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Comparative effect of company-driven SNS activity vs. consumer-driven SNS activity on firm value: Evidence from facebook

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ABSTRACT

As mobile technology and social media have advanced, companies have become more and more motivated to make use of social network services (SNS) such as Facebook to increase future firm performance. Perusing the literature on the association between SNS and firm performance, we found very few empirical studies of the comparative effect of company-driven activity (e.g. posting) and consumer-driven activity (e.g. liking, commenting, sharing) on firm performance. Moreover, specific SNS activities affecting firm performance in the present, future, or both have not been explicitly identified. Hence, we developed an empirical model to identify and find differences between the effects of SNS activities on firm performance in the present (as measured by returns on investment) or future (as measured by Tobin's q) to improve our understanding of the impact of corporate SNS as a marketing channel. Text mining techniques are applied in this study to identify SNS activities from SNS data. The results suggest that SNS contributes significantly to future firm performance, as evidenced by increases in Tobin's q. Moreover, company-driven activities affect future value, while consumer-driven activities affect present value. Implications from these results are discussed.

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1. Introduction

The phrase "Social Network Services" (SNS) refers to Internet applications that allow people to build online social networks [49]. Some studies focus on corporate SNS, while others focus on individual SNS [21]. In most cases, SNS is a major channel through which actual and potential consumers may be reached [36,50]. Potential consumers visit the page of a corporation while using SNS in order to obtain information or make purchase decisions based on that information [17]. Identifying the contributions of corporate SNS activities to firm performance is crucial for both academics and corporate executives who need to quantify its financial value.

The relationship between corporate SNS activity and firm performance is treated inconsistently and defined restrictively in the literature [19,27]. For example, some scholars advocate that the contribution of SNS to firm performance is mainly dependent on word of mouth [43], while others are more skeptical [8]. These inconsistencies may stem from a lack of generalizability of the results [43]; previous researchers have seldom explored the relationships between SNS usage and firm performance across industries. Fortunately, investigating the impact of corporate SNS activity on firm value becomes possible by web crawling and analysis of large-scale, unstructured text available via SNS. However, despite this availability, no such study has been undertaken.

In this empirical study, we compare the effects of SNS activities initiated by the company and by consumers on firm performance and their associations with present (or short-term) as well as future (or long-term) outcomes in terms of firm performance (using ROI and Tobin's q). We predict that companies with their own SNS sites will be more profitable in the long term than those without. In addition, we posit that the effect of company-driven SNS activity (posting, etc.) on firm performance will be more evident in the longer term than that of consumer-driven SNS activity (liking, commenting, sharing, etc.). To examine the impact of SNS activity on corporate financial value more rigorously, we employ meaningful control variables used in accounting research in the model.

This paper is organized as follows: Section 2 provides a literature review and presents our hypotheses on corporate SNS, firm performance, and the association between SNS activity and

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firm performance. The research model and results are presented in Sections 3 and 4, respectively. Finally, in Section 5, we conclude and provide suggestions based on the study results to future researchers and business practitioners.

2. Theoretical background and hypotheses

In terms of research scope, extant studies restricted their focus to the performance resulting from SNS activity constructed by individuals, testing using metrics indirectly related to financial performance (e.g. satisfaction, awareness, engagement, etc.) [15,29,46]. They also used obvious measures (e.g. the number of likes, posts or shares), rather than using deeper measures identified by testing and analysis (e.g. type of content posted or nature of comments). A full-fledged investigation is needed to understand the contributions of corporate SNS activity better.

Our study is more comprehensive in scope than prior studies in three ways. First, we look at the relationship between corporate SNS activity and firm financial performance, rather than factors that mediate performance such as consumer satisfaction and engagement [15,29,46]. Second, our research design incorporates both short-term firm performance (ROI) and long-term firm performance (Tobin's q) in assessing the impact of SNS activity on firm performance. This is clearly important for managers and marketing practitioners to estimate the profitability and value of SNS activity. Finally, while prior work has been focused solely on the influence of SNS as a whole, our study examines the comparative effects of company-driven SNS activity and consumer-driven SNS activity and their differing roles in terms of firm performance.

2.1. Engagement in SNS activity and firm performance

The effectiveness of marketing via SNS has been measured using both consumer ratings [43] and reviewers' responses [27]. Firm performance has been measured in terms of firm equity value [43], sales volume [2,22,65], long-term marketing profitability [18], stock price [39], stock returns [42], and Tobin's q [9]. Measures of firm performance can be divided into two types: present value and future value [9].

Among the topics of extant studies, the relationships between corporate SNS activities and short-term firm performance remain obscure. Previous studies have reached contradictory conclusions about the contributions of SNS activities to firm performance [14]. On the positive side, studies have shown SNS-based metrics to be significant leading indicators of firm equity value [11,43]. SNS helps companies to increase the visibility of their products and services at low marketing costs [2], foster friendly attitudes about them, and improve consumer satisfaction and loyalty [16]. On the other hand, SNS may negatively affect firm performance in terms of publicity in the short term [8,2]. Negative reactions on social media can decrease stock prices [10]. Overwhelming and conflicting information regarding SNS can result in negative consequences for firms [38].

However, extraordinary cases do exist. Noise marketing can have positive effects on firm performance. Negative publicity can increase product awareness through noise marketing, which can increase purchase likelihood and sales [8]. This phenomenon has also been identified in other studies. For example, irrelevant posts act as catalysts and can exponentially increase the readership of employees [2]. Consequently, the results of sentiment or content analyses using SNS data can yield mixed responses [27]. Some prior studies report that SNS can have positive effects on firm performance [43,44]. However, other researchers report that SNS has a negative influence on firm performance [29,64]. Hence, we hypothesize that:

Hypothesis 1. *Engaging in corporate SNS activity is NOT positively associated with present firm performance.*

Firm equity value, long-term marketing profitability, and Tobin's q may all be used to evaluate a firm's future value. Such indices are useful for SNS operators, although the effect of SNS may not always be realized within a single fiscal year. In the extant literature, the contribution of IT to performance dimensions such as strategic flexibility and intangible value is mentioned [13,55]. In line with this notion, Tobin's q is a representative financial market-based measure of firm performance associated with IT investments, after controlling for a variety of industry factors and firm-specific variables [9].

