.8200 **		0.5593 *	
FLIER					0.7390 **	0.2577	
DM					0.3085	0.3157	
CARDIS					0.7584 **	0.3658	
CATALOG					1.1988 **	0.8274 **	0.9092 **
POSOUT					0.9928 **	0.7701 **	0.8206 **
POSIN					0.4367	0.3590	
SALESREP					0.8472 **	0.8405 **	1.0755 **
TDRI					0.4766	0.3383	
SHOW					1.7719 **	1.6845 **	1.7382 **
Constant	-1.3131 **	-1.3499 **	-1.5100 **	-19.6200 **	-1.1297 **	-1.6386 **	-1.6180 **
Log Likelihood	-1183.4	-1172.5	-1138.5	-1183.8	-1161.4	-1089.2	-1096.5
Joint Test	**	**	**	**	**	-	-

TABLE 5

The Marignal Effects of Touchpoints on the Probability of WOM$_{advice}$

	Model I	Model II	Model III	Model IV	Model V	Model VI	Model VII
TVPRO			13.6%**			11.8%**	11.3%**
TVAD	1.7%	1.3%	1.4%			-0.4%	
NPAR			2.5%			-3.0%	
NPAD	13.9%**	12.6%**	10.9%**			8.6%**	9.2%**
CMAGAR			38.6%**			35.2%**	35.2%**
CMAGAD		39.7%**	29.2%**			23.9%**	23.5%**
MAGAR			14.1%**			11.6%*	12.3%**
MAGAD		2.0%	-3.1%			-7.7%	
RDAD		16.6%	15.3%			16.9%	
BANWEB				-1.0%		-9.9%	
WEBMAN				24.4%**		16.8%**	16.0%**
BBSBLOG				29.5%**		19.5%**	19.3%**
FLIER					13.1%**	5.7%	
DM					11.9%	10.8%	
CARDIS					12.3%**	2.4%	
CATALOG					6.6%	-5.0%	
POSOUT					3.8%	4.3%	
POSIN					5.4%	5.0%	
SALESREP					17.0%**	17.5%**	18.5%**
TDRI					6.5%	0.6%	
SHOW					26.6%**	26.0%**	25.9%**

** P < .05, * P < .10

TABLE 6

The Marignal Effects of Touchpoints on the Probability of WOM$_{vtz}$

	Model I	Model II	Model III	Model IV	Model V	Model VI	Model VII
TVPRO			22.1%**			17.7%**	19.0%**
TVAD	16.7%**	16.2%**	16.3%**			13.6%**	14.4%**
NPAR			3.5%			-3.6%	
NPAD	17.4%**	15.2%**	12.9%**			9.3%**	10.9%**
CMAGAR			18.2%**			9.7%**	12.6%**
CMAGAD		21.8%**	8.6%			3.8%	
MAGAR			17.8%**			14.2%**	16.9%**
MAGAD		16.7%**	11.4%*			2.9%	
RDAD		-2.8%	-6.2%			-8.0%	
BANWEB				27.3%**		14.0%	
WEBMAN				29.2%**		18.5%**	19.7%**
BBSBLOG				19.3%**		12.5%	
FLIER					16.9%**	5.5%	
DM					6.8%	6.8%	
CARDIS					17.5%**	7.9%	
CATALOG					28.4%**	19.0%**	21.0%**
POSOUT					23.4%**	17.6%**	18.9%**
POSIN					9.8%	7.8%	
SALESREP					19.7%**	19.4%**	25.2%**
TDRI					10.7%	7.3%	
SHOW					41.6%**	39.7%**	40.8%**

** P < .05, * P < .10

Simulations by an Artificial Neural Network System

Next, a series of ANN simulations was conducted by examining the best simulators. The simulation results are shown in Table 7 and Table 8, which indicate the simulation result summary about dynamic relations between the consumer norms and each of WOM, when the amount of information on touchpoint increases.

The purpose of these simulations was to explore dynamic correlation patterns between two types of WOM and consumer norms. We found that the consumer preference rates and purchase willingness rates usually follows the emergence rate of common WOM whenever consumer's viewership or readership changes. A typical example of dynamic relations between the consumer norms and common WOM is shown in Figure 2. It means amplifying common WOM regarding one product can increase its brand assets. In that case, conventional mass media communication efficiently works by accelerating the amplification of common WOM.

