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경영학석사 학위논문

Direct and Indirect Cross-channel
Advertising Effect through
Word-of-mouth

매출에 대한 광고의 직접 및 입소문을 통한 간접 효과

2022년 2월

서울대학교 대학원
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Direct and Indirect Cross-channel Advertising Effect through Word-of-mouth

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이 논문을 경영학석사 학위논문으로 제출함
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Abstract

Many companies sell and advertise products through various channels. To precisely understand the effectiveness of each advertising, it is crucial to understand how advertising in one channel influences sales in the same type of channel (own-channel effect) and other channels (cross-channel effect). Advertising can also indirectly influence sales by online word-of-mouth (WOM). This research develops sales and WOM models to examine how online (e.g., banner, video) and traditional advertising (e.g., TV) affect sales in online and offline channels (e.g., brand store, mart, door-to-door sales).

This research on a product of cosmetics brand in Korea finds that both own and cross-channel effects exist in most channels. The magnitude is different across channels, but both types of channels receive a larger impact from online advertising. Yet, for certain channels like door-to-door channel, the effect of online advertising or synergy are insignificant. This research also measures the mediating effect of WOM. Advertising has a positive impact on WOM, while WOM also increases sales. Online has a larger effect on WOM than TV. In addition, this study finds negative interaction between two advertisements from most channels. Promotion has a positive effect especially on offline channels and door-to-door sales channel has the largest impact. On the other hand, promotion has an insignificant effect on online sales and WOM. This study also measures the return on investment (ROI) of each advertisement and finds that for the focal brand, both advertisings have similar negative ROIs. In the long term, online advertising has a much bigger ROI.

Based on these findings, this research provides managerial implications for marketing managers. This research suggests that it is crucial to consider both own

and cross-channel advertising effects when allocating advertising expenditure. It also highlights the importance of considering the indirect effect of WOM. Moreover, the findings suggest that managers should be careful about overusing marketing communication tools like advertising and promotion.

Keywords : advertising, cross-channel, word-of-mouth, synergy, promotion

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Table of Contents

Chapter 1. Introduction	1
Chapter 2. Literature Review	3
2.1. Advertising effect on sales	
2.2. Effect of WOM on sales	
2.3. Advertising effect on WOM	
2.4. Indirect advertising effect through WOM	
2.5. Effect of promotion on WOM	
Chapter 3. Conceptual Framework.....	7
Chapter 4. Model	8
4.1. Data description	
4.2. Model description	
Chapter 5. Results	11
5.1. Adstock variables	
5.2. Sales model	
5.3. WOM model	
5.4. Total elasticities and ROI	
5.5. Comparison with benchmark models	
5.6. Robustness check	
Chapter 6. Discussion	22
6.1. Summary of findings	
6.2. Managerial implications	
6.3. Limitations and future research	
References	25
Appendix.....	29
Abstract in Korean.....	31

Tables

[Table 1] Advertising Carryover Coefficients	12
[Table 2] Sales Model Results.....	13
[Table 3] WOM Model Result	14
[Table 4] Total Long-term Advertising Elasticities	16
[Table 5] Total Short-term Advertising Elasticities.....	17
[Table 6] ROI	18
[Table 7] Comparison with Total Long-term Advertising Elasticities of Benchmark Models.....	19
[Table 8] ROI of Benchmark Models	20
[Table 9] Model Results with TV Ad Interpolation.....	21
[Table 10] Comparison of Adjusted R-Square.....	22

Figure

[Figure 1] Conceptual Framework.....	7
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Chapter 1. Introduction

Over the last few years, many companies started to sell products through multiple channels. With the dramatic growth of the online market, brick-and-mortar stores have been establishing online channels. Especially after COVID-19, this trend towards online has accelerated and e-commerce sales increased significantly (Forbes, 2020; eMarketer, 2021). On the other hand, online brands began to open physical stores to increase consumer experience and brand touchpoints. For example, Amazon opened grocery, convenience stores, and bookstores (eMarketer, 2021).

Retailers are also using various types of advertisements to promote their products. The two major types are online advertising (e.g., online banner, video, paid search) and traditional advertising (e.g., TV, radio, catalog, newspaper, print). Online or digital ad spending has grown quickly over the past years and new digital forms have constantly appeared (eMarketer, 2021; Statista, 2021). Nevertheless, many companies still rely on traditional advertising and consider it as an effective advertising form (Forbes, 2019).

For multi-channel retailers that rely on numerous advertisements, it is important to understand how different types of advertisements influence sales in various channels. To accurately assess the effectiveness of each advertisement, “own-channel effect” and “cross-channel effect” should be considered separately. In fact, the own-channel effect refers to online (traditional) advertising affecting online (offline) channel sales. The cross-channel effect refers to online (traditional) advertising affecting offline (online) channel sales (Lesscher et al., 2021; Dinner et al., 2014). Advertising also indirectly affects sales via word-of-mouth (WOM), which is communication among consumers that marketing managers cannot easily

control, unlike advertising expenditure. Interactions between online and traditional advertising could have an impact on both WOM and sales. Despite the importance of the integrated study on these effects, many prior studies separately examine the relationship between advertising and sales, WOM and sales, and advertising and WOM.

This research raises four questions as follows:

(1) Do own and cross-channel advertising effects exist, and what are the magnitudes?

(2) Do advertising indirectly affect sales through WOM?

(3) Are there synergy effects between online and traditional advertising?

(4) Do promotions affect sales and WOM, and what are the magnitudes of the effects?

Considering these research questions, the goal of this study is to examine how online and traditional advertising, directly and indirectly, affect sales in online and offline channels. Moreover, this research aims at measuring the impact of promotions on both sales and WOM.