Since SNS is a typical contemporary IT used by many companies, we expect to find a positive association between engagement in SNS activity and future firm performance. That is, consistent with the findings in the literature [14,9,62], we posit that engagement in SNS activity will contribute to a firm's future performance potential, which a forward-looking measure such as Tobin's q is better able to capture; however, the results of empirical studies relating SNS investments to instant firm performance measures will be equivocal. Hence, we hypothesize that:

Hypothesis 2. *engagement in corporate SNS activity IS positively associated with future firm performance.*

2.2. Company-driven SNS activities and firm performance

Companies engage in uploading self-proclaimed information through posting and publishing the company profile. These are corporate SNS activities. Posting information about events, survey results, or ads on the company's SNS page is most common. For companies with Facebook accounts, fan pages can be opened on which they can post information, messages, quizzes, and other materials. Companies can also communicate with consumers through these links and advertise or encourage changes in consumer behavior. Advertisements on Facebook can increase both the number of visitors and company profit [56]. Hence, posts in a volume or of a certain number can signal that the company is engaged with advertising through SNS. Engaging in SNS provides an excellent means for companies to deliver news to and foster relationships with consumers [16].

When providing information on SNS, companies have the option to publish profile data such as a company description, website links, corporate history, contact information, and product descriptions. Companies that manage and operate their own SNS pages can control the number of postings and use SNS to introduce themselves. SNS pages for top brand-name products attract more interest from users than pages for other products [16]. Social media users are much more interested in top brand-name products than in lesser-known products. For instance, social media users visit SNS pages for top brand-name products, post comments, and share posts more often than for other products. In addition, SNS pages for top brand-name products can enhance consumer engagement in SNS activity. SNS activity associated with top brand products has been shown to generate the highest number of clicks. According to these prior studies, placing an advertisement in the top position on a webpage is most efficient, and the introduction section of the company profile page is also the most effective. Therefore, we anticipate that the introduction part of a given SNS page will influence consumers' awareness of and increase firm sales for companies engaging in SNS activity (Fig. 1).

The relationships between the company profile and firm performance can be explained by DeLone and McLean's IS Success Model [20]. In line with their research, we posit that information quality affects user satisfaction and net profit positively. In many

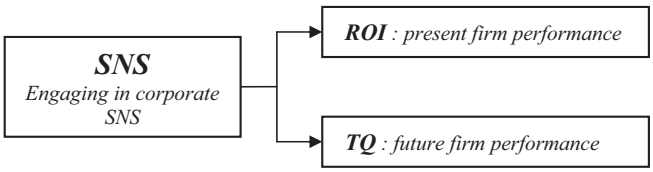

Fig. 1. Hypotheses 1 and 2.

cases, SNS like Facebook allows companies to publish images and text on a fan page in order to familiarize their customers with corporate activities and communicate with visitors. Sufficient provision of information (unless it is too complicated) contributes to better communication, which commits listeners to the speaker more deeply [31] and promotes trust [58]. Moreover, when data is seen as official and trustworthy, consumers tend to feel that the more information is provided, the better the company's reputation [58]. Therefore, the amount of information published in the company profile on an SNS page will be positively related to firm performance. Consequently, we hypothesize as follows:

Hypothesis 3. *Company-driven SNS activities are positively associated with present firm performance.*

Hypothesis 4. *Company-driven SNS activities are positively associated with future firm performance.*

2.3. Consumer-driven SNS activities and firm performance

Several variables related to customer-driven SNS activity are utilized in this study, such as the number of posted comments, the number of likes, and the number of shares on Facebook. These measures may be indicators of users' instant reactions. However, these indicators may also have other meanings related to the purpose or intention of the message. For instance, some companies conduct promotional events via Facebook. In reaction to such a promotion, the posts and likes on Facebook may simply be emotional or extempore behaviors.

When the numbers of likes and shares are high, we can interpret that users are positively disposed toward the company. Consumers like a company's posts when they think that the posts are useful [37], enjoyable [40], or trustworthy [53]; thus, they are more engaged [41,45]. Consequently, we suggest that the higher the number of Facebook likes, the more credible the brand is in the minds of consumers. Hence, the number of likes indicates the quality of the posts by the company, while the number of posts accumulated over time indicates the volume of posts. As these indicators increase in number, firm profitability increases proportionally [33,43].

Sharing and commenting on posts are regarded as different from likes. By sharing or commenting, consumers can add their feelings and opinions, either positive or negative. Moreover, sharing posts with their neighbors can be interpreted as a diffusion process [35] or network externality [40], even though "sharing" can be perceived as weaker than "posting". If consumers share and comment in order to express their positive feelings, then these activities will help to increase future firm performance. In addition, companies promote their products or services, inform potential consumers of their activities or achievements, and communicate with consumers about needs through social media like Facebook. Firms manage their customers, engage in marketing activities, and try to improve their corporate image through social media. Controlling public opinion on social media can impact firm performance positively. Thus, we put forward the following hypotheses:

Hypothesis 5. *Consumer-driven SNS activities are positively associated with present firm performance.*

Hypothesis 6. *Consumer-driven SNS activities are positively associated with future firm performance.*

2.4. Control variables

The impact of SNS may be overestimated if various other factors affecting firm performance are not considered and carefully controlled. Firm-specific variables must be controlled for in order to examine the effect of IT investment on firm performance [9]. In this study, variables are controlled for which are commonly included in management studies. Factors affecting firm performance are as follows. The larger the firm, the higher its value because of the greater opportunities for growth [28]. At the same time, company size may also have a negative effect on firm performance because of high political costs. Therefore, we include a *SIZE* variable. Evidence for a negative relationship between firm age and firm performance [24]. Therefore, we include an *AGE* variable. In addition, higher firm performance in companies with higher debt ratios [51]. Higher debt ratios can increase the degree of monitoring in the capital market. The effect of monitoring in the capital market may also be relevant to financial performance and firm performance. Therefore, we use *LEV* as a control variable in our model and expect its sign to be negative. Finally, we assume financial loss may negatively influence current firm performance and even future firm performance. Therefore, we employ *LOSS* (a dummy variable representing whether or not a firm reports a loss on the financial statement) as a control variable. We expect the sign of *LOSS* to be negative. Thus, based on research in previous studies, we include the following indicators as control variables in this study: firm size, longevity, the debt ratio, and a dummy variable, *LOSS*, which indicates that the company experienced loss. Finally, we employ an industry dummy to control for industry effects (Table 1).