Conversely, regarding gap WOM, consumer's preference rate and purchase willingness rate do not follow its tendency when viewership or readership changes. In some cases, they look to move to the other way around. A typical conflicting relation is shown in Figure 3. It means gap WOM may even decrease the brand assets when marketing practitioners try to utilize gap WOM as a marketing tool. Probably, it is because that gap WOM includes some critics from knowledgeable consumers and is also influential to other mass consumers. We have also found that the increase of CMAGAD, BBSBLOG, and SHOW touchpoints can amplify gap WOM, while the increase of BANWEB, CATALOG, SALESREP touchpoints tend to decrease it. CMAGAR can stimulate gap WOM even though the result seems to be uncontrollable.

In these simulations we could not find any general pattern of dynamic correlation between gap WOM and typical mass media ad, such as TVPRO, TVAD, and NPAD. It means that, contrastively to common WOM, gap WOM should be considered as a relatively "external" element from the viewpoint of marketing practitioners. Thus, we should say our hypothesis H3 is not fully supported.

TABLE 7   Simulation result summary 1

	Comparison of change direction between consumer norms and common WOM	Comparison of change direction between consumer norms and gap WOM
1.TV program	same	different
2.TV ad	same	different
3.Nwespaper ad	same	same
4. Article on car magazines	same	same
5. Ad on car magazines	same	same
6. Article on general magazines	same	different
7. Banner-type message on website	same	different
8. Website of the car manufacturer	same	different
9. Bulletin board system or blog	same	same
10. Manufacturer and dealer's handbills	same	same
11. Catalog or brochure including videos and D	same	same
12. Banner or poster outside of the car dealer	same	same
13. Communication with sales representatives	same	same
14. Large showroom	same	same

TABLE 8 Simulation result summary 2

1.TV program

	0	0.2	0.4	0.6	0.8	1
Vitz preference	0.0%	-0.1%	-0.1%	-0.1%	0.2%	5.6%
Vitz purchase willingness	0.0%	-0.2%	-0.2%	-0.3%	-0.1%	4.0%
Vitz common WOM	0.0%	1.5%	3.0%	4.6%	6.2%	7.5%
Vitz gap WOM	0.0%	-7.8%	-15.8%	-23.9%	-30.5%	-10.8%

2.TV ad

	0	0.2	0.4	0.6	0.8	1
Vitz preference	0.0%	0.0%	0.0%	-0.2%	-0.4%	-0.6%
Vitz purchase willingness	0.0%	0.1%	0.2%	0.2%	0.2%	0.0%
Vitz common WOM	0.0%	0.3%	0.7%	0.9%	1.2%	1.4%
Vitz gap WOM	0.0%	-3.6%	-7.1%	-10.6%	-14.0%	-17.4%

3.Nwespaper ad

	0	0.2	0.4	0.6	0.8	1
Vitz preference	0.0%	0.7%	1.4%	2.1%	2.7%	3.3%
Vitz purchase willingness	0.0%	0.5%	1.0%	1.4%	1.8%	2.2%
Vitz common WOM	0.0%	0.2%	0.5%	0.7%	0.9%	1.2%
Vitz gap WOM	0.0%	0.4%	0.7%	0.8%	0.9%	0.9%

4. Article on car magazines

	0	0.2	0.4	0.6	0.8	1
Vitz preference	0.0%	5.7%	11.3%	16.5%	21.3%	25.7%
Vitz purchase willingness	0.0%	4.1%	8.0%	11.8%	15.3%	18.6%
Vitz common WOM	0.0%	1.0%	1.9%	2.8%	3.7%	4.7%
Vitz gap WOM	0.0%	12.0%	23.7%	34.4%	43.5%	50.2%

5. Ad on car magazines

	0	0.2	0.4	0.6	0.8	1
Vitz preference	0.0%	2.2%	4.4%	6.6%	8.8%	10.9%
Vitz purchase willingness	0.0%	1.7%	3.3%	5.0%	6.7%	8.3%
Vitz common WOM	0.0%	0.5%	1.1%	1.6%	2.1%	2.6%
Vitz gap WOM	0.0%	2.8%	5.6%	8.5%	11.3%	14.1%

