Print ISSN: 1738-3110 / Online ISSN 2093-7717
http://dx.doi.org/10.15722/jds.15.9.201709.85

The Impact of Initial eWOM Growth on the Sales in Movie Distribution*

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Received: August 11, 2017. Revised: August 22, 2017. Accepted: September 15, 2017.

Abstract

Purpose - The volume and valence of online word-of-mouth(eWOM) have become an important part of the retailer's market success for a wide range of products. This study aims to investigate how the growth of eWOM has generated the product's final financial outcomes in the introductory period influences.

Research design, data, and methodology – This study uses weekly box office performance for 117 movies released in the South Korea from July 2015 to June 2016 using Korean Film Council(KOFIC) database. 292,371 posted online review messages were collected from NAVER movie review bulletin board. Using regression analysis, we test whether eWOM incurred during the opening week is valuable to explain the last of box office performance. Three major eWOM metrics were considered after controlling for the major distributional factors.

Results – Results support that major eWOM variables play a significant role in box-office outcome prediction. Especially, the growth rate of the positive eWOM volume has a significant effect on the growth potential in sales.

Conclusions – The findings highlight that the speed of eWOM growth has an informational value to understand the market reaction to a new product beyond valence and volume. Movie distributors need to take positive online eWOM growth into account to make optimal screen allocation decisions after release.

Keywords: eWOM, Online Product Review, Growth Rate of eWOM, Movie Distribution.

JEL Classifications: M31, L86.

1. Introduction

With the advent of Internet and social network systems, online WOM have profoundly influence consumers' information search process and their product choice: review bulletin board, online discussion forum, and SNS. The user's experience is disseminating through the Internet with low-cost and mostly available to the public. As a result, researchers and practitioners have long noticed the importance of online WOM on a product's market performance. Consumers form their perception of the product quality based on consumer ratings and reviews as well as the product information provided by the seller(Sthapit, Jo, & Hwang, 2016). Unlike traditional marketing effort, online WOM are endogenously related to product sales(Liu, 2006; Duan, Gu, & Whinston, 2008; Chintagunta, Gopinath, & Venkataraman, 2010). That is, positive WOM leads to increases in sales, which in turn leads to increases in positive WOM(Godes & Mayzlin, 2004; Duan et al., 2008). Two important attributes of online WOM are the valence of reviews and the volume of reviews(Neelamegham & Jain, 1999). Valence is the average rating which reflects positive, neutral, or negative evaluation for the product. Volume refers to the number of reviews. Consumers are likely to pay more attention to the product with high rating WOM volume or sales and believe its mean rating is more credible(Shen, Richards, & Liu, 2013).

In the movie industry, early prediction on sales is important to both movie distributors and theaters. For distributors, the decision for the number of screens and playing times per day is the most critical factor in determining box office performance. At the same time, having many screens increases the administrative cost. Therefore, distributors need to predict the growth potential of their movie and considers the cost-effectiveness of screen occupation to minimize the distributional cost. For theaters, screen allocation decisions for all available movies are

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important. Movie theaters have incentives to allocate more screens for the hit films. If not, they fade out the number of screens over time to reduce the opportunity costs for alternative films. Thus, predicting the box office performance in advance has importance in practice. However, during the pre-release period, it is hard to detect the market reactions to a movie. Only after the opening date, when WOM information becomes available, managers in the film industry can be in better position to predict a movie to be a hit or a failure. Therefore, the screen allocation contract between the film distributor and theaters needs to be modified based on anticipated sales after release.

Prior studies have focused on the role of online WOM for experience goods because the quality is hardly known before use. Thus, the movie industry is a popular category for eWOM studies. Both researchers and practitioners have believed that eWOM affects an individual's movie selection and plays a major role in box office performance(Bayus, 1985; Neelamegham & Chintagunta, 1999; Neelamegham & Jain, 1999). This study is in line with the widely adopted view that a movie's opening week performance determines its final outcome(Elberse & Eliashberg, 2003; Liu, 2006). Nevertheless, few prior studies have examined the explanatory power of the growth rate of eWOM.