3. Modeling

3.1. Data and measures for SNS usage and firm performance

In order to test hypotheses 1 and 2, we establish the model below (Eqs. (1) and (2)). The independent variable, SNS, is a dummy variable indicating that the company maintains and operates a Facebook account. After classifying the whole sample into companies using SNS (SNS = 1) and companies not using SNS (SNS = 0), we compare firm performance between these two groups. If $\beta 1$, the coefficient value of the independent variable SNS, presents a positive and significant result, this indicates that the value of companies with Facebook accounts is higher than that of those without Facebook accounts. We used ROI [25,32] and TQ [52,54,63] as proxies for present firm value and future firm value, respectively. This practice is common in papers in the general management and management science fields [25,32,52,54,63].

Table 1
Control variables.

Variables	Description
$SIZE_{t-1}$	natural logarithm as a result of total assets
LEV_{t-1}	total liabilities/total assets
AGE_t	natural logarithm as a result of age (current year − founding year)
$LOSS_{t-1}$	dummy variable: 1 if the company experiences loss, otherwise 0
IND_t	dummy variable for industry

Tobin's q is calculated as the sum of the market value of equity and the book value of debt, all divided by the book value of total assets. The market value means the stock price. This implies future expected income.

$$ROI_t = \alpha_0 + \beta_1 SNS_t + \beta_2 SIZE_{t-1} + \beta_3 AGE_t + \beta_4 LEV_{t-1} + \beta_5 LOSS_t + \beta_5 IND_t + \varepsilon_t \quad (1)$$

$$TQ_t = \alpha_0 + \beta_1 SNS_t + \beta_2 SIZE_{t-1} + \beta_3 AGE_t + \beta_4 LEV_{t-1} + \beta_5 LOSS_t + \beta_5 IND_t + \varepsilon_t \quad (2)$$

ROIt: Net income of the current term, all divided by the sum of investment;

TQ_t: Tobin's q, the sum of the market value of equity and the book value of debt, all divided by the book value of total assets;

SNS_t: dummy variable with a value of 1 if a company has its own Facebook account, otherwise 0;

$SIZE_{t-1}$: natural logarithm as a result of total assets;

AGEt: natural logarithm as a result of age (current year − founding year);

LEV_{t-1}: total liabilities/total assets;

$LOSS_t$: dummy variable with a value of 1 if the company experiences loss, otherwise 0; and

INDt: dummy variable for industry.

In this study, we utilize ROI and Tobin's q as proxies for present and future firm performance, respectively. As shown in Eq. (2) above, we use ROI as a proxy for present performance because ROI is calculated as net income of the current term, all divided by the sum of investment [25,32]. In addition, we employ Tobin's q to estimate future value because Tobin's q is computed as the sum of the market value of equity and the book value of debt, all divided by the book value of total assets [23,26,59,60].

3.2. Data and measures for company-driven corporate SNS activities and firm performance

To test hypothesis 3, we analyze the relationship between firm performance and the amount of corporate SNS usage using the model following Eqs. (3) and (4). *POCOUNT* indicates the number of posts on a company's Facebook page. In this study, this variable is a proxy of the amount of SNS usage by a given company. As another proxy variable, *POWORD* indicates the average number of words in a company's posts on Facebook. *POWORD* measures not only the frequency of posting activity, but also the length of the posts. Similarly, *INTRO* indicates the number of words in the introduction section of a company's Facebook page. In this study, we also utilize four dummy variables to examine the relationship between the content appearing on the page and firm performance; *LOC* is a dummy variable with a value of 1 if the company's location is provided on its Facebook page, otherwise 0. *PROD* is a dummy variable with a value of 1 if the production list is provided on the Facebook page, otherwise 0. *WS* is a dummy variable with a value of 1 if a link to the homepage website appears on the Facebook page, otherwise 0. In addition, *YEAR* is a dummy variable with a value of 1 if the year of establishment of the company appears on the Facebook page, otherwise 0. In Eqs. (3) and (4) below, we add all control variables considered in testing of hypotheses 1 and 2. Finally, *NUMSNS* indicates the number of SNSs (e.g. Twitter, LinkedIn, Instagram, etc.) that the company is using.

$$ROI_t = \alpha_0 + \beta_1 POCOUNT_t + \beta_2 POWORD_t + \beta_3 INTRO_t + \beta_4 LOC_t + \beta_5 PROD_t + \beta_6 NUMSNS_t + \beta_7 WS_t + \beta_8 YEAR_t + \beta_9 SIZE_{t-1} + \beta_{10} AGE_t + \beta_{11} LEV_{t-1} + \beta_{12} LOSS_t + \varepsilon_t \quad (3)$$

$$TQ_t = \alpha_0 + \beta_1 POCOUNT_t + \beta_2 POWORD_t + \beta_3 INTRO_t + \beta_4 LOC_t + \beta_5 PROD_t + \beta_6 NUMSNS_t + \beta_7 WS_t + \beta_8 YEAR_t + \beta_9 SIZE_{t-1} + \beta_{10} AGE_t + \beta_{11} LEV_{t-1} + \beta_{12} LOSS_t + \varepsilon_t \quad (4)$$

ROI_t = net income of the current term, all divided by the sum of investment; $TQ_{t:}$ = the sum of the market value of equity and the book value of debt, all divided by the book value of total assets; $POCOUNT_t$ = natural logarithm of the average number of posts on Facebook; $POWORD_t$ = natural logarithm of the average number of words used when a company posts on Facebook; $INTRO_t$ = natural logarithm as a result of the number of words used in the company introduction section of a Facebook page; LOC_t = dummy variable with a value of 1 if the company location is provided on a Facebook page, otherwise 0; $PROD_t$ = dummy variable with a value of 1 if the production list is provided on the Facebook page, otherwise 0; WS_t = dummy variable with a value of 1 if the homepage website appears on the Facebook page, otherwise 0; $YEAR_t$ = dummy variable with a value of 1 if the year of establishment appears on the Facebook page, otherwise 0; $SIZE_{t-1}$ = the natural logarithm as a result of total assets; LEV_{t-1} = total liabilities/total assets; ROA_t = net income/total assets; GRW_t = (sales of this year/sales of last year) − 1; AGE_t = the natural logarithm as a result of age (current year − founding year); $LOSS_{t-1}$ = dummy variable with a value of 1 if the company experiences loss, otherwise 0.