6. Article on general magazines

	0	0.2	0.4	0.6	0.8	1
Vitz preference	0.0%	-0.2%	-0.4%	-0.7%	-1.0%	-1.3%
Vitz purchase willingness	0.0%	-0.1%	-0.3%	-0.5%	-0.7%	-0.9%
Vitz common WOM	0.0%	-0.7%	-1.3%	-2.0%	-2.7%	-3.4%
Vitz gap WOM	0.0%	2.2%	4.4%	6.7%	8.9%	11.0%

7. Banner-type message on website

	0	0.2	0.4	0.6	0.8	1
Vitz preference	0.0%	0.7%	1.9%	4.9%	12.0%	23.1%
Vitz purchase willingness	0.0%	0.6%	1.6%	4.2%	10.6%	20.7%
Vitz common WOM	0.0%	0.8%	1.9%	3.9%	8.0%	14.2%
Vitz gap WOM	0.0%	-3.1%	-6.9%	-12.7%	-23.1%	-38.8%

8. Website of the car manufacturer

	0	0.2	0.4	0.6	0.8	1
Vitz preference	0.0%	1.5%	2.6%	3.4%	3.8%	3.8%
Vitz purchase willingness	0.0%	1.0%	1.7%	2.2%	2.3%	2.1%
Vitz common WOM	0.0%	0.1%	0.2%	0.1%	-0.1%	-0.4%
Vitz gap WOM	0.0%	2.7%	5.3%	7.6%	9.6%	11.5%

9. Bulletin board system or blog

	0	0.2	0.4	0.6	0.8	1
Vitz preference	0.0%	6.9%	14.1%	22.3%	33.6%	48.0%
Vitz purchase willingness	0.0%	4.8%	10.0%	16.2%	25.5%	37.8%
Vitz common WOM	0.0%	1.2%	2.6%	4.7%	8.9%	15.0%
Vitz gap WOM	0.0%	17.7%	34.4%	47.1%	52.5%	49.8%

10. Manufacturer and dealer's handbills

	0	0.2	0.4	0.6	0.8	1
Vitz preference	0.0%	-0.4%	-0.8%	-1.2%	-1.7%	-2.3%
Vitz purchase willingness	0.0%	-0.4%	-0.8%	-1.2%	-1.7%	-2.3%
Vitz common WOM	0.0%	0.3%	0.6%	0.9%	1.2%	1.4%
Vitz gap WOM	0.0%	-0.4%	-0.8%	-1.2%	-1.7%	-2.1%

11. Catalog or brochure including videos and DVDs

	0	0.2	0.4	0.6	0.8	1
Vitz preference	0.0%	-2.9%	-5.7%	-8.3%	-10.8%	-13.1%
Vitz purchase willingness	0.0%	-2.0%	-3.9%	-5.7%	-7.4%	-8.9%
Vitz common WOM	0.0%	-1.1%	-2.2%	-3.3%	-4.3%	-5.4%
Vitz gap WOM	0.0%	-5.1%	-9.8%	-14.0%	-17.7%	-20.8%

12. Banner or poster outside of the car dealers

	0	0.2	0.4	0.6	0.8	1
Vitz preference	0.0%	0.6%	1.2%	1.8%	2.4%	2.9%
Vitz purchase willingness	0.0%	0.4%	0.9%	1.3%	1.7%	2.1%
Vitz common WOM	0.0%	0.3%	0.7%	1.0%	1.4%	1.7%
Vitz gap WOM	0.0%	-0.7%	-1.5%	-2.3%	-3.2%	-4.1%

13. Communication with sales representatives

	0	0.2	0.4	0.6	0.8	1
Vitz preference	0.0%	-2.9%	-5.5%	-6.9%	-5.8%	-0.4%
Vitz purchase willingness	0.0%	-2.1%	-3.8%	-4.6%	-3.1%	2.2%
Vitz common WOM	0.0%	-0.8%	-1.5%	-1.5%	-0.4%	2.8%
Vitz gap WOM	0.0%	-4.1%	-8.4%	-13.4%	-20.6%	-31.4%

14. Large showroom

	0	0.2	0.4	0.6	0.8	1
Vitz preference	0.0%	2.3%	4.6%	6.8%	9.0%	11.1%
Vitz purchase willingness	0.0%	1.6%	3.1%	4.7%	6.2%	7.6%
Vitz common WOM	0.0%	0.8%	1.5%	2.3%	3.0%	3.7%
Vitz gap WOM	0.0%	3.8%	7.6%	11.3%	14.9%	18.2%