This study contributes to the growing literature on the effect of eWOM on the new product's market performance and attempts to answer to what extent of WOM growth influences the future product sales. If the WOM growth is the one of major factors to explain a new product's future sales, firms should incorporate the variable into forecasting future sales and reduce the administrative cost of film distribution. This study differs from previous research in two aspects. First, this study suggests an importance of the growth rate of eWOM and develop a metric, in addition to traditional major two eWOM factors-valence(simple mean score) and volume(the number of reviews). Second, we test the effect of an early period of movie release on the cumulative market performance. To this end, we consider eWOM factors as exogenous variables that have explanatory power for future sales.

This study uses weekly box office performance data for 117 movies released in the South Korea from July 2015 to June 2016. We collect 292,371 posted online review messages for the 117 movies from NAVER movie review bulletin board, which are posted during the same period. This study adopts the approach of prior studies(Liu, 2006; Duan et al., 2008) to measure eWOM valence and volume of reviews. We control for other important drivers such as the number of screens, star power, distribution, genre, and movie ratings(All, PG-12, PG-15, and PG-R). As Chintagunta et al.(2010) noted, in models that use aggregate time-series data, the WOM generated in week t-1 affects box office performance in week t-1 and that in week t at the same time. Therefore, serial correlation issues arise between the error term in t and the error term in t-1. Due to the presence of the serial correlation, we restrict our analysis to the effect of online WOM generated in the opening week on the box office performance of a movie from the second to the eighth week. Specifically, this study shows that, in the context of predicting future sales after the first week of release, valence, volume, and growth of eWOM matter and their effects are consistent with theoretical predictions. The next section provides the discussions of the current literature and key research hypotheses. Then, the empirical model, data, and results and findings are discussed. Finally, the conclusion section includes the implications, limitations and future research.

2. Theory and Hypotheses

The vast literature on eWOM has focused on how online review affect market performance in the experience good industries- movie(Elberse & Eliashberg, 2003; Liu, 2006; Dellarocas, Zhang, & Awad, 2007; Chintagunta et al., 2010), book(Godes & Mayzlin, 2004; Chevalier & Mayzlin, 2006) and restaurant(Oluwafemi & Dastane, 2016). Particularly for the movie industry, movie-goers actively involve interpersonal communication to increase accessibility of information and to influence others. These studies characterize the major two online reviews metrics-eWOM valence(user ratings) and eWOM volume(the number of reviews). Prior studies consistently document positive associations between eWOM volume and sales, but the empirical evidence on the effect of eWOM valence on sales are somewhat contradictory (Godes & Mayzlin, 2004; Liu, 2006; Duan et al., 2008). <Table 1> summarizes several studies show that each dimension of eWOM can significantly affect sales outcome. For example, Godes and Mayzlin(2004) found a positive and significant effect of user ratings on sales for Amazon.com, but the insignificant effect for BarnsandNobles.com. Duan et al.(2008) pointed out that endogeneity between eWOM variables and market outcome leads to a mixed result for the valence. Differently, from prior studies adopting weekly sales prediction, we employ aggregate sales model having exogenous eWOM information available at the early period after release. Elberse and Eliashberg(2003) emphasize that sales performance in the mainstream market depends on product performance in the introductory stage. Therefore, our discussion of prior studies focuses on the effect of eWOM generated during the early period after the true quality of the product is revealed.

2.1. eWOM Valence of Opening Week

The valence of eWOM in the initial period reflects valuation for a new product of early adopters who have experienced the product before the majority. Sundaram, Mitra, and Webster(1998) show that altruism and self-enhancement motivate consumers to spread positive WOM,

while anxiety reduction and vengeance motivates negative WOM. In other words, the satisfied consumers have incentives to spread positive feedbacks, while dissatisfied ones have incentives to leave negative comments. As higher valence of opening week signals that more of early adopters are willing to spread positive WOM, it motivates following movie-goers are willing to watch the movie. At a later period, consumers are likely to rely on WOM to reduce uncertainty in their decision-making whether to watch the movie or not(Banerjee, 1992). Some of the prior studies have reported a weak relationship between eWOM weekly valence and weekly sales(Liu, 2006; Duan et al., 2008). Liu(2006) employ pre-release online WOM valence to predict aggregate box office performances. However, pre-release eWOM valence cannot reflect the valuation of real movie goers and can be exaggerated by advertising efforts by distributors. Therefore, pre-release eWOM valence may fail to predict aggregated box office accurately. In the context of two different periods, this study considers the relationship of eWOM valence in the opening week and cumulative sales after the 2nd week. Based on prior literature, eWOM valence is expected to be useful information to predict future sales. We thus propose the first hypothesis.