3.3. Data and measures for consumer-driven corporate SNS activities and firm performance

In Eqs. (5) and (6) below, *PALIKE* indicates the number of likes on a company's Facebook page. In this study, this variable is a proxy of the amount of consumer engagement on the company's Facebook page. As the proxy variables of consumer engagement, we considered *POLIKE*, which indicates the average number of likes of a post on a company's Facebook page, and *POSHARE*, the average number of shares of the posts on Facebook [19].

$$ROI_t = \alpha_0 + \beta_1 PALIKE_t + \beta_2 POLIKE_t + \beta_3 POSHARE_t + \beta_4 SIZE_{t-1} + \beta_5 AGE_t + \beta_6 LEV_{t-1} + \beta_7 LOSS_t + \varepsilon_t \quad (5)$$

$$\beta_6 LEV_{t-1} + \beta_7 LOSS_t + \varepsilon_t \quad TQ_t = \alpha_0 + \beta_1 PALIKE_t + \beta_2 POLIKE_t + \beta_3 POSHARE_t + \beta_4 SIZE_{t-1} + \beta_5 AGE_t + \quad (6)$$

ROI_t = net income of the current term, all divided by the sum of investment; $TQ_{t:}$ = the sum of the market value of equity and the book value of debt, all divided by the book value of total assets; $PALIKE_t$ = natural logarithm as a result of the number of likes of a company's page on Facebook; $POLIKE_t$ = natural logarithm as a result of the average number of likes of the company's posts on Facebook; $POSHARE_t$ = natural logarithm as a result of the average number of shares of the posts on Facebook; $NUMSNS_t$ = the number of social network sites that the company is using; $SIZE_{t-1}$ = the natural logarithm as a result of total assets; LEV_{t-1} = total liabilities/total assets; ROA_t = net income/total assets; GRW_t = (sales of this year/sales of last year) − 1; AGE_t = the natural logarithm as a result of age (current year − founding year); $LOSS_{t-1}$ = dummy variable with a value of 1 if the company experiences loss, otherwise 0.

4. Experiment

4.1. Data

The results of previous studies may also be contradictory due to the fact that many studies use data for a very limited number of firms. For example, the relationship between consumer buzz in

SNS and sales volume as a measure of firm value included 12 American companies in the hardware or software industries [42]. For social media metrics, they collected consumer rating data from the consumer technology product website CNET.com. This size limitation may prohibit generalization of the implications suggested by the results. Thus, empirical studies including a sufficient number of firms must be conducted. Hence, in this study, we evaluate the effect of SNS activities on firm performance using a full sample and including a full set of control variables that were considered as independent variables affecting firm performance. The sample employed in this study is restricted by firm-year and satisfies the criteria below:

(1) Korea Composite Stock Price Index (KOSPI)-listed companies in 2013 whose financial data are available in the Korean Information Service Value database; and

(2) Companies in non-financial industries with fiscal year-end in December.

Our analysis includes 773 firms listed in the KOSPI in 2013. We exclude companies in the financial industry and those with fiscal year-end in a month other than December. Thus, the final sample for the analysis is comprised of 565 firms.

To collect the SNS data, we investigate articles posted on Facebook from 1 January to 31 December 2013, after selecting companies with their own Facebook accounts among the KOSPI-listed companies of 2013 (excluding deactivated Facebook accounts). Among these companies, 82 firms had their own Facebook accounts and actively used them. Deactivated Facebook accounts were excluded to avoid distortion of results. In order to obtain Facebook data for these companies, we developed a Java application by making use of Facebook API (application programming interface) in the crawling part (Please see Appendix A). Facebook API allows collection of all data related to the page, posts, and relevant statistics (liking, commenting, and sharing). Then the collected data are stored in CSV format. After obtaining JSON data, we performed lexical analysis using a Morphological Analyzer and Part-of-Speech Tagger. Since this study focuses on the Facebook pages of Korean companies using the Korean language, a Korean Morphological Analyzer called RHINO Release 2.x was used. Finding the open source data at sourceforge, we can easily download it and run our experiment. Then we preprocessed text to identify nouns, adverbs, and adjectives in the comments, introduction, and posts. For *POWORD* and *INTRO*, which are not related to parts of speech and hence have nothing to do with Morphological Analysis, we developed a Java code with tokenizer functions in Java API. The Java code was able to count the number of words in blocks of text (i.e. posts and introduction). Thus, data for *POCOUNT*, *POWORD*, *INTRO*, *LOC*, *PROD*, *WS*, *YEAR*, *PALIKE*, *POLIKE*, and *POSHARE* for each sample were gathered successfully.

Table 2 shows the descriptive statistics for the variables used in our analysis. The final sample included 565 firm-year observations. The average value of Tobin's q (*TQ*), which is the variable representing future firm performance, is 0.845. The median of *TQ* is 0.596, and the standard deviation of *TQ* is 0.832. The average (median) value of *SNS*, the SNS variable, is 0.145 (0.000) and the standard deviation is 0.353.

4.2. Testing of hypotheses 1 and 2

Table 3 presents the results of the regression analysis for testing of hypotheses 1 and 2, which pertain to the association between *SNS* and present/future firm performance. In order to control for the industry effect, we added an industry dummy to the OLS model. Using Eqs. (1) and (2), we perform an OLS regression analysis. With *ROI* as the dependent variable, the coefficient of the independent variable, *SNS*, is not significant. However, using *TQ* as the dependent variable, the coefficient of the independent variable, *SNS*, is 0.448, which is statistically significant at the 1% level.