To achieve these objectives, I develop models that evaluate the elasticities of different advertising and examine data from a cosmetics brand in Korea. The models include sales models for each sales channel and the WOM model that measures the impact of advertising on WOM. Cosmetic brands are unique in that there are still many sales generated by various offline channels like door-to-door sales.

There are several expected contributions of this study. First, this research provides a unified framework considering both direct and indirect advertising effects on sales through WOM. I also measure total sales elasticities and return on investment (ROI) of advertising expenditure. Therefore, the current study will be

helpful for the integrated decision-making of marketing managers. Second, this research studies the effect of advertising and promotion on WOM, which not many researchers focused on. Third, this study is expected to especially give insight into advertising and WOM's effect on sales of cosmetics brands.

Chapter 2. Literature Review

I examine the direct effect of advertising on sales, which can be found in the literature on own and cross-channel effect. A few studies also investigate the cross-media effect or synergy of advertisements. The current study investigates the indirect effect of WOM, which can be found in prior research on the impact of WOM on sales and the impact of advertising on WOM. Moreover, this research examines the impact of promotion on WOM, which not many researchers have investigated.

2.1. Advertising effect on sales

Prior research on advertising effect on sales can be classified into own and cross-channel advertising effects. First, some studies focus on the own-channel advertising effect. Many articles highlight the effect of traditional advertising. For example, catalogs significantly increase offline sales (Mark et al., 2019). Television (TV) advertisement for a hospital leads to a higher likelihood of consumer choice for the hospital (Kim and KC, 2020). In terms of online advertising, studies find that email and paid search increase online sales (Danaher et al., 2020). Based on each consumer's past online display ad impressions, managers can even increase the number of website visits or own-channel effect by varying ad contents for

individuals (Braun and Moe, 2013).

Second, some studies analyze the cross-channel advertising effect, which has recently started to gain attention from researchers. Research related to traditional advertising suggests that advertisements like catalogs increase online sales. Despite the growing popularity of online advertising, these traditional advertisements are still effective in increasing sales (Mark et al., 2019). Research on online advertising suggests that digital advertisements like email, online display advertising, paid search, increase offline sales (Danaher et al., 2020; Dinner et al., 2014).

Third, articles compare the magnitudes of own and cross-channel advertising effects. Some show that the own-channel effect is larger than the cross-channel effect (Danaher et al., 2020). Others, however, argue that cross-channel is bigger. For example, online display, paid search, and mobile banner ads have a higher impact on offline sales than traditional advertising (Dinner et al., 2014; Osinga et al., 2019).

Meanwhile, research on synergy effects between different advertisements shows inconsistent results of positive and negative interactions. Synergy is a combined effect that goes beyond the mere sum of individual effects (Schultz et al., 2012). Some studies find positive interactions. There could be a positive synergy between traditional advertisements like TV and radio on offline sales. In that way, the usage of multiple advertisements can be more effective than a single medium (Danaher and Dagger, 2013). Some studies also show that there is a positive synergy between online and traditional advertising like direct mailing and display advertising (Lesscher et al., 2021; Ewijk et al., 2021). These findings highlight the importance of integrating different advertisements (Sridhar et al., 2021).

A few studies suggest negative synergies. There could be a negative interaction between traditional advertisements like TV and radio. Online and traditional

advertisements like email and catalogs also could have negative synergy. If consumers are constantly exposed to various advertisements that show similar marketing messages, they could experience cognitive overload. This is because constant exposure can impact information processing capacity. Consequently, consumers could delay decisions, which indicates that the interaction of advertisements has a negative impact on purchase intentions (Sridhar et al., 2021).

2.2. Effect of WOM on sales

Research on the impact of WOM on sales can be categorized into studies that focus on WOM volume and valence. Volume means the total number of WOM comments like the total number of reviews about a product. Valence is the tone of messages, such as positive, negative, or neutral messages (You et al., 2015).

First, some studies analyze the effect of WOM volume on sales. Many researchers show that online WOM volume like the number of blog or community forum posts positively affects online sales (Stephan and Galak, 2012). Studies also show that the impact of volume can be time-variant. For example, the influence of online reviews on a TV show viewership can have an inverted U-shape curve. This indicates that the impact increases gradually as time goes, and then after reaching a peak, it decreases in the late part of the show's life (Cadario, 2015). A few articles find that volume does not have a significant effect on sales (Chintagunta et al., 2010; Gopinath et al., 2014).

Second, some studies investigate the effect of WOM valence on sales. Positive WOM can increase sales, while negative WOM is the opposite (Sonnier et al., 2011; Chintagunta et al., 2010). Yet, negative WOM can boost sales in some cases. For instance, negative buzz can result in higher purchase likelihood and sales of unknown products because it boosts product awareness (Berger et al., 2010). If negative

comments are considered unfair, they can also increase sales as they heighten empathy for the firm among consumers (Allard et al., 2020).

2.3. Advertising effect on WOM

Compared to prior research on the impact of WOM on sales, empirical research examining the impact of advertising on WOM is sparse. Most studies focus on the advertising effect on WOM volume. Both traditional and online advertising have a positive impact, while online advertising seems to have a slightly higher effect on online WOM (Lovett et. al, 2019; Tirunillai and Tellis 2017). A few studies suggest ad contents can have varying impacts on WOM volume. For example, information-focused content has a negative effect, but ads that induce positive emotions increase WOM (Tellis et al., 2019).

2.4. Indirect advertising effect through WOM

Only a handful of studies examined the indirect advertising effect on sales through WOM. From the initial study by Onishi and Manchanda (2012), TV advertisements and WOM, which is represented by blogs, have a positive interaction effect on movie sales. Specifically, ad boosts blog volume before the launch of a movie, but the effect decreases after the movie is released. Pauwels et al. (2016) classify online WOM based on the contents and show how they affect online and offline store traffic. The research also demonstrates the indirect advertising effect of TV, radio, and print ads through WOM on store traffic. These studies, however, do not take actual sales as their dependent variables or advertising expenditure as independent variables.