Figure 2: Typical results of common WOM

*Horizontal axis　Standard deviation of the amount of information on touchpoint
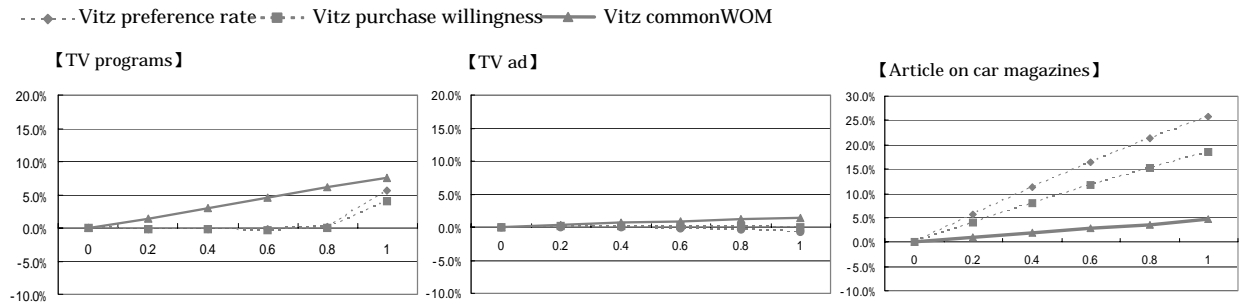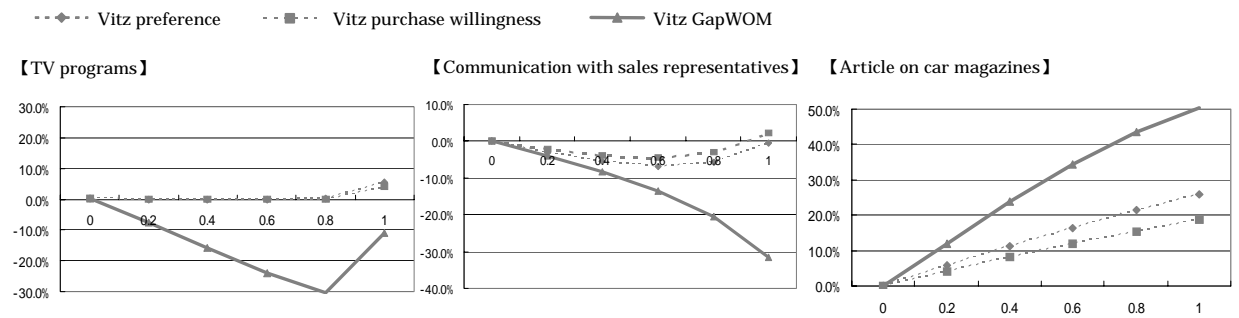

Figure 3: Typical results of gap WOM

*Horizontal axis　Standard deviation of the amount of information on touchpoint

6. Conclusion, Further Discussion, and Limitation

Supposing that the emergence of WOM among consumers can be utilized as a part of marketing techniques, even WOM can be an indirect element for marketing practitioners. We made three hypotheses to examine if WOM could be manipulated by other media effects. To explain these hypotheses, we conducted an empirical survey for Japanese consumers, and analyzed the results by multinomial logit regression analysis and ANN dynamic simulation. We reached the conclusion that the occurrence of WOM can be amplified by marketing communications and that gap WOM is qualitatively different from common WOM in relationship with marketing communications (H1 and H2). However, H3, which suggests the possibility of creating a robust framework to manipulate WOM as a new marketing medium that can generate particular consumer norms as intended, was not fully supported.

Summing up, we assume that amplifying common WOM can be a part of marketing strategy because it controllably accelerates positive consumer norms when marketing practitioners manipulate media touchpoints. However, we should be also noticed that gap WOM looks a "double-edged sword" in marketing planning. Even though gap WOM can be a new element to generate consumer's recommendation behaviors besides conventional advertising, it also looks uncontrollable and it may sometimes work to decrease positive consumer norms. Our result suggests that the gap WOM behaviors can explain the "influencer" effects that should be separated from conventional mass marketing. Further discussions and researches are necessary to explore detailed relations between consumer norms, gap WOM behaviors, and "influencer" effects, when other media touchpoints are dynamically controlled. We can assume the possibility of "brand-based gap WOM" as a liner extension of this research. The concept of "brand-based gap WOM" may be an important clue to fill the vacuum between consumer norms and "influencer" effects.