As for the control variables, the coefficient of *AGE* is not significantly associated with *ROI*. However, the coefficient of *AGE*, −0.141, has a significantly negative relation with *TQ* at the 5% level, as expected. The coefficients of *SIZE* and *LEV* are not significantly related to the dependent variables. Finally, the coefficient of *LOSS*, −0.591, is significantly associated with *ROI* at the 1% level. The

Table 2
Descriptive statistics (n = 565).

Variable	*Mean*	*Std Dev*	*Minimum*	*Lower Quartile*	*Median*	*Upper Quartile*	*Maximum*
SNS	0.151	0.359	0	0	0	0	1
POCOUNT	4.602	1.232	0	4.257	5.223	5.442	5.480
POWORD	7.753	1.544	0	7.206	8.393	8.742	9.347
INTRO	3.613	1.024	0	3.020	3.688	4.226	6.052
LOC	0.737	0.442	0	0	1	1	1
PROD	0.562	0.499	0	0	1	1	1
WS	0.962	0.191	0	1	1	1	1
YEAR	0.787	0.411	0	1	1	1	1
PALIKE	8.980	2.759	2.197	7.504	9.346	10.946	13.896
POLIKE	8.372	2.624	1.386	7.142	9.096	10.343	13.200
POSHARE	7.168	1.772	1.098	5.837	7.740	8.294	10.385
NUMSNS	0.111	0.601	0	0	0	0	7
AGE	3.618	0.503	2.079	3.465	3.737	3.951	4.770
SIZE	26.848	1.544	23.169	25.854	26.621	27.550	32.731
LEV	0.447	0.216	0.001	0.271	0.440	0.602	1.530
LOSS	0.258	0.437	0	0	0	1	1

TQ_t: = the sum of the market value of equity and the book value of debt, all divided by the book value of total assets; SNS_t = dummy variable with a value of 1 if a company has its own Facebook account, otherwise 0; $POCOUNT_t$ = natural logarithm of the average number of posts on Facebook; $POWORD_t$ = natural logarithm of the average number of words used when a company posts on Facebook; $INTRO_t$ = natural logarithm as a result of the number of words used in the company introduction section of a Facebook page; LOC_t = dummy variable with a value of 1 if the company location is provided on a Facebook page, otherwise 0; $PROD_t$ = dummy variable with a value of 1 if the production list is provided on the Facebook page, otherwise 0; WS_t = dummy variable with a value of 1 if the homepage website appears on the Facebook page, otherwise 0; $YEAR_t$ = dummy variable with a value of 1 if the year of establishment appears on the Facebook page, otherwise 0; $PALIKE_t$ = natural logarithm as a result of the number of likes of a company's page on Facebook; $POLIKE_t$ = natural logarithm as a result of the average number of likes of the company's posts on Facebook; $POSHARE_t$ = natural logarithm as a result of the average number of shares of the posts on Facebook; $NUMSNS_t$ = the number of social network sites that the company is using; $SIZE_{t-1}$ = the natural logarithm as a result of total assets; LEV_{t-1} = total liabilities/total assets; ROA_t = net income/total assets; GRW_t = (sales of this year/sales of last year) − 1; AGE_t = the natural logarithm as a result of age (current year − founding year); $LOSS_{t-1}$ = dummy variable with a value of 1 if the company experiences loss, otherwise 0.

Table 3
Results of testing of hypotheses 1 and 2.

Variable	KOSPI (565 firm-year observations)	
	ROI β (*t-value*)	*TQ* β (*t-value*)
Intercept	1.244	1.803*
	(0.760)	(2.139)
SNS	0.132	0.448**
	(0.754)	(4.957)
AGE	−0.049	−0.028
	(−1.177)	(−1.306)
SIZE	0.015	−0.141*
	(0.132)	(−2.361)
LEV	−0.094	0.039
	(−0.342)	(0.276)
LOSS	−0.591**	−0.102
	(−4.390)	(−1.471)
IND	Included	Included
F-value	0.781	3.316**
Adj-R^2	2.25%	18.4%

ROI_t = net income of the current term, all divided by the sum of investment; TQ_t = the sum of market value of equity and book value of debt, all divided by book value of total assets; SNS_t = dummy variable with a value of 1 if a company has its own Facebook page, otherwise 0; AGE_t = natural logarithm result of (current year − founding year); $SIZE_{t-1}$ = natural logarithm result of total assets; LEV_{t-1} = total liabilities/total assets; $LOSS_{t-1}$ = dummy variable with a value of 1 if the company experiences loss, otherwise 0, IND_t: dummy variable for industry.
* $p < 0.05$.
** $p < 0.01$.

other coefficient of *LOSS* is −0.102, which is not significantly associated with *TQ*.

4.3. Testing of hypotheses 3 through 6

Table 4 shows the results of testing of hypotheses 3 through 6. The coefficient of *POCOUNT* shows no significant relationship with *ROI* and *TQ*. The coefficient of *POWORD* is not significantly associated with *ROI* and *TQ* either. The coefficients of *INTRO* and *LOC* are significantly associated with *TQ*. The coefficient of *INTRO* is 0.006, which is statistically significant at the 1% level. The coefficient of *LOC* is −0.450, which indicates a significantly negative relationship with *TQ* at the 10% level. However, the coefficients of *INTRO* and *LOC* are not significantly associated with *ROI*. In addition, the coefficients of *PROD, WS,* and *YEAR* are not significantly related to *ROI* and *TQ*.

The results of testing of the association between consumer-driven SNS activities (*PALIKE, POLIKE,* and *POSHARE*) and *ROI*/*TQ* are reported below. The coefficients of *PALIKE* are not significant for either of these variables. The coefficient of *POLIKE* for *ROI* is significant at the 1% level, although the coefficient of *POLIKE* is not significantly associated with *TQ*. Also, the coefficients of *POSHARE* are not significantly associated with either *ROI* or *TQ*.