<H1> Average rating of movies(valence) of the opening week has a positive effect on the after that box office outcome.

2.2. eWOM Volume of Opening Week

Unlike eWOM valence, prior studies consistently show a strong relationship between eWOM volume and market performance(Godes & Mayzlin, 2004; Liu, 2006; Duan et al., 2008). In the movie industry, eWOM volume plays an informative role by indicating how many consumers have willing to spread their evaluation for the quality. The rationale behind using volume is that high level of online WOM volume can draw attention from consumers and increase the awareness of a product(Dellarocas et al., 2007; Duan et al., 2008). In addition to the awareness effect, high level of WOM volume can increase the credibility of product rating and reduce uncertainty due to experiential nature of movie(Faber & O'Guinn, 1984).

Dellarocas et al.(2007) show that the initial volume of online reviews(2-3 days after release) can be utilized as a proxy for early sales and forecast box office outcomes. Using a Bass diffusion model, they find that the volume of the first week's user ratings affects the external factors(parameter p), whereas the valence of user ratings affects the internal factors(parameter q) that induce a moviegoer to watch a movie. Using data from Yahoo Movies, Liu(2006) examines the effects of online WOM into three aspects of a movie's run: the opening week, the weeks after opening, and aggregated box office outcome. Consistently with prior studies, we predict the volume of eWOM generated during the first week, provides a significant driver for the aggregated box office revenue.

<Table 1> Previous Studies on the effect of eWOM on Sales Outcome

Dimension of eWOM	Study	Data	Key Findings
Valence	Elberse & Eliashberg(2003)	movie	Less positive reviews correspond to a higher number of opening screens, but more positive reviews mean more opening revenue.
	Chevalier & Mayzlin(2006)	book	Negative reviews have a greater impact than positive reviews.
	Liu(2006)	movie	Pre-release eWOM valence has weak relationship with box-office outcome.
	Chintagunta, Gopinath, & Ventakraraman(2010)	movie	The valence of online WOM has a significant and positive impact on box office earnings.
	Dellarocas, Zhang, & Awad(2007)	movie	First week eWOM valence affect box office sales.
	Duan, Gu, & Whinston(2008)	movie	Endogeneity between WOM variables and market outcome leads to a mixed result for the WOM valence.
	This study	movie	First week WOM valence affects box office sales.
Volume	Liu(2006)	movie	eWOM volume has a strong positive relationship on sales.
	Dellarocas, Zhang, & Awad(2007)	movie	First week WOM volume affect box office sales.
	Duan, Gu, & Whinston(2008)	movie	The influence of WOM volume on movie sales beyond the concurrent term is positive. However, the influence diminishes quickly.
	Chintagunta, Gopinath, & Ventakraraman(2010)	movie	Volume of review is the main driver of box office performance.
	This study	movie	First week WOM volume affects box office sales.
Growth	This study	movie	Positive WOM volume growth during first week affects box office sales.

<H2> The volume of eWOM generated during the opening week has a positive effect on the after that box office performance.

