Linking Media Communication Efficiencies to Stock Valuation

〔Research note〕

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メディアコミュニケーション効率性と企業価値評価の関係

Woo Li Ko

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1. Introduction

As companies increasingly use multiple media platforms to engage with consumers, an integrated approach that considers all platforms collectively is essential (Lee et al., 2022). Traditionally, companies focused on paid media activities, such as television, newspapers, print, and online advertising, but with the rise of social media popularity, companies have begun to underscore the importance of managing customer relationships through platforms like blogs, Twitter, and Facebook (Shankar & Kushwaha, 2021). However, implementing multiple media communication strategies demands substantial resources and effort. For companies, the bottom line is accountability (Taylor, 2011). Thus, companies that can justify their investment levels in media communication strategies should be recognized by the financial market as efficient investors.

The efficient capital market (ECM) hypothesis posits that stock prices reflect all available market information (Jensen, 1978). Therefore, a strategy is only valued by the financial market when its effects are fully manifested in accounting performance. This puts marketers under intense pressure to quantify the impact of media activities and enhance the efficacy of media communication strategies (Danaher & Rust, 1994). To invest effectively in developing multichannel media activities, it is imperative to have media-related knowledge that competitors cannot easily replicate (Danaher, 2023). Ideally, the market should value companies that exhibit high media communication efficiencies. However, shareholders, not being marketing experts, may underestimate the influence of media communication efficiencies on future cash flows (Srinivasan & Hanssens, 2009; Katsikeas et al., 2016). This mispricing by the financial market can yield additional returns for companies with efficient marketing communication strategies. This study aims to empirically quantify the financial value of such strategies to better understand the value of media communication efficiency from the financial market's viewpoint.

The present study aims to evaluate media communication efficiencies and identify efficient investors with effective media communication strategies. It also seeks to determine whether there is a significant predictive relationship between media communication efficiencies and stock market valuation. To achieve this, we need to distinguish between efficient and inefficient investors in developing media communication strategies and examine the impact of efficiency on firm valuation. This study contributes to the literature in several ways. Unlike previous studies that limit their analysis to paid media activities (Luo & Donthu, 2001, 2005; Büschken, 2007; Spotts et al., 2022), we consider multiplatform media activities as a communication system. This approach provides a more realistic assessment of media communication efficiency. Furthermore, this study posits that efficiency in media communication strategies is a unique asset that can be valued. If the market underreacts to the economic value added by efficient media communication strategies, it could yield additional returns in the financial market.

2. Media Effectiveness and Efficiency

2.1. Media Types and Effectiveness

It is now commonplace for companies to develop marketing communication strategies that encompass a variety of media activities. Media can be categorized into three types, based on their characteristics (Stephen & Galak, 2012). First, paid media refers to activities that a company pays for, such as traditional advertising (TV, radio, print) and online advertising (banners, pop-ups, displays). Second, owned media encompasses activities generated on channels controlled by the company, including official company websites, blogs, and social media platforms, such as Facebook and Twitter. Finally, earned media is generated by external entities through ratings, reviews, and comments. Although companies cannot directly control earned media activities, these can serve as a performance indicator. Therefore, earned media should be considered a key component of media communication strategies, and companies should strive to maintain strong relationships with customers and journalists (Adeola et al., 2020).

Numerous scholars have thoroughly examined the impact of various media activities on sales performance. This includes the effects of paid media, such as advertising and sponsorships, on short-term and long-term sales (Lodish et al., 1995; Danaher et al., 2010), the influence of owned media through official network effects (Stephen & Galak, 2012), and the impact of word-of-mouth from earned media (Chevalier & Mayzline, 2006; Bruce et al., 2012; Berger et al., 2010). Additionally, recent studies have explored the effects of cross-media platforms on sales, demonstrating that social media can complement traditional media activities (Onish & Manchanda, 2011; Taylor & Kennedy, 2013; Spotts et al., 2022).

Despite the focus on the role of media communication activities, their impact on sales

performance is underrepresented in the marketing literature (Luo & Donthu, 2001; Dong et al., 2018). Marketers are not only interested in the effectiveness of these activities but also in the output they generate, referred to as efficiency. Implementing multiple media activities demands substantial investment and effort. For businesses, accountability is paramount. Therefore, they must invest efficiently in media communication strategies, which involve examining the profitability of these activities in relation to outcomes, such as sales. Thus, we assess the efficiency of three media activities in relation to sales performance.