As for the control variables, we employ *NUMSNS* to control for the effect of other SNSs (Twitter, LinkedIn, etc.) for testing of hypotheses 3 through 6. The coefficients of *NUMSNS* are not significantly associated with *ROI* or *TQ*. The coefficients of *AGE* are not significantly associated with *ROI* or *TQ*. The coefficients of *SIZE* are also not significantly associated with *ROI* and *TQ*. However, the coefficients of *LEV* are negatively and significantly related to *ROI* and *TQ*. The coefficient of *LEV* for *ROI* (company-driven SNS activities) is −544.314, which is statistically significant at the 10% level. The coefficient of *LEV* for *ROI* (consumer-driven SNS activities), −787.649, is significant at the 1% level. In addition, the coefficient of *LEV* for *TQ* (company-driven SNS activities) is −2.127, which is statistically significant at the 1% level. The coefficient of *LEV* for *TQ* (consumer-driven SNS activities) is −2.0576, which is significant at the 1% level. Finally, the coefficients of *LOSS* are not significant for either *ROI* or *TQ*.

Table 4
Results of testing of hypotheses 3 through 6.

Variable	KOSPI (82 firm-year observations)			
	Company-driven		Consumer-driven	
	ROI β (*t-value*)	*TQ* β (*t-value*)	*ROI* β (*t-value*)	*TQ* β (*t-value*)
Intercept	−1,145.526	4.848	−75.138	4.101
	(−1.242)	(2.416**)	(−0.00)	(1.900*)
POCOUNT	73.131	−0.036		
	(0.760)	(−0.174)		
POWORD	−49.587	0.084		
	(−0.704)	(0.548)		
INTRO	0.444	0.006		
	(0.585)	(3.516***)		
LOC	−100.291	−0.450		
	(−0.884)	(−1.835*)		
PROD	−66.402	0.188		
	(−0.646)	(0.852)		
WS	235.329	0.293		
	(0.965)	(0.552)		
YEAR	81.862	−0.147		
	(0.610)	(−0.512)		
PALIKE			3.930E-5	−4.862E-7
			(0.081)	(−0.390)
POLIKE			0.004	4.241E-6
			(2.655***)	(0.571)
POSHARE			−36.051	−4.720E-6
			(−1.182)	(.513)
NUMSNS	14.934	−0.075	−51.694	−0.101
	(.392)	(−0.907)	(−1.341)	(−1.010)
AGE	35.500	−0.144	27.803	−0.192
	(.480)	(−0.907)	(0.436)	(−1.169)
SIZE	48.067	−0.103	26.470	−0.028
	(1.423)	(−1.413)	(0.876)	(−0.360)
LEV	−544.314	−2.127	−787.649	−2.0576
	(−1.892*)	(−3.448***)	(−2.762***)	(−2.832***)
LOSS	−243.319	−0.216	−197.148	−0.485
	(−1.751*)	(−0.716)	(−1.496)	(−1.432)
F-value	1.705*	3.045***	5.504***	2.233**
Adj-R^2	21.2%	35.0%	44.5%	24.5%

ROI_t = net income of the current term, all divided by the sum of investment; $TQ_{t:}$ = the sum of the market value of equity and the book value of debt, all divided by the book value of total assets; SNS_t = dummy variable with a value of 1 if a company has its own Facebook account, otherwise 0; $POCOUNT_t$ = natural logarithm of the average number of posts on Facebook; $POWORD_t$ = natural logarithm of the average number of words used when a company posts on Facebook; $INTRO_t$ = natural logarithm as a result of the number of words used in the company introduction section of a Facebook page; LOC_t = dummy variable with a value of 1 if the company location is provided on a Facebook page, otherwise 0; $PROD_t$ = dummy variable with a value of 1 if the production list is provided on the Facebook page, otherwise 0; WS_t = dummy variable with a value of 1 if the homepage website appears on the Facebook page, otherwise 0; $YEAR_t$ = dummy variable with a value of 1 if the year of establishment appears on the Facebook page, otherwise 0; $PALIKE_t$ = natural logarithm as a result of the number of likes of a company's page on Facebook; $POLIKE_t$ = natural logarithm as a result of the average number of likes of the company's posts on Facebook; $POSHARE_t$ = natural logarithm as a result of the average number of shares of the posts on Facebook; $NUMSNS_t$ = the number of social network sites that the company is using; $SIZE_{t-1}$ = the natural logarithm as a result of total assets; LEV_{t-1} = total liabilities/total assets; ROA_t = net income/total assets; GRW_t = (sales of this year/sales of last year) − 1; AGE_t = the natural logarithm as a result of age (current year − founding year); $LOSS_{t-1}$ = dummy variable with a value of 1 if the company experiences loss, otherwise 0.
* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.

5. Discussion

5.1. Main findings

Prior studies about the contributions of SNS have mentioned customer awareness, customer engagement [15,29,46], customer satisfaction [47], intention to use [4,30], and continuance intention [7]. Though many studies imply that these SNS effects may be linked to financial performance, they do not conduct empirical

analyses including financial outcomes such as sales volume. By contrast to these studies, our empirical study is based on the assumption that a company's SNS activities partly influence current firm performance (ROI) and future firm performance (Tobin's q).

The results of testing of hypothesis 1 suggest that whether or not a company engages in SNS activity has no effect on current firm performance, *ROI*. However, it has a positive effect ($\beta = 0.498$, $p < 0.01$) on future firm performance, as proxied by Tobin's q. it may be that companies engaging in SNSs like Facebook utilize the service to build friendly relationships with consumers and increase loyalty. When companies communicate and share information with consumers via SNS, they can improve their image. Although operating a Facebook page does not affect current financial performance, as a result of engagement in SNS activities, companies can lead Facebook members to become potential consumers and eventually increase future firm performance.

The significant effect of company-driven SNS activity on future firm performance is partly explained by the carry-over effect of SNS advertising. The carry-over effect refers to the amount of transfer of a consumer's impression or memory caused by the company's SNS posts from the current state to the next timeline [1]. The importance of the carry-over effect has remained unquestioned for decades [57], but its nature has not been well understood. In the context of SNS, company profiles posted on SNS remain available for a longer time than through other media, and due to the lower costs and positive network effects of advertising via SNS, posting a company profile on SNS may be more beneficial than doing so through any other marketing channels despite the minimal short-term effect.

The results of testing of hypotheses 3 and 4 imply that company-driven activities are more strongly related to *TQ* (*Adj-R^2* of *TQ:* 35.0%) than *ROI* (*Adj-R^2* of *ROI*: 21.2%). By contrast, consumer-driven activities are more strongly associated with *ROI* (*Adj-R^2* of *ROI*: 44.5%) than *TQ* (*Adj-R^2* of *TQ*: 24.5%). This indicates that the level of company-driven activity can increase future firm performance, while the level of consumer-driven activity can influence current firm performance.