Our research focuses only on Japanese consumers' automobile purchase behaviors, and there is a limitation to adopt the results into other areas or other product categories. Media environment in one country is strongly affected by political, cultural, and technological aspects of that country, and WOM also exists in consumer's daily life. We must consider those externalities even if a part of WOM can be considered as the internal element of the media and marketing business.

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Appendix 1: Design of the Empirical Consumer Survey

Survey name: *Diffusion Dynamics Survey 2006 – automobile (DD 2006-auto)*

Survey location and the effective sample populations: the all over Japan, 2060 samples

Respondents: ordinary individual men and women living, in Japan and owning a driving license, aged 18-69

Sampling procedure: internet consumer survey panels, provided by a professional survey company, were used.

Response result: 19000 of calls for the survey are done and 9428 accesses are recognized (total access rate was 49.6%). The 6572 effective responses are collected, while 2856 incomplete or inappropriate responses are eliminated (total response rate was 69.7%). According to the distribution setting by age and gender, 2060 samples are randomly selected in the effective responses.

Distribution of samples among age and gender groups: 20.0% of aged 18-29, 30-39, 40-49, 50-59, and 60-69. Male: Female rate is 1: 1

Survey date: Sep. 1, to 2, 2006

Appendix 2: Design of the Simulation System

Simulator name: *WOM simulator 2006- compact automobile*

Computational framework: Feedfoward-type artificial neural network

Parameters: *Refer to the Figure 1.

14 inputs: i1: TV program, i2: TV ad, i3: Newspaper ad, i4: Article on car magazine, i5: Ad on car magazine, i6: Article on general magazine, i7: Banner-type message on website, i8: Website of the car manufacturers, i9: Bulletin board system or blog, i10: Manufacturer and dealer's handbills, i11: Catalog or brochure including videos or DVDs, i12: Banner or poster outside of the car dealers, i13: Communication with sales representatives, i14: Large showroom,

4 outputs: o1: Brand preference rate, o2: Brand purchase willingness rate, o3: Common WOM emergence rate, o4: Gap WOM emergence rate

(9 nodes in the hidden layer)

Training procedure and fitness measurement: For each simulator all of 2110 samples' touchpoint data was inputted 50 times. The inputting order was randomly changed for every simulator. By inputting the touchpoint data, weight values for each node and link were calculated by JMP version 5.1.1 Japanese edition. After the calculation, the

outputs of the simulation were compared with the actual average values in all 2110 samples.

Simulation and observation procedure: The normalized viewership or

readership rates were virtually increased by the step of 0.2 SD in the input section of the

simulator, and the simulative transition of each output parameter was recorded.

Calculated weights for each link and node:

h1:-8.649293106, h2:25.23434907, h3:6.138590615, h4:-0.610247226,

h5:-0.323728432, h6:-0.427440759, h7:1.534185176, h8:0.556244997,

h9:-16.78399273

h1-i1: -2.764873581, h1-i2: 0.847965198, h1-i3: -8.433782048,

h1-i4: 4.294802199, h1-i5: 2.658524601, h1-i6:1.299323516,

h1-i7: 5.116079257, h1-i8: -2.721219327, h1-i9: 4.694507411,

h1-i10: -0.212684018, h1-i11: -0.140774266, h1-i12: -4.565609454,

h1-i13: 0.840124253, h1-i14: -1.129013908

h2-i1: -17.3353257, h2:-i2:-15.84694596, h2-i3: 2.837886918,

h2-i4:   7.978193525, h2-i5: -0.85161159, h2-i6: 7.569300193,

h2-i7: -0.895347768, h2-i8: 17.39653552, h2-i9: -0.79247069,

h2-i10: -10.66108767, h2-i11: 10.25145051, h2-i12: -2.351795642, h2-i13: -6.398295101,

h2-i14: -10.59725151

h3-i1:6.209285541, h3-i2:1.535498302, h3-i3:14.98752557,

h3-i4: -3.63722472, h3-i5: 1.962664004, h3-i6: -1.363758984,

h3-i7: -6.488008785, h3-i8: 2.911923456, h3-i9: -6.503851375,

h3-i10: -1.244656782, h3-i11: 2.678518512, h3-i12: 7.315115038, h3-i13: -5.571682461,