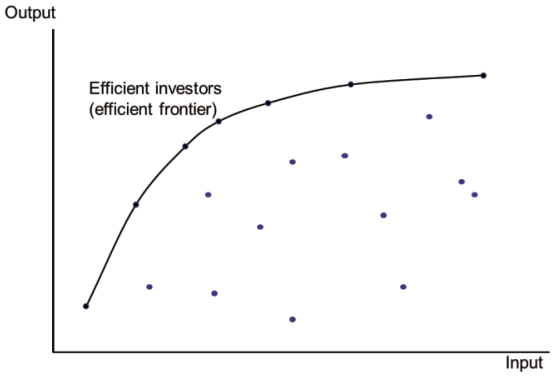
2.2. Media Communication Efficiency and DEA Analysis

Previous academic research has established that media activities influence sales (Lodish et al., 1995; Stephen & Galak, 2012; Joshi & Hanssens, 2010). However, a critical question remains: "Does each media activity contribute to profit generation?" Media communication efficiency, defined as the profitability of media activities, focuses on the impact of these activities relative to the investment made (Büschken, 2007). Several studies have highlighted the issue of inefficiencies in media activities, often resulting from overestimation of media effects (Bass, 1979; Aaker & Carman 1981; Dutta et al. 1999). Consequently, companies tend to overinvest in media activities, and without proper accountability, a significant portion of these efforts is wasted.

In today's landscape, various media channels coexist. It is crucial to view these multichannel activities as an integrated media communication system and empirically evaluate their efficiency in driving sales performance. Additionally, numerous scholars have discussed the importance of responding to competitors' actions (Aaker & Carman, 1982; Rust et al., 2004). This suggests that companies are not only attuned to their competitors' media activities, but they often formulate their media communication strategies with competitors in mind. Therefore, it is advantageous to gauge media communication efficiencies using relative measurements, such as comparing performance against that of industry peers.

Data envelopment analysis (DEA) is a well-established nonparametric method for measuring relative efficiency. It has been used to study performance in various contexts, such as salespeople (Pilling et al., 1999), retail outlets (Donthu & Yoo, 1998), and advertisers (Luo & Donthu, 2001; Büschken, 2007). Originally proposed by Charne, Cooper, and Rhodes (1978), DEA can evaluate multiple criteria when measuring media efficiency. It derives a single efficiency score by finding input and output weights that maximize the combined output-input ratio for each company. A company's media communication efficiency is measured relative to all other companies, with the stipulation that all companies lie on or below the efficient frontier, defined by the most efficient company. Figure 1 illustrates an example of a case with one input and one output. Efficient investors are companies that generate the highest possible outcome at each input level among observed practices. Companies located below the frontier line are deemed inefficient investors.

Figure 1. DEA efficient frontier



The primary analysis of this research focuses on two aspects: 1) the output a company generates from given inputs relative to other companies in the same industry, and 2) the value placed on efficient investment in a media communication strategy in terms of firm valuation. Therefore, we use the output-oriented DEA model, presented below.

(1)

$Max\ \ \phi$

Subject to

$$\sum_{j=1}^{n} \lambda_j \chi_{ij} \leq \chi_{i0} \qquad i \ = 1, \ldots, \mathrm{I};$$

$$\sum_{j\ =1}^{n} \lambda_j y_{rj} \ \leq \ \phi y_{r0} \quad r \ = 1, \ldots, R;$$

$$\sum_{j=1}^{n} \lambda_j = 1$$

$$\lambda_j \ \geq \ \ 0 \qquad j = company$$

Here, ∅ is the efficiency coefficient for the company under analysis, and ∅ = 1 indicates that the company is an efficient investor, and the ∅ > 1 indicates inefficiency in investing in media communication strategies. The observed input vector of the company under analysis is denoted by x_{io}, y_{ro} is the observed output vector for the company under analysis, and λ denotes the activity vector.

This study concentrates on the significance of ∅ for each firm within competing industries. For a company to be an effective investor in multichannel media activities, it needs a comprehensive

understanding of how to use multiple media channels. Therefore, this research seeks to determine whether the stock market accurately appreciates the advantages of efficient media communication.

