# Top management's communication in economic crisis and the firm's subsequent performance: sentiment analysis approach

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Received 29 July 2019
Revised 5 January 2020
Accepted 16 February 2020

## Abstract

**Purpose** – In economic crisis, where tensions create anxiety and test the emotions of the firms' shareholders, communication from top management is very crucial as it provides the reflection of the managers' interpretation of the firms' situation and potential strategies. The goal of this paper is to investigate the relationships between sentiment, as an aspect of emotions extracted from the letters to shareholders, managerial discretion and the firms' subsequent performance and performance trajectory during crisis.
**Design/methodology/approach** – A sentiment analysis was conducted to extract the sentiment from the letters to shareholders, which were collected from firms in two countries with different levels of managerial discretion (US vs. Japan). Hypotheses were developed and tested using a series of regression analysis.
**Findings** – The primary findings indicate that (1) managerial sentiment identified in letters to shareholders can potentially be related to the firm's subsequent performance in the economic crisis, and (2) managerial discretion moderates the relationship between managerial sentiment and subsequent firm performance.
**Practical implications** – When the managerial discretion is high, firms' shareholders can use the sentiment in top management communications to gauge whether the firms' situation would be improving in the near future.
**Originality/value** – This study expands the current research on sentiment analysis and firm performance to the context of economic crisis by suggesting that managerial sentiment can be substantially provoked as firms are facing with stressful economic conditions. The study also highlights the moderating role of managerial discretion on the firms' subsequent performance.

**Keywords** Organizational performance, Sentiment analysis, Economic crisis, Managerial discretion, Letters to shareholders

**Paper type** Research paper

## Introduction

Top management plays an important role in interpreting the current situation of the company and communicating the future direction and expectations to organizational stakeholders (Hambrick and Mason, 1984). In economic crisis, where tensions create anxiety and test the emotions of the organization's stakeholders, positive communication from top management can mitigate anxiety and positively affect performance (Lehmberg and Tangpong, 2018; Pang *et al.*, 2014). Managerial communications from top management can take several forms and reflect various substances, including managerial sentiment and attributions of performance outcomes. While attributions are management's interpretation of past performance (Heider, 1944), sentiment – positive or negative – may indicate what will be coming for the company in the future.

The relationship between managerial attributions and performance has been studied using letters to shareholders under different circumstances, including economic crisis

The authors gratefully thank the Editor and two anonymous reviewers for their constructive comments and insightful suggestions during the review process. The authors also thank the Department of Management and Marketing and the Center for Enterprise Business Analytics at North Dakota State University for their support important to the completion of this research.

Corporate Communications: An International Journal
Vol. 25 No. 2, 2020
pp. 187-205

1356-3289
DOI 10.1108/CCIJ-07-2019-0094

(e.g. Clapham and Schwenk, 1991; Clatworthy and Jones, 2003; Keusch *et al.*, 2012; Lehmberg and Tangpong, 2018). Many studies have examined annual reports for patterns that distinguish those published by companies reporting strong performance from those reporting low performance. These studies have examined, for example, readability and financial performance (Smith and Smith, 1971; Subramanian *et al.*, 1993), discourse and firm performance (Thomas, 1997), themes emphasized and past performance (Kohut and Segars, 1992) and narrative strategies and complexity and performance (Laskin, 2018). Although numerous observations and patterns have been observed, Lasking (2018) noted a lack of conclusive evidence to determine that overperforming firms communicate differently from underperforming ones. One implication of this is that different contexts need to be considered in this area of research. Recently, developments in sentiment analysis have facilitated new research approaches, facilitating examination of sentiment in managerial communications (e.g. Boudt and Thewissen, 2019; Irresberger *et al.*, 2015; Lee *et al.*, 2014); however, this emerging research stream has yet to examine sentiment in crisis situations.

The upper echelons literature suggests that managerial discretion can shape the relationship between managerial interpretations and organizational performance outcomes (Crossland and Hambrick, 2007, 2011; Hambrick, 2007; Hambrick and Mason, 1984). However, extant research has not explored the role of managerial discretion in the relationship between managerial sentiment and organizational outcomes. This study, therefore, investigates the interplay of managerial sentiment, managerial discretion and organizational outcomes, particularly in the context of economic crisis. Specifically, we ask the following research questions: (1) In the midst of economic crisis, can the sentiment of top management identified in letters to shareholders be an effective indicator of the top management' interpretation of the firm's situation, which subsequently is reflected in the firm's subsequent firm performance? (2) Does managerial discretion moderate the role of sentiment addressed in the first research question?