2.5. Effect of promotion on WOM

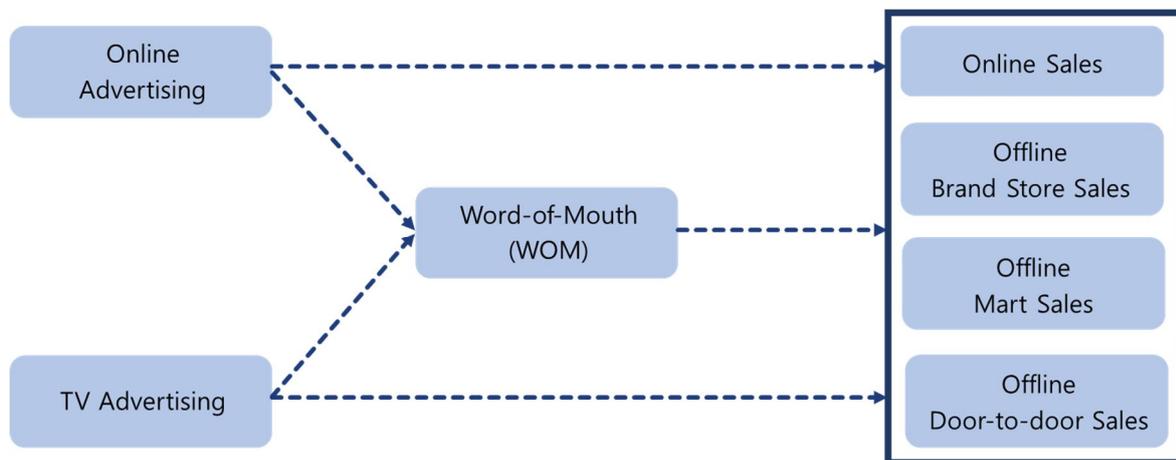
Studies analyzing the impact of promotion on WOM are scarce. Berger and

Schwartz (2011) find that the impact can vary depending on the type of promotion. For example, providing the full product or extras like brochures or stickers significantly boost WOM volume. On the other hand, free samples of products or coupons have an insignificant effect.

Chapter 3. Conceptual Framework

This research develops a framework that examines the own-channel, cross-channel, and synergy effects of online and TV advertising on online and offline channels (Figure 1). There are three different offline channels, which are brand store, mart, and door-to-door channel. Advertising directly affects sales, but also indirectly influences sales through WOM.

Figure 1 Conceptual Framework



Chapter 4. Model

4.1. Data description

I analyze data from a Korean cosmetics brand that wishes to remain anonymous. The research is particularly focused on a popular product of the retailer. With 74 weeks of data from January 2020 to May 2021, this provides observations of sales, WOM, advertising expenditure, and promotions. Price is not considered in this study since it was fixed throughout the period and the retailer did not provide price discounts for promotions.

First, the retailer has both online and offline sales data. It is daily aggregate sales for each channel. The company has diverse offline channels, which are brand store, mart, and door-to-door channels. About 6.6% of sales come from the online channel, while 34.5% is from the brand store, 19.4% from mart, and 39.4% from the door-to-door sales channel.

Second, WOM data is drawn from Synthesio, which is a company that provides social media data like WOM. It contains the total number of online mentions about the product, which was measured every seven days. To obtain daily volume, I duplicated the WOM value for the following six days.

Third, the retailer collected daily online ad expenditure and monthly traditional ad expenditure. Online advertising includes online banner and video advertising, which account for 21.8% of total ad expenditure. Traditional advertising is mostly TV ads, accounting for 78.2% of the total expenditure. The company ran a TV ad four times during the period. The longest one lasted for two months, while others were broadcasted for one month. To obtain daily expenditure, I divided the monthly

expenditure by the number of days of the month.

Fourth, the company spends monthly promotion expenditure. The data consists of promotions given to consumers who purchased the product at the three offline channels. Brand store and mart channel provide the same promotions every month. The most common type of promotion is giving away samples of different products from the same brand. There is no precise information about online promotion, but the company revealed that there is also online channel promotion expenditure. The amount is determined by multiplying daily online sales to the ratio of brand store promotion expenditure to brand store sales.

4.2. Model description

I develop sales and WOM models. Sales models capture the direct effect of independent variables (online advertising, TV advertising, interaction between ads, WOM, and promotion) on sales for each channel (online, brand store, mart, door-to-door channel). Control variables (days of the week dummy variables) are included in the models. The WOM model shows the impact of independent variables (online advertising, TV advertising, interaction between ads, and promotion) on WOM volume. It captures the indirect advertising effect. The models are all log-log models. Therefore, the coefficients of independent variables indicate elasticities.

For advertising variables, adstock variables are used instead of advertising expenditure to capture the long-term impact of ads. Online and TV adstock are calculated separately for all four sales models and the WOM model.

Sales model for each sales channel is defined as,

$$(1) \ln(\text{OnlineSales}_t + 1)$$

$$= \beta_{1,0} + \beta_{1,1}\text{OnlineAdStock}_t + \beta_{1,2}\text{TvAdStock}_t + \beta_{1,3}\text{OnlineAdStock}_t \\ * \text{TvAdStock}_t + \beta_{1,4}\ln(\text{WOM}_t) + \beta_{1,5}\ln(\text{PromotionOnline}_t + 1) \\ + \beta_{1,6}\text{DummyMon}_t + \beta_{1,7}\text{DummyTue}_t + \beta_{1,8}\text{DummyWed}_t + \beta_{1,9}\text{DummyThu}_t \\ + \beta_{1,10}\text{DummyFri}_t + \beta_{1,11}\text{DummySat}_t + u_{1,t}$$