3. Data and Research Methodology

To evaluate the efficiency of media communications, we require both input and output variables. We collect three types of media communications data — paid media, owned media, and earned media — as multiple input variables. Paid media data, specifically advertising expenses, are gathered from COMPUSTAT, which they publish annually. Owned and earned media data are collected daily from various sources. Owned media data include the number of news posts from official press releases on company websites, Facebook, and Twitter. We collect these data at the company level, not the brand level. Earned media data consists of daily blog posts about the targeted companies and their brands, sourced from the Lexis/Nexis web blog databases. To ensure consistency across media types, we convert daily data into annual measures. Finally, as the output variable, we obtain sales data for the fiscal year 2022 from COMPUSTAT.

Table 1. Variable definitions

Variables		Example	Data from (year 2022)
Inputs	Paid media	Traditional offline & online advertising	COMPUSTAT - Advertising expenditure
	Owned media	Company websites -press release -news Company-owned pages on online social networks -Twitter -Facebook	No. of news posts from official press releases on - a company website -Facebook -Twitter
	Earned media	Daily blog posts on professional media outlets Ratings & reviews	Lexis/Nexis Web blogs database
Output	sales	Sales amount in the year 2022	COMPUSTAT - Sales ($)

3.1. Classifying Sectors

DEA enables us to gauge the relative efficiencies of media communication and the variations in media communication activities across different companies due to sector-specific effects. For

accurate measurement, companies should be grouped by sectors to ensure industry-specific sample homogeneity. In this study, companies in the final sample are matched according to the three-digit grouping in the standard industrial classification. In total, seven distinct sectors were selected to identify companies with a sufficient number of industry competitors: 1) non-durable goods firms, 2) durable goods firms, 3) transport firms, 4) service firms, 5) high-tech firms, 6) retail firms, and 7) financial firms.

3.2. Portfolio Formation

This study primarily investigates whether the market underreacts to the economic value added by efficient communication media, and if so, whether this results in additional returns in the financial market. The analysis concentrates on the performance of companies with efficient communication media compared to the broader market. Companies are categorized into three portfolios based on two criteria: 1) whether a company's media communication efficiency is at or below the frontier for that period, and 2) whether a company's media communication efficiency is above or below the industry average efficiency score. The three distinct portfolio groups are as follows.

Table 2: Portfolio formations

	Media communication efficiency	Grouping with efficiency level compared to industry average efficiency score
Portfolio 1	Frontier	-
Portfolio 2	Below the frontier	Above
Portfolio 3	Below the frontier	Below

Portfolio 1 comprises companies with 100% efficiency scores (frontier), representing efficient investors. Companies falling below this efficient frontier are further categorized based on whether they are above or below the industry's average efficiency scores, forming portfolios 2 and 3, respectively.

3.3. Data and Measures for Assessing Abnormal Portfolio Returns

This study investigates whether the efficiency of media communication leads to pricing anomalies by focusing on abnormal returns. The sample consists of NYSE-AMEX- and Nasdaq-listed U.S. companies with efficient media communication. Monthly returns are matched with data from the University of Chicago's Center for Research in Security Prices (CRSP) database. The values for the risk-free return ($Ret_{riskfree}$), market return (Ret_{mkt}), market size (SMB), book-to-market (HML) and momentum factors (MOM) are sourced from Kenneth French’s data library.

If the market underestimates the effectiveness of media communication strategies, this violates the ECM hypothesis (Jensen, 1978), leading to companies with high efficiencies earning positive abnormal returns. This study uses firm-specific risk models from the financial literature to identify pricing anomalies (Fama & French, 1996; Carhart, 1997). Risk is defined as the volatility of a firm's equity value. By controlling for four risk factors—market, size, value, and momentum—the firm-specific risk model can capture nearly all pricing anomalies (Fama & French, 1992).