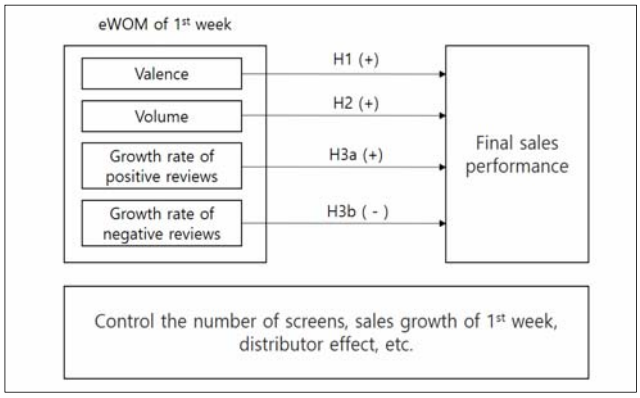
2.3. eWOM Growth Rate of Opening Week

Not all consumers have the same incentives to write product reviews. In the movie industry, prior studies have documented that the movie-goers with high valuation have more incentives to spread the word(Duan et al., 2008). Previous studies show consumers spread positive WOM out of self-enhancement and altruism, whereas where they spread negative WOM to reduce anxiety(Sundaram et al., 1998). Typical consumer ratings reveal J-shaped distribution with many highest ratings and some lowest ratings and not as many ratings in between(Archak, Ghose, & Ipeirotis, 2011; Moon, Park, & Kim, 2014). A J-distribution of numeric scores arises when consumers show self-selection biases, resulting in over-representation of the extreme ratings and under-representation of the moderate ratings(Li & Hitt, 2008; Hu, Zhang, & Pavlou, 2009). Li and Hitt(2008) document the existence of positive and self-selected early-review bias and thereby the reviews may not represent the opinions of the broader consumer population. Since the early movie-goers with high valuation have greater incentives to express their views in online, the reviews follow a declining pattern over time. As a result, the growth of the number of positive reviews may also affect positively on the future market performance. On the other hand, the movie goers with low valuation also have more incentives to leave their negative opinion than those with moderate valuation. However, the growth of negative reviews in early period can lead to negative consequences in sales. Therefore, the effect of eWOM growth may have an asymmetric effect on sales depending the valence(positive or negative).

<H3a> The growth rate of positive volume generated during the opening week has a positive effect on the later box office outcome.

<H3b> The growth rate of negative volume generated during the opening week has a negative effect on the later box office outcome.

<Figure 1> summarizes our model of early eWOM effect on final sales performance. eWOM generated during the early period after product release have a significant effect on sales. Specifically, eWOM valence and volume are expected to have positive effects on sales. Beyond the effect of average rating and the number of reviews, the growth rate of positive reviews have a positive effect on sales while the growth rate of negative reviews have a negative effect on sales.



<Figure 1> The Impact of Early eWOM on Final Sales Performance

3. Empirical Applications

3.1. Movie Data

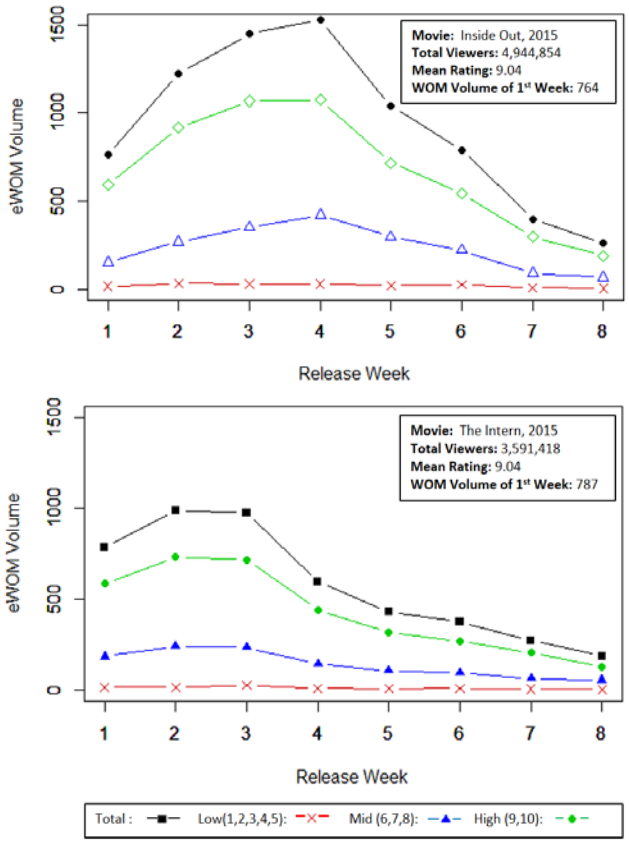
Daily box office data were collected from the Korean Film Council (KOFIC, http://www.kobis.com) on movies released from July 2015 to June 2016. The KOFIC database includes daily box office performance- the number of movie-goers, the number of screens, and box office revenue. Out of 1,046 movies, the movies which had less than 0.1 million cumulative viewers after release were filtered out. After screening out the movies without online WOM data, our sample includes 117 movies. Daily box office records were summed up weekly since the movie release date. This analysis used the opening week performance and the cumulative performance from 2nd week to 8th week after release.