$$(2) \ln(\text{BrandStoreSales}_t + 1)$$

$$= \beta_{2,0} + \beta_{2,1}\text{OnlineAdStock}_t + \beta_{2,2}\text{TvAdStock}_t + \beta_{2,3}\text{OnlineAdStock}_t \\ * \text{TvAdStock}_t + \beta_{2,4}\ln(\text{WOM}_t) + \beta_{2,5}\ln(\text{PromotionBrandStore}_t + 1) \\ + \beta_{2,6}\text{DummyMon}_t + \beta_{2,7}\text{DummyTue}_t + \beta_{2,8}\text{DummyWed}_t + \beta_{2,9}\text{DummyThu}_t \\ + \beta_{2,10}\text{DummyFri}_t + \beta_{2,11}\text{DummySat}_t + u_{2,t}$$

$$(3) \ln(\text{MartSales}_t + 1)$$

$$= \beta_{3,0} + \beta_{3,1}\text{OnlineAdStock}_t + \beta_{3,2}\text{TvAdStock}_t + \beta_{3,3}\text{OnlineAdStock}_t \\ * \text{TvAdStock}_t + \beta_{3,4}\ln(\text{WOM}_t) + \beta_{3,5}\ln(\text{PromotionMart}_t + 1) \\ + \beta_{3,6}\text{DummyMon}_t + \beta_{3,7}\text{DummyTue}_t + \beta_{3,8}\text{DummyWed}_t + \beta_{3,9}\text{DummyThu}_t \\ + \beta_{3,10}\text{DummyFri}_t + \beta_{3,11}\text{DummySat}_t + u_{3,t}$$

$$(4) \ln(\text{DoorSales}_t + 1)$$

$$= \beta_{4,0} + \beta_{4,1}\text{OnlineAdStock}_t + \beta_{4,2}\text{TvAdStock}_t + \beta_{4,3}\text{OnlineAdStock}_t \\ * \text{TvAdStock}_t + \beta_{4,4}\ln(\text{WOM}_t) + \beta_{4,5}\ln(\text{PromotionDoor}_t + 1) \\ + \beta_{4,6}\text{DummyMon}_t + \beta_{4,7}\text{DummyTue}_t + \beta_{4,8}\text{DummyWed}_t + \beta_{4,9}\text{DummyThu}_t \\ + \beta_{4,10}\text{DummyFri}_t + \beta_{4,11}\text{DummySat}_t + u_{4,t}$$

WOM model is defined as,

$$(5) \ln(\text{WOM}_t) = \beta_{5,0} + \beta_{5,1}\text{OnlineAdStock}_t + \beta_{5,2}\text{TvAdStock}_t + \beta_{5,3}\text{OnlineAdStock}_t \\ * \text{TvAdStock}_t + \beta_{5,4}\ln(\text{PromotionTotal}_t + 1) + u_{5,t}$$

$OnlineAdStock_t, TvAdStock_t$ are online and TV adstock at day t. $PromotionTotal_t$ is the sum of the online, brand store, mart, and door-to-door sales channel promotion expenditure. In both sales and WOM models, I presume advertising is not endogenous because the retailer notified that advertising expenditures are determined in advance and unchanged. Therefore, I can assume advertising is unrelated to error terms.

Adstock variables can be expressed as,

$$(6) \text{ } OnlineAdStock_t$$

$$= \lambda_{OnlineAd} OnlineAdStock_{t-1} + (1 - \lambda_{OnlineAd}) \ln(OnlineAdvertising_t + 1)$$

$$(7) \text{ } TvAdStock_t = \lambda_{TvAd} TvAdStock_{t-1} + (1 - \lambda_{TvAd}) \ln(TvAdvertising_t + 1)$$

where $OnlineAdvertising_t$ and $TvAdvertising_t$ are Korean won expenditures on online and TV advertising in day t. $\lambda_{OnlineAd}$ and λ_{TvAd} ($0 \leq \lambda < 1$) are carryovers of online and TV advertising that captures the decaying effect of advertising in each channel. I employed a grid search that compares different combinations of carryover parameters by increasing by 0.01. Using ordinary least squares (OLS) regression, the grid search returns the combination that minimizes the residual sum of squares (RSS) of each sales model.

Chapter 5. Results

5.1. Adstock variables

The estimated carryover coefficients for online and TV adstock differ among the four sales models and WOM model (Table 1). For sales models, both online and TV

advertising have high carryovers (mostly above 0.9). This suggests that these advertisements boost consumer awareness of the product for a long time. Moreover, as the analysis is conducted daily, the carryovers may be bigger than the weekly carryover estimation.

On the other hand, online advertising has a relatively low carryover on WOM (0.12), while TV advertising has 0 carryover. This indicates that the effect of advertising is immediate on WOM and does not last for a long period of time.

Table 1. Advertising Carryover Coefficients

	Online Sales	Brand Store Sales	Mart Sales	Door-to-Door Sales	WOM
Online advertising	0.84	0.99	0.99	0.93	0.12
TV advertising	0.91	0.96	0.55	0.99	0

5.2. Sales model

Table 2 shows the results of four sales models. First, online advertising has a significantly positive impact on online ($b = 0.585$, $p = 0.000$), brand store ($b = 2.06$, $p = 0.000$), and mart sales ($b = 0.585$, $p = 0.002$). Yet, it has no significant effect on door-to-door sales. Second, TV advertising has a significantly positive effect on all sales, but all the channels except door-to-door channel have higher impact from online advertising. Third, the interaction between online and TV advertising has a negative impact on online ($b = -0.117$, $p = 0.013$) and brand store sales ($b = -1.255$, $p = 0.000$). This suggests that repetitive exposure to similar advertising messages could lead to cognitive overload and purchase postponements of consumers (Sridhar et al., 2021). Yet, there is no statistically significant association between interaction variable and mart or door-to-door sales.