(2)

$$Ret_{it} - Ret_{riskfree,t} = \alpha_i + \beta_i\left(Ret_{mkt,t} - Ret_{riskfree,t}\right) + s_i(SMB_t) + h_i(HML_t) + m_i(MOM_t) + \varepsilon_{it}$$

Here, Ret_{it} represents the rate of return for a company i at time t, $Ret_{riskfree,t}$ is the risk-free rate at time t, $Ret_{mkt,t}$ is the average market returns at time t, SMB_t is the size effect, HML_t is the value effect, MOM_t is Carhart's momentum effects, and a_i is the intercept. Notably, the HML factor captures the return difference between value stocks (high book-to-market) and growth stocks (low book-to-market). A "value stock" will have a positive exposure to HML, while a "growth stock" will have a negative exposure. The intercepts from the regressions can be interpreted as abnormal returns relative to the four-factor model.

The coefficients estimate a company's risk exposure. These coefficients, $\left(Ret_{mkt,t} - Ret_{riskfree,t}\right)$, when equal to one and the other factor coefficients are zero, reflect a risk sensitivity similar to that of the broader market index (Aksoy et al., 2008). By classifying portfolios based on media communication efficiency, we can reduce other firm-specific factors and focus on the influence of media communication efficiency on stock valuation (Jacobson & Mizik, 2009; Aksoy et al., 2008). The initial step is to calculate abnormal returns by firm, aggregate these returns into a portfolio, and then ascertain whether the mean abnormal returns for companies within a specific portfolio significantly deviate from zero.

4. Expected Results of Empirical Analysis

This study's theoretical premise suggests that greater media communication efficiency should correspond to higher abnormal returns, and vice versa. Table 3 presents projected estimates of abnormal returns, factoring in risk parameters, across three distinct portfolios:

- Portfolio 1 consists of companies with efficient frontiers that will demonstrate the highest abnormal returns, all of which are statistically significant, compared with Portfolio 2 and Portfolio 3.
- Portfolio 2 comprises companies that fall below the efficient frontier but exceed the

industry's average efficiency scores. Consequently, their abnormal returns are not anticipated to deviate significantly from zero.

- Portfolio 3 comprises companies with efficiency scores below both the frontier and the industry average. It is anticipated that Portfolio 3 will exhibit either negative abnormal returns with marginal significance, or abnormal returns that are not statistically different from zero.
- Risk parameter estimates are expected to show that four risk factors sufficiently capture stock price volatility. Specifically, the MKT risk (Ret_(mkt,t)-Ret_(risk free,t)) indicates the portfolio's risk relative to the overall market. An MKT coefficient of less than one signifies that the portfolio carries less risk than the market, overall. It is expected that Portfolio 1 will exhibit the lowest MKT coefficient..
- For the SMB parameters, Portfolio 1 is expected to have a negative load, indicating its association with large-cap stocks. Conversely, it is anticipated to have a positive load on HML, suggesting its classification as value stocks.
- Finally, a significant difference is anticipated between Portfolio 1 and Portfolio 3 in terms of the MOM effect. Portfolio 1 is expected to have a positive MOM value, while Portfolio 3 is likely to have a negative MOM value. This suggests that the market favors Portfolio 1 over Portfolio 3.

Table 3: Projected estimates of abnormal returns, factoring in risk parameters

			α_i	MKT,β_i	SMB,s_i	HML,h_i	MOM, m_i	R^2
No Portfolio formation	Durable	Estimate t-statistic						
	Non-durable	Estimate t-statistic						
	Transport	Estimate t-statistic						
	Service	Estimate t-statistic						
	High-tech	Estimate t-statistic						
	Retail	Estimate t-statistic						
	Financial	Estimate t-statistic						
Portfolio formation								

Portfolio 1	Durable	Estimate t-statistic	+ sig	$\beta_i < 1$	- loading	+ loading	+ loading	
	Non-durable	Estimate t-statistic	+ sig	$\beta_i < 1$	- loading	+ loading	+ loading	
	Transport	Estimate t-statistic	+ sig	$\beta_i < 1$	- loading	+ loading	+ loading	
	Service	Estimate t-statistic	+ sig	$\beta_i < 1$	- loading	+ loading	+ loading	
	High-tech	Estimate t-statistic	+ sig	$\beta_i < 1$	- loading	+ loading	+ loading	
	Retail	Estimate t-statistic	+ sig	$\beta_i < 1$	- loading	+ loading	+ loading	
	Financial	Estimate t-statistic	+ sig	$\beta_i < 1$	- loading	+ loading	+ loading	
Portfolio 2	Durable	Estimate t-statistic						
	Non-durable	Estimate t-statistic						
	Transport	Estimate t-statistic						
	Service	Estimate t-statistic						
	High-tech	Estimate t-statistic						
	Retail	Estimate t-statistic						
	Financial	Estimate t-statistic						
Portfolio 3	Durable	Estimate t-statistic					- loading	
	Non-durable	Estimate t-statistic					- loading	
	Transport	Estimate t-statistic					- loading	
	Service	Estimate t-statistic					- loading	