To collect online WOM data, this study chose NAVER Movies (http://movie.naver.com) for the following reasons. First, it is the largest portal site to which more than 70% of population connects in South Korea on a daily basis. Second, NAVER classifies whether a review is written by a 'real' viewer who made a reservation a ticket through their system. Since 2014, NAVER starts adopting this identification system to improve the credibility of the reviews and shows the ratings of two groups-identified real viewers vs. all viewers including anonymous reviewers. This study utilized only real viewers' ratings and opinions to minimize the fake or paid review effect. <Table 2> shows the descriptive statistics of the sample data. The rating average of the 117 movies was 8.17 out of 10-point scale, with a mean of 759 reviews per a movie.

Due to self-selection bias, online review tends to show a J-shaped distribution with many high ratings and some low ratings(Moon et al., 2014). Our sample also shows a similar pattern. Out of total sample, the score greater than nine is four times higher than the score less than 4. As a result,

the mean score of 117 sample movies is relatively high(8.04 out of 10). The high average mean rating and J-shaped distribution represent that the viewers with high valuation tend to write reviews, while the viewers with low valuation tend not to write reviews. Thus, the mean score of online reviews of a movie may not correctly represents the true evaluations of the total viewers. Considering J-distribution, we categorized volumes into three levels- Low(1, 2, 3, 4, 5), Mid(6, 7, 8), High(9, 10) out of 10 points.

<Figure 2> illustrates the patterns of the weekly online WOM volume in 8 weeks after release. We contrast two movies- "Inside Out" and "The Intern," which have similar eWOM volumes around 700 reviews and end up with similar eWOM valences around 9. Although starting with a similar level of eWOM volume during the 1st week, the growth rate of High eWOM volume for "Inside Out" is 63% which is far greater than that of "The Intern"(27%). As time goes by, it turns out that movie-goers of "Inside Out" had kept creating BUZZ up to 4th week after release. On the other hand, online WOM for "The Intern" shows a diminishing pattern from the 3rd week after release. <Figure 2> suggests that the growth rate of eWOM can help early period prediction for a success of a movie(or product).



<Figure 2> Comparison of Box Office Outcomes: Inside Out vs. The Intern

<Table 2> Summary Statistics

Variable	Description	Summary Statistics			
		Mean	Std.dev	Min	Max
Online Word of Mouth					
VALENCE	the mean rating of a movie at opening week (scale of 10)	8.17	0.76	5.89	9.57
VOLUME	the number of online reviews at opening week	757	1131	28	9448
HIGHVGR	the growth rate of volume of high rating (9,10) during the opening week	0.33	0.54	-0.55	1.82
MIDVGR	the growth rate of volume of mid rating (5,6,7,8) during the opening week	1.37	1.97	-0.50	10.76
LOWVGR	the growth rate of volume of low rating (1,2,3,4) during the opening week	16.52	27.71	-0.45	161.67
Box Office					
CUMVIEWS	cumulative number of viewers (2nd week ~ 8th week, million)	1.70	2.44	0.10	13.18
VIEWGR	the growth rate of viewers during the opening week	-0.52	0.36	-0.99	0.73
SCREENS	the maximum number of screens during the opening week	670	339	66	1991
Movie Characteristics					
Nationality	Korea(KOR): 44%, USA: 50%, Others: 6%				
Star Casting (STAR)	Cast actors/actress who achieved 10 million viewers in the previous works in 2 years: 12%				
Genre	Action(ACTION): 37%, Drama(DRAMA): 35%, Thriller(THRILLER): 22%, Comedy: 15%				
Movie Rating	All: 12%, PG12(PG12): 38%, PG15(PG15): 38%, PG-R(PGR): 12%				
Distributor	Distributors who own theater(TDIST): 26% Other major distributors(MDIST): 48%				