Fourth, WOM has significantly positive association with online ($b = 0.097$, $p =$

0.041), brand store (b = 0.144, p = 0.039), and mart (b = 0.075, p = 0.036) sales. Yet, it has no significant impact on door-to-door sales. Fifth, promotion has marginally positive effect on brand store sales (b = 0.147, p = 0.091). It has significantly positive impact on mart (b = 0.494, p = 0.01) and door-to-door sales (b = 0.581, p = 0.000). It has the highest effect on door-to-door sales. Promotion, however, has no impact on online sales. Sixth, control variable of days of the week mostly has significantly positive impact on sales. Meanwhile, Heteroscedasticity-Autocorrelation Consistent (HAC) or Newey-West method is used to correct standard errors.

Table 2. Sales Model Results

Variables	Online Sales	Brand Sales	Store Mart Sales	Door-to-Door Sales
Online advertising	0.585*** (0.092)	2.06*** (0.32)	0.585*** (0.187)	0.001 (0.192)
TV advertising	0.159*** (0.042)	0.495*** (0.055)	0.25*** (0.054)	0.449*** (0.086)
Online advertising × TV advertising	-0.117** (0.047)	-1.255*** (0.271)	-0.224 (0.155)	-0.102 (0.184)
WOM	0.097** (0.041)	0.144*** (0.039)	0.075** (0.036)	0.039 (0.038)
Promotion	0.467 (0.384)	0.147* (0.087)	0.494*** (0.191)	0.581*** (0.118)
Monday	0.109*** (0.039)	0.397*** (0.055)	0.188 (0.109)	1.17*** (0.045)
Tuesday	0.041 (0.04)	0.486*** (0.061)	0.243** (0.11)	1.153*** (0.053)
Wednesday	0.119*** (0.045)	0.494*** (0.060)	0.164 (0.11)	1.039*** (0.087)
Thursday	0.014 (0.042)	0.489*** (0.062)	0.215** (0.108)	1.046*** (0.065)

Friday	-0.045 (0.041)	0.529*** (0.075)	0.49*** (0.103)	0.924*** (0.062)
Saturday	-0.069** (0.033)	0.517*** (0.064)	0.703*** (0.087)	-0.079 (0.040)

Standard errors are in parenthesis
 *p < 0.1; **p < 0.05; ***p < 0.01

5.3. WOM model

Table 3 shows the result from the WOM model estimation. All variables except promotion have a statistically significant effect on WOM. Online advertising (b = 0.983, p = 0.000) has greater impact on WOM than TV advertising (b = 0.311, p = 0.000). There is a negative synergy effect between the two forms of advertising (b = -0.237, p = 0.077). As in sales models, constant exposure to similar advertising messages might also lead to cognitive overload and decrease in WOM among people. Promotion has no significant impact on WOM. The company provided free samples of other products of the same brand or coupons to consumers who purchased the product, suggesting that these promotion types have insignificant effect on WOM. (Berger and Schwartz, 2011).

Table 3 WOM Model Result

Variables	WOM
Online advertising	0.983*** (0.179)
TV advertising	0.311*** (0.056)
Online advertising × TV advertising	-0.237*** (0.077)
Promotion	-0.191 (0.122)

Standard errors are in parenthesis
 *p < 0.1; **p < 0.05; ***p < 0.01

5.4. Total elasticities and ROI

Table 4 presents the long-term advertising elasticity or total effect, which is

measured by adding direct and indirect advertising effects. The direct effect is the marginal effect of both advertisements. The marginal effect of online advertising on sales can be calculated by adding the estimated coefficient of online advertising and the coefficient of interaction variable multiplied by the mean of TV advertising. Similarly, the marginal effect of TV advertising on sales can be calculated by adding the estimated coefficient of TV advertising and the coefficient of interaction variable multiplied by the mean of online advertising. The marginal effect of advertising on WOM is also calculated in the same way. Consequently, online advertising has a bigger direct effect than TV advertising on all channels except door-to-door channel. The difference is biggest at the offline brand store channel (0.693).

Meanwhile, the indirect effect is the effect of advertising through WOM. It is calculated by multiplying the marginal effect of advertising on WOM and the marginal effect of WOM on sales. For all channels except the door-to-door channel, where there is no indirect effect, online advertising has a bigger indirect effect than TV advertising. Similar to the direct effect, the brand store channel has the biggest difference between the two indirect effects (0.081).

The total effect is larger for online advertising. Since the brand store has the noticeably big direct and indirect effects of online advertising, the total effect is also very large and the difference with TV advertising is the biggest. For door-to-door sales, there is no total effect of online advertising.

Long-term total sales elasticity is calculated by multiplying each total effect with the percentage of sales via each channel (online channel 6.6%, brand store 34.5%, mart 19.4%, door-to-door 39.4%). As there is an insignificant effect of online advertising in the door-to-door channel, which takes a big portion of total sales, the difference between online and TV advertising elasticity decreased,

compared to the total effects of the online, brand store, and mart sales channels. The advertising elasticity is similar to the result in the meta-analysis of Sethuraman et al. (2011), where the mean long-term elasticity is 0.24. Considering that the meta-analysis mainly focused on traditional advertising like print and TV ads, the estimated TV advertising elasticity in this research (0.295) is very similar to past studies. Yet, it may be larger than the average of past studies since most studies conducted weekly analysis, while I estimated it on a daily basis.