The implications of the results of testing using company-driven activity factors are as follows. No significant relationship was found between *POCOUNT* and *POWORD* and *ROI* or *TQ.* These results indicate that the number of posts on Facebook and the number of words in Facebook comments have no effect on current firm performance and future firm performance. Thus, we now know that the quantity of information on Facebook has no effect on firm financial performance or value.

It is interesting that one of the company-driven factors, *INTRO*, which represents the number of words used in the company introduction section of a Facebook page, has a strongly positive effect on Tobin's q ($\beta = -0.006$, $p < 0.01$). This fact may be explained as follows: many consumers can gain and understand information related to the company through this introduction. Companies that operate their own Facebook pages may therefore want to control the number of words used to introduce themselves. The text appearing at the top of a Facebook page induces more user interest than text in other positions [16]. Hence, this text is associated with brand popularity. Click frequency, especially at the top position of the page, is also affected. According to these prior studies, just as an advertisement placed in the top position of other media is most efficient, the introduction section of a Facebook page is also effective. Moreover, the text in the top position of a Facebook page rarely changes, while posts and comments appear and disappear as subsequent posts are uploaded. Thus, this text may have a positive influence on the company image and reputation, eventually leading to an increase in future firm performance. However, according to the results of our study, the number of words used in the company introduction part of a Facebook page has no effect on current firm performance, possibly because it typically does not include advertisement about specific products and services. Rather, the company introduction section of a Facebook page typically includes information about the location of headquarters, how to buy products and services, links to the web site, company history, and so on. In this study, we also analyze effects of these factors specifically. Interestingly, *LOC* has a significant negative relation with Tobin's q. If the location of the company headquarters is in a domestic region, consumers may assume it is a domestic company, which suggests the possibility that the company limits its business to that region. This may explain the negative relation between *LOC* and future firm performance. However, the association between *LOC* and current firm performance is not significant because the location of headquarters may have no immediate effect on firm performance. The variables *PROD, WS,* and *YEAR* have no significant association with *ROI* and *TQ.* These facts indicate that consumers may think that the company introduction information is unrelated to the selling of products and services, links to the web site, and company history.

The results of this study indicate that consumer-driven activity factors affect present firm performance rather than future firm performance. *POLIKE* was positively and significantly associated with *ROI* ($\beta = 0.004$, $p < 0.01$), but not with *TQ.* Companies promote their products or services, inform potential consumers of their activities or achievements, and communicate with consumers about their needs through social media like Facebook. One page of Facebook consists of a few posts. From the results of our study, we infer that consumers tend to recognize and react not to individual Facebook pages, but to Facebook posts. These results suggest that expressing preferences by posting on Facebook is related to current performance because it is an instant reaction to a post such as event promotion. That is why this phenomenon does not remain consistent over time. Hence, *POLIKE* may be unrelated to future firm performance because of the short-term nature of likes. Companies should therefore manage the preferences and needs of consumers from a long-term perspective. In addition, *PALIKE* and *POSHARE* had no significant relation with *ROI* and *TQ.*

Consumers can acquire information as to a company's products or services through use of Facebook, which may affect their decision-making. Since SNS allows two-way communication between corporations and consumers, combining SNS with other marketing media may result in a viral marketing effect. This means that consumers can play a role in spreading information about a company's products or services. However, this does not mean that what consumers share is also preferred by their friends. People often do not like other people's sharing of their perspectives. Moreover, social media users may engage in SNS activity just for fun, not to support the company's fan page. This explains the insignificant coefficient of *POSTSHARE* in terms of profitability in our study.

The results of testing including control variables are as follows (Tables 3 and 4). The result for *AGE* is inconsistent. Except for the relation with *TQ* in Table 3, the result is not significant. From this result, we can infer that there are mature companies that do not adapt themselves to changes in the business environment. Thus, corporate age may not be highly related to firm performance. Except for the relation with *TQ* in Table 3, the results for *SIZE* are also inconsistent. Larger companies have been shown to have higher political costs [28]. Thus, because larger firms have more factors to consider, firm performance may be decreased. At the same time, however, larger companies can invest in themselves much more than smaller companies, which can increase firm performance. Therefore, these two contrasting factors may have made the coefficient of *SIZE* inconsistent. The coefficients of *LEV*

were all significantly associated with *ROI* and *TQ*. From this result, we can infer that companies with higher debt ratios have a higher risk of bankruptcy, which has a negative effect on current firm performance and future firm performance. Inconsistent results were also found for the last control variable, *LOSS*, in relation to *ROI* and *TQ*. Subsequent loss can decrease firm performance. In addition, fluctuations in loss and profit can lead to changes in firm performance.

In our study, only a single year was included in the analysis period because of the limitations of collecting Facebook data. Thus, this unexpected result may be caused by the limitations related to data collection and the brevity of the analysis period. *NUMSNS*, the number of social network sites that the company is using, was also not significantly related to *ROI* and *TQ*. This indicates that companies using Facebook do not need to operate another SNS for business success.

5.2. Theoretical implications

Our study makes important theoretical contributions to the emerging body of knowledge about the operational and managerial issues related to SNS. First, prior studies investigated factors related to SNS that affect its success, such as consumer engagement [15,29,46]. However, to the best of our knowledge, this is the first study to offer a firm-level evaluation of SNS with a set of companies from a single country. Prior studies on the relationship between SNS and future firm performance have presented contradictory results [2,8,11,43]. Most of these studies use data from a very restricted set of companies. Moreover, not a few studies adopt survey data, which must involve subjective opinions from the participants. This restricts the objectivity of the results. By contrast, we include a full set of companies listed in the market and data from public and objective sources. Hence, our results are free from concerns about biased selection of participants or conceptualization of the variables. Consequently, we believe that our empirical results are unbiased.