3.2. Model

This study distinguishes a movie's opening week outcome from its run in following weeks. In the opening week, the quality of a movie is hardly revealed. However, in the subsequent period, the potential movie-goers are likely to depend on the external public source, which is online word-of-mouth communications(Elberse & Eliashberg, 2003). Thus, the second week and beyond box office aggregated outcome is considered(Liu, 2006). As a box office outcomes measure, the number of viewers is used for three reasons. First, more than 80% box office revenues are generated from the theater in South Korea. Second, the general movie ticket price is fixed as $10(except 3D and 4D movies). Thus, the revenue is proportional to the number of viewers. Third, using the number of viewers is easy to interpret and free from time-varying exchange rate or inflation rate. The cumulative viewers for a movie i after the first week is modeled as follows:

$$\begin{aligned}&\log(CUMVIEWS_{i,-0})\\&=\alpha+\beta_1 VALENCE_{i,o}+\beta_2\log(VOLUME_{i,o})+\gamma_1 HIGHVGR_{i,o}\\&\quad+\gamma_2 MIDVGR_{i,o}+\gamma_3 LOWVGR_{i,o}+\delta_1 VIEWGR_{i,o}+\delta_2 KOR_i\\&\quad+\delta_3 STAR_i+\delta_4 TDIST_i+\delta_5 MDIST_i+\delta_6 PG12_i+\delta_7 PG15_i\\&\quad+\delta_8 PGR_i+\delta_9 ACTION_i+\delta_{10} THRILLER_i+\delta_{11} DRAMA_i\\&\quad+\delta_{12}\log(SCREENS_{i,o})+\epsilon_i\end{aligned} \quad (1)$$

Following prior studies(Elberse & Eliashberg, 2003; Liu, 2006), log-linear formulation is employed in our model. On the right-hand side of the equation, online WOM variables can be measurable during the opening week. In addition to the standard online WOM variable VALENCE and VOLUME, we have HIGHVGR, MIDVGR, and LOWVGR which captures the growth rate of volume of high scores (9~10 points), mid scores (5~8 points), and low scores (1~4 points), respectively. For example, the growth rate of volume of high scores (9~10 points) is defined as follows:

$$HIGHVGR_{i,o}=\frac{VOLUME_{high,2}-VOLUME_{high,o}}{VOLUME_{high,o}} \quad (2)$$

, where and represent the maximum number of reviews with score 9 and10 written in the opening week and the second week respectively.

The remaining variables account for other factors that influence box office cumulative outcomes. The growth rate of viewers during the opening week is controlled with VIEWGR. This specification is necessary to test whether online WOM has an exploratory power for the box office performance outcome beyond lagged value of box office performance. The model also accounts for the characteristics of a domestic film market in South Korea. Korean film(KOR) accounts for 44 % of the sample, which is corresponding to the average ratio of Korean films in the market 53.7% in 2016. Star power(STAR) is considered when the film cast the actor/actress who has achieved more than 10 million cumulative box office viewers in recent two years. To control for the distributional power, this study employed two variables- TDIST and MDIST, which represent distributors who own theater and other major players. In our sample, 26% of movies are released by distributors who have theaters, and 48% of movies are released by other major distributors. Three genre dummy variables (ACTION, THRILLER, and DRAMA) were used to control for the genre effects. More than two genres can apply to one movie. For example, Mission: Impossible-Rogue Nation(2015) is classified to both Action and Thriller. Lastly, the model also accounts for the strong factors driving box office performance- the number of screens(SCREENS). Generally, movie distributors set the maximum number of screens during the opening week and reduce them thereafter. This study used the maximum number of screens which set in the opening week. To address the endogeneity concerns, all the right-hand side variables were exogenous.