Table 4. Total Long-term Advertising Elasticities

	Online sales			Brand store sales		
	Direct effect (a)	Indirect effect (b)	Total effect (a) + (b)	Direct effect (c)	Indirect effect (d)	Total effect (c) + (d)
Online advertising	0.48	0.076	0.556	0.824	0.114	0.938
TV advertising	0.114	0.022	0.136	0.131	0.033	0.165

	Mart sales			Door-to-door sales		
	Direct effect (e)	Indirect effect (f)	Total effect (e) + (f)	Direct effect (g)	Indirect effect (h)	Total effect (g) + (h)
Online advertising	0.585	0.059	0.643	n.s.	n.s.	n.s.
TV advertising	0.25	0.017	0.267	0.449	n.s.	0.449

Total sales elasticity	
Online advertising	0.486
TV advertising	0.295

Meanwhile, Table 5 presents the total short-term advertising elasticities. Short-term elasticity is calculated by multiplying long-term elasticity by (1 - carryover coefficient). It is smaller than long-term elasticity. Like in the long-term, online advertising has bigger short-term elasticity than TV in online and brand store channels. Unlike in the long-term, however, TV ad has a larger impact on mart sales than online ad in the short-term. TV has bigger total sales elasticity (0.028) than online ad (0.01), which is the opposite of the long-term analysis. Moreover, the total sales elasticities of online and TV ads are bigger than the average short-term

advertising elasticity that Sethuraman et al. (2011) found, which is 0.12. The reason I obtained bigger elasticity is probably that daily advertising tends to have a bigger carryover coefficient than weekly carryover.

In summary, online advertising has a larger direct, indirect, and total effect than TV advertising on all channels except door-to-door channel. As there is an insignificant effect of online advertising in the door-to-door channel, which takes a big portion of total sales, the difference between long-term sales elasticities of online and TV advertising elasticity decreased. Moreover, TV ad has a bigger total sales elasticity in the short-term.

Table 5. Total Short-term Advertising Elasticities

	Online Sales	Brand Store Sales	Mart Sales	Door-to-Door Sales
Online advertising	0.089	0.009	0.006	n.s.
TV advertising	0.012	0.007	0.12	0.005
Total sales elasticity				
Online advertising	0.01			
TV advertising	0.028			

Table 6 shows ROI, the profitability of advertising or the profit change per 1 Korean won in advertising (Investopedia, 2021). The profit margin of the online channel is 0.6, the brand store is 0.44, the mart is 0.59, and the door-to-door sales channel is 0.28. In Appendix, I present the derivation of ROI in detail.

In the short-term, both advertisements have negative ROI with similar values. Within-channel contribution is bigger than cross-channel contribution. In the long-term, online advertising has an ROI of 6.541 won, while TV returns only 0.382 won. For online advertising, cross-channel contribution (6.75 won) is larger than within-channel contribution (0.791 won). The big cross-channel contribution is due to brand store (4.401 won) and mart (2.349 won) sales, which is larger than online

sales (0.791 won). For TV advertising, within-channel contribution (1.304 won) is larger than cross-channel contribution (0.077 won).

In summary, in the short run, both ads have negative ROI. Yet, in the long run, online advertising generates a much larger profit than TV advertising, which is mainly due to cross-channel contribution.

Table 6. ROI

	Short-term				
	Online	Brand store	Mart	Door-to-door	ROI
Online advertising	₩0.127	₩0.044	₩0.026	₩0	-₩0.806
TV advertising	₩0.007	₩0.012	₩0.175	₩0.006	-₩0.8

	Long-term				
	Online	Brand store	Mart	Door-to-door	ROI
Online advertising	₩0.791	₩4.401	₩2.349	₩0	₩6.541
TV advertising	₩0.077	₩0.308	₩0.388	₩0.608	₩0.382

	Short-term			Long-term		
	Within-Channel Contribution	Cross-Channel Contribution	ROI	Within-Channel Contribution	Cross-Channel Contribution	ROI
Online advertising	₩0.127	₩0.068	-₩0.806	₩0.791	₩6.75	₩6.541
TV advertising	₩0.193	₩0.007	-₩0.8	₩1.304	₩0.077	₩0.382

5.5. Comparison with benchmark models

To understand the contribution of WOM, I compared the elasticities and ROI of advertising with two benchmark models that exclude the indirect effect of WOM. Benchmark 1 model is a sales model without WOM as an explanatory variable. Benchmark 2 model is a sales model that has WOM as an independent variable.

Table 7 shows the comparison of total elasticities. In terms of online sales, all three models have similar elasticities for both advertisements. For brand store sales, benchmark 1 has the lowest online ad effect (0.59) and the highest TV ad effect

(0.198). Benchmark 2 is similar to the main model. The main model has the highest online ad effect (0.938). For mart sales, the online ad has an insignificant effect on benchmark 1. The main model has the highest ad effect from both advertisements. For door-to-door sales, online advertising has no significant effect on all the models. TV advertising has the highest effect on benchmark 1. Benchmark 2 and the main model have the same coefficient since WOM has no impact on door-to-door sales. Meanwhile, total sales elasticity is obtained by multiplying ad elasticity from each sales channel by the market share of the channel. The main model has the highest online advertising elasticity (0.486) and a relatively low TV advertising elasticity (0.295). Unlike other models, benchmark 1 has higher TV advertising elasticity (0.434) than online advertising elasticity (0.243).

Table 7. Comparison with Total Long-term Advertising Elasticities of Benchmark Models

	Online sales			Brand store sales		
	Benchmark 1	Benchmark 2	Main	Benchmark 1	Benchmark 2	Main
Online advertising	0.589	0.48	0.556	0.59	0.824	0.938
TV advertising	0.12	0.114	0.136	0.198	0.131	0.165

	Mart sales			Door-to-door sales		
	Benchmark 1	Benchmark 2	Main	Benchmark 1	Benchmark 2	Main
Online advertising	n.s.	0.585	0.643	n.s.	n.s.	n.s.
TV advertising	0.146	0.25	0.267	0.836	0.449	0.449

	Total sales elasticity		
	Benchmark 1	Benchmark 2	Main
Online advertising	0.243	0.43	0.486
TV advertising	0.434	0.278	0.295

While Table 6 presents the ROI of the main model, Table 8 shows the ROI of benchmark models. In terms of short-term ROI, the three models all have negative ROI for both ads. All three have similar ROI values for online advertising. Yet,

benchmark 1 has a bigger ROI for TV advertising because it has a bigger within-channel contribution (0.594 won), although it is still negative. In terms of long-term ROI, the three models have positive ROI for both advertisements. Online advertising has a larger return than TV advertising. TV advertising is not profitable since it returns less than 1 won. The main model has a larger ROI for both advertisements. Benchmark 1 has a much smaller ROI for online advertising than other models because it captures smaller cross-channel contribution of online advertising.