	High-tech	Estimate t-statistic					- loading	
	Retail	Estimate t-statistic					- loading	
	Financial	Estimate t-statistic					- loading	

5. Summary and Limitations of this Proposal

In summary, this study underscores the necessity for researchers to (1) evaluate the efficiency of media communication; (2) employ DEA, a nonparametric method that measures the relative efficiency among competitors; and (3) acknowledge the degree to which media efficiency yields additional financial returns for businesses.

This research primarily emphasizes the need to reassess the accountability of media communication investment and its connection to stock valuations. While the measures for media communication efficiency and firm-specific risk models are not new, their linkage has been largely unexplored until now. The value of this work lies not in creating new measurement techniques, but in uncovering the impact of media communication efficiencies on future cash flows, a topic of interest to both researchers and industry practitioners. This study contributes to the literature by categorizing three types of media, applying the DEA for efficiency frontier assessment, and using a portfolio formation approach to evaluate the influence of media communication efficiency on stock returns. The aim is to provide empirical evidence that media communication efficiency is a valuable asset, impacting not just short-term outputs, such as sales, but also long-term financial market performance. Specifically, the anticipated findings of this research suggest that the financial market favors companies with efficient media communication, while those with lower efficiencies are less preferred.

Regarding the limitations of this study, note that media communication efficiencies do not always correlate directly with sales. While the value of integrating three different types of media as input for DEA has been demonstrated, future research could benefit from incorporating nonfinancial metrics, such as brand affinity, market share, and customer satisfaction, to examine their impact on stock valuation.

References

Aaker, D. A., & Carman, J. M. (1982). Are you over-advertising? *Journal of Advertising Research, 22*(4), 57-70.

Adeola, O., Hinson, R. E., & Evans, O. (2020). Social media in marketing communications: A synthesis of

successful strategies for the digital generation. *Digital Transformation in Business and Society: Theory and Cases*, 61-81.

Aksoy, L., Cooil, B., Groening, C., Keiningham, T. L., & Yalçın, A. (2008). The long-term stock market valuation of customer satisfaction. J*ournal of Marketing, 72*(4), 105-122.

Bass, F. M., & Clarke, D. G. (1972). Testing distributed lag models of advertising effect. *Journal of Marketing Research, 9*(3), 298-308.

Büschken, J. (2007). Determinants of brand advertising efficiency: Evidence from the German car market. *Journal of Advertising, 36*(3), 51-73.

Carhart, M. M. (1997). On persistence in mutual fund performance. *The Journal of finance*, *52*(1), 57-82.

Charnes, A., Cooper, W. W., & Rhodes, E. (1978). Measuring the efficiency of decision-making units. *European Journal of Operational Research*, *2*(6), 429-444.

Danaher, P. J. (2023). Optimal microtargeting of advertising. *Journal of Marketing Research*, *60*(3), 564-584.

Danaher, P. J., Lee, J., & Kerbache, L. (2010). Optimal internet media selection. *Marketing Science*, *29*(2), 336-347.

Danaher, P. J., & Rust, R. T. (1994). Determining the optimal level of media spending. *Journal of Advertising Research*, *34*(1), 28-35.

Dong, X., Chang, Y., Liang, S., & Fan, X. (2018). How online media synergy influences consumers' purchase intention: A perspective from broadcast and interactive media. *Internet Research*, *28*(4), 946-964.

Donthu, N., & Yoo, B. (1998). Retail productivity assessment using data envelopment analysis. *Journal of Retailing*, *74*(1), 89-105.

Dutta, S., Narasimhan, O., & Rajiv, S. (1999). Success in high-technology markets: Is marketing capability critical?. *Marketing Science*, *18*(4), 547-568.