4. Results

<Table 3> shows the estimation results for nested models of cumulative viewers. All models are statistically significant with high adjusted R-squares. Model (1) shows estimation results with only classical WOM variables - valence and volume of the opening week. WOM level and volume explain 73.8% of the number of cumulative viewers. Consistently with previous literature(Liu, 2006; Duan et al., 2008), both valence and volume have a significant and positive effect on cumulative viewers (<H1> and <H2> are supported). In Model(2), we further add the growth rate of the number of reviews into three categories- High, Mid, and Low. The Inclusion of the growth rate of volume improves the goodness of fit(the adjusted R-square increases to 80.4%). Especially, the growth of very positive ratings(9,10) has a significant effect on the cumulative viewers(<H3a> is supported). Both valence and volume are positive and statistically significant, which suggests that the speed of WOM growth in early period plays an important role to explain remaining box office performance. However, the growth rate of low ratings(1, 2, 3, 4, 5) which reflects growth of negative word-of-mouth in the movie industry does not have a significant influence on the sales performance (<H3a> is not supported). This results also support the self-selection bias in online review system in that the reviewers with negative valuations are not likely to leave a comment(Li & Hitt, 2008).

<Table 3> Analysis Results (n=117)

Independent Variables	Dependent Variable: Cumulative Viewers (2nd week ~ 8th week)			
	(1)	(2)	(3)	(4)
VALENCE	0.690***	0.493***		0.336***
	(0.126)	(0.141)		(0.092)
VOLUME	1.311***	1.226***		0.684***
	(0.088)	(0.077)		(0.086)
HIGHVGR		0.846***		0.275**
		(0.171)		(0.119)
MIDVGR		0.058		-0.048
		(0.082)		(0.061)
LOWVGR		0.001		-0.002
		(0.005)		(0.003)
VIEWGR			3.002***	2.458***
			(0.207)	(0.238)
KOR			-0.129	-0.042
			(0.176)	(0.133)
STAR			-0.043	0.045
			(0.236)	(0.175)
TDIST			0.203	0.207
			(0.193)	(0.149)
MDIST			0.316*	0.110
			(0.189)	(0.148)
PG12			-0.464*	-0.037
			(0.250)	(0.199)
PG15			-0.109	0.183
			(0.275)	(0.211)
PGR			-0.387	-0.097
			(0.313)	(0.238)
ACTION			-0.309*	-0.179
			(0.172)	(0.135)
THRILLER			-0.086	-0.021
			(0.174)	(0.130)
DRAMA			0.058	0.094
			(0.156)	(0.128)
SCREENS			2.263***	1.063***
			(0.163)	(0.191)
Constant	-1.260	0.475	-0.398	-0.189
	(1.014)	(1.123)	(0.988)	(1.133)
R^2	0.743	0.812	0.882	0.94
Adjusted R^2	0.738	0.804	0.869	0.93
F Statistic	164.543***	96.159***	65.057***	91.071***

Note: *p<0.1; **p<0.05; ***p<0.01

Model(3) shows the estimation results with important determinants for the box office performance– the number of screens, movie characteristics and the growth rate of viewers. Without eWOM, Model(3) explains 86.9% of box office outcome. The estimation results show that the growth rate of viewers(VIEWGR) and the number of screens (SCREENS) of the opening week have a significant and positive impact on the future sales outcome(p<0.01). This result supports the findings from prior literature which demonstrated the number of screens is the one of the most influential factor on movie sales.

In Model(4), we add online WOM variables into Model(3). The adjusted R-square improves to 93%, suggesting that online WOM variables of the early period can increase accuracy to predict cumulative sales beyond the box office characteristics. Note that, three eWOM variables(valence, volume, and the growth rate of the volume of high ratings) are still significant even after controlling for the growth rate of viewers and the number of the screen. The most of movie characteristic variables do not have significant explanatory power for sales outcome of from the 2nd to 8th week. This result suggests that movie characteristics are critical determinants only for the opening week box office outcome(Liu, 2006). However, once the true quality of a movie is fully revealed, their effects are fading out after 2nd week after release. Consistent with previous studies(Elberse & Eliashberg, 2003; Duan et al., 2008), the number of screens allocated to a movie is a strong driver for the box office performance. A summary of the hypotheses testing results from Model (4) is provided in <Table 4>.