Table 8. ROI of Benchmark Models

Benchmark 1	Short-term			Long-term		
	Within-Channel Contribution	Cross-Channel Contribution	ROI	Within-Channel Contribution	Cross-Channel Contribution	ROI
Online advertising	₩0.142	₩0.028	-₩0.83	₩0.837	₩2.771	₩2.608
TV advertising	₩0.594	₩0.012	-₩0.394	₩1.17	₩0.068	₩0.238

Benchmark 2	Short-term			Long-term		
	Within-Channel Contribution	Cross-Channel Contribution	ROI	Within-Channel Contribution	Cross-Channel Contribution	ROI
Online advertising	₩0.109	₩0.06	-₩0.831	₩0.683	₩6.003	₩5.685
TV advertising	₩0.179	₩0.006	-₩0.815	₩1.217	₩0.065	₩0.282

In summary, the comparison of total elasticities and ROI between the focal model and benchmark models reveals that it is crucial to consider the indirect effect of WOM. The reason benchmark models have different results from the main model is because they do not consider the indirect effect. As both online and TV advertising increases WOM and WOM also increases sales, not capturing this relationship would underestimate the effect of advertising. Moreover, the adjusted R-square of the main model is higher than benchmark 2 (main model and benchmark 1 have the same adjusted R-square). Therefore, it is reasonable to conclude that the model considering WOM is more accurate (Table 10).

5.6. Robustness check

I conducted a robustness check by changing the method of converting monthly TV advertising expenditure to daily expenditure. In the main analysis, I divided the total monthly expenditure by the number of days in the month. For robustness check, TV ad was decomposed to daily expenditure by using linear interpolation. The new TV ad data was used for sales and WOM model regression.

Table 9 shows the result of the Sales and WOM model with TV ad interpolation. The coefficients are similar to the result of the original analysis. The biggest difference is that, unlike the original analysis, there is a significant effect of WOM on door-to-door sales. Meanwhile, the adjusted R-square is smaller than the focal analysis (Table 10). In summary, using interpolation does not make a big different result and it has a lower adjusted R-square.

Table 9. Model Results with TV Ad Interpolation

Variables	Online Sales	Brand Store Sales	Mart Sales	Door-to-Door Sales	WOM
Online advertising	0.693*** (0.104)	6.272*** (0.912)	0.504** (0.201)	0.148 (0.201)	0.921*** (0.18)
TV advertising	0.147*** (0.049)	1.847*** (0.258)	0.21*** (0.05)	0.816*** (0.098)	0.259*** (0.062)
Online advertising × TV advertising	-0.157*** (0.05)	-6.121*** (1)	-0.181 (0.126)	-0.589** (0.25)	-0.211*** (0.08)
WOM	0.114*** (0.042)	0.24*** (0.038)	0.115*** (0.04)	0.123*** (0.044)	—
Promotion	0.276 (0.384)	-0.023 (0.093)	0.428** (0.188)	0.683*** (0.104)	-0.242* (0.135)

Standard errors are in parenthesis
*p < 0.1; **p < 0.05; ***p < 0.01

Table 10. Comparison of Adjusted R-Square

	Online Sales	Brand Store Sales	Mart Sales	Door-to-Door Sales	WOM
Main	0.653	0.438	0.393	0.668	0.384
Benchmark 1	0.619	0.333	0.348	0.643	–
Interpolation model	0.646	0.406	0.36	0.653	0.344

Chapter 6. Discussion

6.1. Summary of findings

I conducted an empirical research to analyze the direct and indirect effect of advertising on sales through WOM. I used the data of a Korean cosmetics brand over a period of 74 weeks.

The main findings include:

(1) Both own and cross-channel advertising effects exist in most channels. The magnitude is different across channels, but most of them receive a larger impact from online advertising. Yet, door-to-door channel sales gain an insignificant impact from online advertising.

(2) Advertising indirectly affects sales through WOM in most channels. Both advertisements have a positive impact on WOM, while WOM also increases sales. The positive indirect effect is bigger for online advertising. Yet, door-to-door channel sales has no indirect effect.

(3) There are negative interactions between online and traditional advertising in most sales channels and WOM.

(4) Promotions mostly have a positive effect on sales, while they have an insignificant effect on WOM. The positive effect is strong in offline sales and door-to-door sales have the biggest impact.

(5) For this particular brand, online advertising outperforms TV advertising in terms of elasticities and ROI. In the short-term, both advertisements have similar negative ROIs. In the long-term, however, online advertising has a much larger ROI than TV advertising.

6.2. Managerial implications

This research has some crucial managerial implications. First, it is important to optimally allocate advertising expenditure based on both own and cross-channel advertising effects. In fact, although online sales (6.6% of total sales) and online ad expenditure (21.8% of total expenditure) are small for this brand, the online ad has a larger impact on total sales due to the large cross-channel advertising effect. Therefore, focusing merely on own channel effect could lead to inaccurate and inefficient marketing decisions. Managers should also calculate short and long-term ROIs and precisely measure the effectiveness of ads. Second, it is important to consider WOM when evaluating the advertising effect. If WOM is not considered, managers can underestimate the effect of both online and traditional advertising. Moreover, as models with WOM have better adjusted R-Square, including the mediating effect of WOM could provide more accurate results. Third, the findings suggest that managers should be careful about overusing marketing communication tools like advertising and promotion. As there could be negative synergies between different advertisements, managers should be careful about running them. Promotions can also be ineffective in some channels or WOM.