Fama, E. F., & French, K. R. (1992). The cross-section of expected stock returns. *the Journal of Finance*, *47*(2), 427-465.

Jacobson, R., & Mizik, N. (2009). The financial markets and customer satisfaction: Reexamining possible financial market mispricing of customer satisfaction. *Marketing Science*, *28*(5), 810-819.

Jensen, M. C. (1978). Some anomalous evidence regarding market efficiency. *Journal of Financial Economics*, *6*(2/3), 95-101.

Joshi, A., & Hanssens, D. M. (2010). The direct and indirect effects of advertising spending on firm value. *Journal of Marketing*, *74*(1), 20-33.

Katsikeas, C. S., Morgan, N. A., Leonidou, L. C., & Hult, G. T. M. (2016). Assessing performance outcomes in marketing. *Journal of Marketing*, *80*(2), 1-20.

Lee, S. Y., Son, Y., & Oh, W. (2021). Effectiveness of integrated offline-and-online promotions in omnichannel targeting: a randomized field experiment. *Journal of Management Information Systems*, *38*(2), 484-516.

Lodish, L. M., Abraham, M. M., Livelsberger, J., Lubetkin, B., Richardson, B., & Stevens, M. E. (1995). A summary of fifty-five in-market experimental estimates of the long-term effect of TV advertising. *Marketing Science*, *14*(3_supplement), G133-G140.

Luo, X., & Donthu, N. (2001). Benchmarking advertising efficiency. *Journal of Advertising Research*, *41*(6), 7-18.

Luo, X., & Donthu, N. (2005). Assessing advertising media spending inefficiencies in generating sales. *Journal of Business Research*, *58*(1), 28-36.

Mizik, N., & Jacobson, R. (2009). Valuing branded businesses. *Journal of Marketing*, *73*(6), 137-153.

Onishi, H., & Manchanda, P. (2012). Marketing activity, blogging and sales. *International Journal of Research in Marketing*, *29*(3), 221-234.

Pergelova, A., Prior, D., & Rialp, J. (2010). Assessing advertising efficiency. *Journal of Advertising*, *39*(3), 39-54.

Pilling, B. K., Donthu, N., & Henson, S. (1999). Accounting for the impact of territory characteristics on sales performance: Relative efficiency as a measure of salesperson performance. *Journal of Personal Selling & Sales Management*, *19*(2), 35-45.

Sa'ait, N., Kanyan, A., & Nazrin, M. F. (2016). The effect of e-WOM on customer purchase intention. *International Academic Research Journal of Social Science*, *2*(1), 73-80.

Shankar, V., & Kushwaha, T. (2021). Omnichannel marketing: Are cross-channel effects symmetric? *International Journal of Research in Marketing*, *38*(2), 290-310.

Spotts, H. E., Weinberger, M. G., Assaf, A. G., & Weinberger, M. F. (2022). The role of paid media, earned media, and sales promotions in driving marcom sales performance in consumer services. *Journal of Business Research*, *152*, 387-397.

Srinivasan, S., & Hanssens, D. M. (2009). Marketing and firm value: Metrics, methods, findings, and future directions. *Journal of Marketing Research*, *46*(3), 293-312.

Stephen, A. T., & Galak, J. (2012). The effects of traditional and social earned media on sales: A study of a microlending marketplace. *Journal of Marketing Research*, *49*(5), 624-639.

Taylor, J., Kennedy, R., McDonald, C., Larguinat, L., El Ouarzazi, Y., & Haddad, N. (2013). Is the multi-platform whole more powerful than its separate parts? Measuring the sales effects of cross-media advertising. *Journal of Advertising Research*, *53*(2), 200-211.

Vorhies, D. W., & Morgan, N. A. (2005). Benchmarking marketing capabilities for sustainable competitive advantage. *Journal of Marketing*, *69*(1), 80-94.

Zhou, Y., Li, Y. Q., Ruan, W. Q., & Zhang, S. N. (2023). Owned media or earned media? The influence of social media types on impulse buying intention in internet celebrity restaurants. *International Journal of Hospitality Management*, *111*, 103487.

Assistant professor, Department of Global Business, Faculty of Global Studies,
Musashino University