h3-i14: 2.160783184

h4-i1: 0.070781776, h4-i2: -0.301795186, h4-i3: 462280533,

h4-i4: 0.123105494, h4-i5: -0.073613488, h4-i6: 0.320876304,

h4-i7: 0.223029663, h4-i8: 0.30745616, h4-i9: -0.294605875,

h4-i10: -0.445598923, h4-i11: 0.435873541, h4-i12: 0.133507934, h4-i13: -0.477885577,

h4-i14: -0.012832247

h5-i1: 0.257622595, h5-i2: -0.558612275, h5-i3: 0.425006866,

h5-i4: 1.600231222, h5-i5: 0.245124874, h5-i6: -0.00223633,

h5-i7: 0.164862435, h5-i8: 0.562870901, h5-i9: 2.220262718,

h5-i10: 0.177646432, h5-i11: -1.011250055, h5-i12: 0.142659523, h5-i13: -1.043954992,

h5-i14: 0.847573271

h6-i1: -0.05100134, h6-i2: 0.016645304, h6-i3: 0.226224091,

h6-i4: 0.246450433, h6-i5: 0.032936806, h6-i6: 0.18724231,

h6-i7: 0.073067288, h6-i8: 0.338023343, h6-i9: -0.155599412,

h6-i10: -0.32534727, h6-i11: 0.219556544, h6-i12: 0.118170082, h6-i13: -0.240922447,

h6-i14: 0.015576763

h7-i1: -0.083412196, h7-i2: -0.27230324, h7-i3: -0.150234463,

h7-i4: -0.549678535, h7-i5: -0.003908296, h7-i6: -0.076335676,

h7-i7: 0.01350723, h7-i8: -0.688879904, h7-i9: 0.001805984,

h7-i10: 0.19486397, h7-i11: 0.078042718, h7-i12: -0.196397749, h7-i13: 0.152598599,

h7-i14: -0.196620886

h8-1: -0.67448801, h8-i2: -0.065246403, h8:i3: -0.487249629,

h8-i4: -0.383781262, h8-i5: -0.029310298, h8-i6: -0.043571365,

h8-i7: -0.412121122, h8-i8: -0.567315707, h8-i9: 0.265439172,

h8-i10: 0.313284806, h8-i11: -0.078970069, h8-i12: -0.308333624, h8-i13: 0.618270141,

h8-i14: -0.235342865

h9-i1: 15.99669508, h9-i2: -2.032211119, h9-i3: -3.430074343,

h9-i4: 5.322125358, h9-i5: -5.522750614, h9-i6: -7.433493318,

h9-i7: 9.733180324, h9-i8: 0.869268153, h9-i9: 1.367816283,

h9-i10: 4.666081225, h9-i11: -9.11010392, h9-i12: 1.175672573, h9-i13: 10.8286161,

h9-i14: -3.612790877

o1:-6.910834416, o2:-6.688377955, o3:-1.292653066, o4:-4.18395289

o1-h1: -1.97396254, o1-h2: 0.356749992, o1-h3: -1.135759525,

o1-h4:-6.85778583, o1-h5: 1.906895591, o1-h6: 11.92907387,

o1-h7: 6.710753268, o1-h8: -1.319699343, o1-h9: 0.536451554

o2-h1: -1.862562194, o2-h2: 0.372950526, o2-h3: -1.245588015,

o2-h4: -6.612387885, o2-h5: 1.637665782, o2-h6: 11.62829926,

o2-h7: 6.625699149, o2-h8: -1.309768511, o2-h9: 0.507695597

o3-h1: -0.750335167, o3-h2: 1.194663169, o3-h3: -0.723754301,

o3-h4: -2.875548485, o3-h5: 0.412649159, o3-h6: 2.079294936,

o3-h7: 2.879973172, o3-h8: -2.302507755, o3-h9: -0.036882846

o4-h1: -0.363072098, o4-h2: -0.537902069, o4-h3: 0.372010422,

o4-h4: -1.205894981, o4-h5: 1.500135366, o4-h6: 5.174629901,

o4-h7: 0.921588989, o4-h8: 2.370875214, o4-h9: 0.910489658

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