6.3. Limitations and future research

This research has some limitations. First, the data only include online and TV advertising. Although online ads had different forms like banner and video ads, I did not separately analyze them. It was because the video ad expenditure was ambiguous

in that video banner ads were involved in it, which could be similar to online banner ads. Second, I only examined online WOM volume. Third, this research mostly analyzed the promotion type of sample giveaways.

Future research could evaluate the effect of various online ads on sales and the interactions between different ads. It could also estimate the effect of offline WOM or WOM valence on sales and measure indirect effect. Finally, future studies could measure how different types of promotions like coupons and rebates affect WOM.

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Appendix: Calculating ROI

ROI refers to the change in profits per 1 won change in advertising expenditure. This research calculates the profit and ROI from online and TV advertising, respectively. Profit can be written as,

$$\pi = m_{online} * S_{online} + m_{brand} * S_{brand} + m_{mart} * S_{mart} + m_{door} * S_{door} - Ad$$

where

m = profit margin for each sales channel

S = sales in each channel

Ad = advertising expenditure.

Long-term ROI can be written as,

$$\begin{aligned} ROI &= \frac{\partial \Pi}{\partial Ad} = m_{online} * \frac{\partial S_{online}}{\partial Ad} + m_{brand} * \frac{\partial S_{brand}}{\partial Ad} + m_{mart} * \frac{\partial S_{mart}}{\partial Ad} + m_{door} * \frac{\partial S_{door}}{\partial Ad} - 1 \\ &= m_{online} * \eta_{online} * \frac{S_{online}}{Ad} + m_{brand} * \eta_{brand} * \frac{S_{brand}}{Ad} + m_{mart} * \eta_{mart} * \frac{S_{mart}}{Ad} \\ &+ m_{door} * \eta_{door} * \frac{S_{door}}{Ad} - 1 \end{aligned}$$

where

η = long-term advertising elasticity for each sales channel

Short-term ROI can be expressed as,

$$ROI = m_{online} * (1 - \lambda_{online}) * \eta_{online} * \frac{\partial S_{online}}{\partial Ad} + m_{brand} * (1 - \lambda_{brand}) * \eta_{brand} * \frac{\partial S_{brand}}{\partial Ad} \\ + m_{mart} * (1 - \lambda_{mart}) * \eta_{mart} * \frac{\partial S_{mart}}{\partial Ad} + m_{door} * (1 - \lambda_{door}) * \eta_{door} * \frac{\partial S_{door}}{\partial Ad} - 1$$

where

$(1 - \lambda) * \eta$ = short-term advertising elasticity for each sales channel

국문 초록

최근 여러 기업들이 다양한 채널을 활용하여 제품 판매 및 광고를 하고 있다. 각각의 광고가 매출에 미치는 효과를 정확히 측정하기 위해서는 한 채널에서의 광고가 같은 채널에서의 매출에 미치는 영향(own-channel effect)과 다른 채널에서의 매출에 미치는 효과(cross-channel effect)를 모두 이해하는 것이 중요하다. 또, 광고는 word-of-mouth (WOM)을 통해 판매액에 간접적으로 영향을 주는 만큼, 이러한 간접 효과를 파악하는 것 역시 중요하다. 본 연구에서는 매출과 입소문 모형을 개발하여 온라인(배너, 비디오 등) 광고와 전통적인 광고(TV)가 온라인 및 오프라인 채널(브랜드 스토어, 마트, 방문판매)의 매출에 미치는 영향을 종합적으로 분석하였다.

본 연구에서 한국 화장품 브랜드의 한 제품에 대한 데이터를 분석한 결과, own과 cross-channel effect가 대부분의 채널에서 모두 존재한다는 것을 확인하였다. 각 효과의 크기는 채널 별로 상이하지만, 대부분 온라인 광고의 효과가 TV보다 더 컸다. 하지만 방문판매 채널의 경우 특이하게도 온라인 광고의 효과가 유의하지 않았다. 한편, 본 연구에서는 WOM를 통한 간접 효과를 측정하였다. 분석 결과, 광고는 WOM를 증가시키고, WOM 역시 매출을 증가시켰다. 또한 여러 채널의 매출과 WOM 모형에서 광고 간에 부정적인 상호작용 효과가 도출됐다. 판매촉진의 경우, 오프라인 채널에서 매출을 증가시켰으며 특히 방문판매에서 그 효과가 가장 컸다. 반면 판매촉진은 온라인 채널과 WOM에는 아무런 영향을 미치지 않았다. 마지막으로 본 연구에서는 각 광고의 return on investment (ROI)를 계산하였는데, 이는 마케팅 매니저들이 광고 지출을 결정할 때에 도움이 될 것으로 기대된다.

이러한 결과를 바탕으로, 본 연구는 마케팅 매니저들에게 몇 가지 시사점을 제시한다. 첫째, 광고 지출을 정할 때 own과 cross-channel effect를 종합적으로 고려하는 것이 중요하다. 둘째, WOM을 통한 간접 효과를 잘 파악하고 이해하는 것이 중요하다. 셋째, 광고와 판매촉진 활동 등의 마케팅 커뮤니케이션 수단을 무조건 많이

사용한다고 해서 매출이 증가하는 것은 아니다. 예를 들어, 다양한 광고들을 한꺼번에 활용하면 오히려 부정적 상호작용 효과가 초래될 수도 있으며 판매촉진 활동의 효과가 유의하지 않을 수도 있다.

주요어 : 광고, 크로스 채널, 입소문, 시너지, 판매촉진

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