Second, this study expands our knowledge in the SNS field to the strategic level. Its results show that a company's use of SNS may be an important factor affecting corporate outcomes such as current firm performance and future firm performance. SNS is a powerful and effective means to influence corporate outcomes, not merely at the departmental level in terms of marketing costs or consumer satisfaction [2,16]. For example, although the decrease in marketing costs due to SNS usage has been noted in other research [2], the relationship of this decrease with future firm performance (e.g., profitability) is unclear. In fact, decreased marketing costs may negatively affect sales volume. However, our results reveal that SNS usage is directly associated with *ROI* and Tobin's q, which is a recently and widely adopted metric in information systems and accounting research frequently used to examine firm performance. Moreover, we classify SNS factors as company-driven activity and consumer-driven activity for the first time, discovering that company-driven activity outperforms consumer-driven activity in predicting future firm performance, while consumer-driven activity outperforms company-driven activity in predicting present firm performance.

Third, this study is the first to expand our knowledge of the value of SNS in B2B companies through empirical tests with data crawled from SNS. Investigating social media use in B2B companies is worthwhile in industrial marketing and consumer behavior research. Social media is now popular in these companies as well as in B2C companies [12] to build up marketing strategy [5], value co-creation [34], B2B communication [61], and customer satisfaction [3]. Moreover, B2B e-commerce is valued at more than that of B2C e-commerce. However, there is a lack of empirical research into SNS in the B2B environment based on data from within social media [48]. Thus, B2B companies were included in the hypothesis testing.

Further, our study is rigorous because its models employ control variables that have been included in previous accounting research, whereas prior studies' models do not [6,14]. Therefore, we provide more reliable research results on the relationship between SNS and future firm performance. Our findings suggest that SNS use exerts a significant influence on future firm performance in terms of Tobin's q. Furthermore, rigorous use of these control variables extends the generalizability of the research model.

5.3. Managerial implications

The results of our study offer important practical implications for business practitioners interested in SNS. In particular, since we investigate all listed corporations in a whole country that are actively utilizing Facebook, the implications are pervasively objective. Hence, this information is relevant for managers, researchers, or consumers who are interested in the usage and potential advantages of SNS. First, in order to improve firm performance and use SNS more effectively, we suggest the need to pay attention to the introduction part of the Facebook page and the company location. In the long term, companies must control the introduction part of their Facebook pages and provide information about the company location, since these factors can influence future firm performance. Also, companies must manage and consider the effects of Facebook posting. In the short term, companies should consider the effects of Facebook posting on current firm performance.

Further, our findings provide evidence of the significant impact of SNS on stock prices and outcomes in areas other than corporate profile. Based on these results, CEOs should recognize that SNS is not just a departmental tool, but potentially a corporate- and strategic-level tool. Therefore, corporate-level SNS management plans must be developed by executives and controlling managers. In accordance with the CEO's plan, the CMO should monitor the marketing, public relations, and communications departments' activities as a regular part of SNS management. In addition, utilizing SNS has the potential to improve current firm performance and future firm performance. Hence, CMOs must establish SNS activity plans according to the current status of their companies. For example, the introduction should demonstrate that the company's management is responsible, advertising new products and services, or sharing the corporate vision with potential consumers, including information about the company location. In addition, CMOs should take SNS activities into account in their strategizing to increase firm performance, which may affect present and future financing significantly.

5.4. Limitations and future research

One limitation of this study relates to the selection of SNS: Facebook. We excluded domestic SNS (e.g., me2 day, cyworld) and SNS that is only used in a few countries (e.g., WeiBo) in order to ensure the generality of the findings. Also, we did not consider Twitter and LinkedIn, which are two of the top three most frequently used SNSs in the world. Comparing the statistics about some of the responses about the posts (e.g., likings, comments and sharing) for each company with Facebook and those with Twitter is very difficult. Moreover, LinkedIn does relatively little advertising of what the company is doing for consumers; hence, the statistics from LinkedIn may distort the results for predicting firm performance if they are combined with those from Facebook. Consequently, we consider Facebook only in our empirical tests to ensure the generality and consistency of the empirical results. Nevertheless, careful integration of the data from Twitter and

LinkedIn with that of Facebook may strengthen the data set. However, *NUMSNS* (the number of social network sites that the company is using), one of control variables, has no significant association with firm performance. We therefore infer that companies do not need to engage in SNS activity on multiple sites for business success. Since Facebook is a general and universal SNS, companies using only Facebook may not need to use additional SNS to improve their outcomes.

The results of our paper are pertinent to the Korean corporate environment. Since Korea has a strong IT infrastructure and the majority of Korean companies are actively using information systems such as social media, we believe that the results of our study provide valid insight that may be applicable to social media and firm performance in other countries. Moreover, we examined the most widely used social media in the world, Facebook, which may minimize the national difference issue. However, scholars and practitioners must be careful in generalizing the results.

We collected SNS data during only a single analysis period because SNS usage at the corporate level is a relatively recent phenomenon. Since lack of longitudinal data may limit the generalizability of the results in estimating the coefficients of some control variables, it is necessary to extend the analysis period by obtaining more data for more than one year in a future study.

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Appendix A. Sample Java code for Data Crawling from Facebook

```
package facebook;

import java.io.FileOutputStream;
import java.io.IOException;
import java.io.OutputStreamWriter;
import java.util.List;
import com.opencsv.CSVWriter;
import com.restfb.*;
import com.restfb.DefaultFacebookClient;
import com.restfb.FacebookClient;
import com.restfb.FacebookClient.AccessToken;
import com.restfb.types.Post;
import com.restfb.types.User;

public class Crawling {
	public static void main(String[] args) throws IOException {
		String accessToken = token name; @SuppressWarnings("deprecation")
		FacebookClient fbClient = new DefaultFacebookClient(accessToken);
		Connection<Post> result =fbClient.fetchConnection("CJcheiljedang/feed", Post.class);
		CSVWriter writer;
		writer = new CSVWriter(new OutputStreamWriter(new FileOutputStream(user path)));
		String[] temp = new String[N];
		int counter = 0;
		for(List<Post> page : result){
			for(Post aPost : page){
				temp[0] = aPost.getId();
				temp[1] = aPost.getMessage();
				temp[2] = aPost.getLikesCount();
					……
				temp[N] = aPost.getSharesCount();
				writer.writeNext(temp);
				counter++;
			}
		}
		temp[0] = ""+counter;
		writer.writeNext(temp);
		writer.close();
	}
}
```

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