<Table 4> Summary of Findings

	Hypothesis Description	Parameter Estimation (Model 4)	Result
H1	Average rating of movies(valence) of the opening week has a positive effect on the after that box office outcome.	0.336^{***}	Supported
H2	The volume of eWOM generated during the opening week has a positive effect on the after that box office performance.	0.684^{***}	Supported
H3a	The growth rate of positive volume generated during the opening week has a positive effect on the later box office outcome.	0.275^{***}	Supported
H3b	The growth rate of negative volume generated during the opening week has a negative effect on the later box office outcome.	$-0.002^{n.s.}$	Not Supported

5. Conclusions

5.1. Summary of Results

This study investigates the exploratory power of early eWOM growth on a product's future sales in the context of the movie industry. To this end, this study utilized weekly box office performance for 117 movies released in the South Korea from July 2015 to June 2016 using the Korean Film Council(KOFIC) database. The weekly sales data were merged into 292,371 posted online review messages collected from NAVER movie review bulletin board. Using OLS estimation, we test whether eWOM incurred during the opening week is valuable to explain the last of box office performance. Three major eWOM metrics: valence, volume, and growth were considered after controlling for the major distributional factors. The analysis results show that WOM valence(<H1>) and volume(<H2>) generated during the opening week are important factors to predict the cumulative sales after the second week. Moreover, how fast the positive eWOM volume grows during the first week also matters in forecasting the later box office performance (<H3a>). However, the speed of negative eWOM volume growth does not have a significant influence on the future sales(<H3b>). These findings support the theory that eWOM elements play an informative role through increased consumer awareness.

5.2. Theoretical and Managerial Implications

This study contributes to the growing eWOM literature in both theory and practice. By building on the prior literature of the economics of information, we provide a theoretical framework to understand the informational value of eWOM. Especially, this study offers a conceptualization of how to measure the eWOM growth considering its valence. While the majority of prior studies on eWOM have focused the effect of valence and volume of eWOM on the sales, our work extends this research stream by providing evidence for the explanatory value of early eWOM growth rate on product sales. Further, we demonstrate an asymmetric effect of eWOM growth, which is the positive growth of eWOM volume only matter in future sales.

In practice, the findings suggest that the marketing practitioners need to monitor eWOM actively from the product release. With the development of web information analysis techniques, marketers can efficiently collect and analyze consumer review data to get insights of valence, volume, and growth pattern of eWOM. We suggest the major application areas in two ways.

First, based on the data analytics, marketers can develop the proactive marketing promotions toward early adopters to encourage positive eWOM right after they launch a new movie(or product). Especially, our key empirical results (<H3a> and <H3b>) suggest that the satisfied early adopters(the viewers in the opening week) are more willing to spread their experience of the product, whereas the dissatisfied ones are less likely to generate eWOM. As a result, average score, total reviews and how much accelerated the eWOM volume altogether influence the followers(the cumulative viewers from the second week after release) who seek the information before they try.

Second, the movie distributors and theaters can allocate their resources efficiently and reduce the managerial risks with the better predictors for the future sales. In movie industry, screen allocation is one of the most important decisions to both distributors and theaters. Having more screens can increase a distributors' box office sales but increase the cost at the same time. On the other hand, the movie theaters try to find an optimal number of screens for a movie to increase sales and reduce the opportunity cost for another hit films. In this vein, the early adopters' reactions reflected in eWOM can help the two parties make reasonable contracts for screens. Furthermore, the eWOM growth metrics suggested in this paper can provide additional information for the trend whether the volume of positive eWOM is rising or fading.

5.3. Limitation and Future Research

Although the effect of eWOM in the current study is significant and consistent with prior research(Liu, 2006; Chintagunta et al., 2010), further studies might conduct analyses with the data from other experiential goods to generalize the explanatory power of eWOM growth in the early period on sales. Books, TV shows, musicals, and mobile applications(Lee, Wu, & Fan, 2017) also have experiential characteristics as movies and generate a significant portion of eWOM during the introductory period. Thus, investigating whether eWOM growth after release has an informational value beyond valence and volume would be insightful. Further, laboratory experiments would be useful to examine the relationship between eWOM growth and a consumer's willingness to view in the controlled setting. Finally, as our empirical demonstration is restricted to the online movie reviews, how the effect of eWOM growth is generalizable beyond the movie industry remains for future research.

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