By addressing these research questions, this study extends the current literature in two major ways. First, it examines the managerial sentiment – firm performance relationship in economic crisis, which is a relevant and recurring context as firms operate within the economic cycles. This important context could arguably provoke various sentiments from top managers (e.g. Clarke and Murray, 2000), but has not been examined by past sentiment analysis research (e.g. Zavattaro *et al.*, 2015; Loughran and Mcdonald, 2011). This study reveals the moderating effect of managerial discretion, an important construct guided by the upper echelons literature (Crossland and Hambrick, 2007, 2011; Hambrick, 2007; Hambrick and Mason, 1984), on the relationship between managerial sentiment and subsequent firm performance in the economic crisis. Second, this study also contributes to the managerial communication literature by examining the managerial communication message at the emotional or affective level, which goes beyond the strategic and cognitive levels as in the past research (e.g. Mayfield *et al.*, 2015; Marschan *et al.*, 1997; Gupta *et al.*, 2014).

## Theoretical background and hypothesis development

Upper echelons theory posits that top managers make decisions based on their personal interpretation of the situation they face, and that these decisions affect how the company acts, and ultimately performs (Hambrick, 2007; Hambrick and Mason, 1984). These interpretations are colored by the manager's experience, skills, values and personalities (Hambrick, 2007). In the management literature, it has been reported that both cognitive and affective aspects of personality on individuals could influence top managers' strategic choices in particular situations (e.g. Krishnakumar and Evglevskikh, 2016; Staw and Barsade, 1993; Son *et al.*, 2015). For example, Krishnakumar and Evglevskikh (2016) demonstrated affective states, such as joy and sadness, influence the emotional regulation ability of the decision-makers when making ethical decisions. In addition, Delgado-García and De La Fuente-Sabaté (2010)

suggested that managers' negative emotional states could result in more conformist strategies and more typical performance, while positive emotional states could promote more innovative strategies and is consequently reflected in the firms' performance.

In this study, we argue that during the economic crisis, managerial sentiment, which is a belief that has emerged from emotions, reflects how the top management senses the internal and external situations (Wagner III and Gooding, 1997), thus influencing top management's expectations of the firm's subsequent performance. Positive sentiment in the letters to shareholders during the economic crisis suggests that top management interprets the firm's actions and internal situations being adequate in coping the external challenges, thus offering potential for improvement and better performance. In other words, positive sentiment during the crisis situation can be considered an expression of top management's positive expectations of future performance. On an individual level, this positive sentiment may also reflect the characteristics of the top managers as being more active in seeking or perceiving opportunities amidst the crisis. Put differently, the positive sentiment may suggest the opportunity-seeking behavioral tendency of top managers (Pech and Cameron, 2006).

At the organizational level, the positive atmosphere established and maintained through the positive sentiment from the top managers may lead to a healthy morale and organizational climate (Bell and Song, 2005), which supports effective implementation of existing strategies as well as development of new ones (Avey *et al.*, 2008), particularly crucial when the firm is facing the crisis situation. For example, organizational morale has been reported as a key factor that influences trust among employees and the organization's performance (Ngambi, 2011). During organizational downsizing, previous studies have also shown that employees often exhibit emotional depression and that senior managers' communication is critical to help preserve the remaining employees' morale and trust (e.g. Mishra *et al.*, 1998; Mishra *et al.*, 2009). In addition, existing empirical research exploring organizational climate suggests that communication messages from top management, especially those emphasizing the organization's goals and strategies, may enhance employee's work passion as well as organizational commitment (Permarupan *et al.*, 2013). Top management's communication has also been reported to be the strongest measure of organizational climate that affects employees' job satisfaction (Johnson and Mcintye, 1998; Pritchard and Karasick, 1973). Furthermore, with appropriate and effective communication from top management, various dimensions of organizational climate can be strengthened, which subsequently leads to a consensus to attain the organization's goal (James *et al.*, 2008).

These positive actions and healthy climate enable the firm to maintain its effective functioning during the crisis, and are important to its subsequent performance. In short, the managerial sentiment is the reflection of top managers' sense of the situations as well as their opportunity-seeking characteristic, and the organization's climate, functioning and subsequent performance are the reflection of their top managers (Crossland and Hambrick, 2007; Hambrick and Mason, 1984). Based on this logic, we hypothesize:

*H1*. During an economic crisis, the greater the positive sentiment from the top managers in the letter to shareholders, the better the firms' subsequent performance.

Previous research has also suggested that the relationship between sentiment and managers' strategic decision-making can be moderated by managerial discretion (Espedal, 2007) or the "latitude of action" by top managers (Hambrick, 2007, p. 335). In this study, we further content that managerial discretion moderates the relationship between the top management's interpretations and subsequent performance (Hambrick, 2007). Where managerial discretion is high, top managers have discretion to select and implement a large variety of strategic actions, whereas where discretion is low, top management has access to a much narrower variety of actions and is restricted in how they may implement these actions (Crossland and

Hambrick, 2011). Specifically, amidst the economic crisis, the top managers can express the positive sentiment to reflect their positive perceptions about their actions, organizational situations and potential opportunities. Subsequently, the move from such positive sentiment and perceptions to actions in materializing positive outcomes can be accelerated by a high degree of the managers' managerial discretion. We, therefore, hypothesize that the relationship between sentiment and subsequent performance, encapsulated in Hypothesis 1, is moderated by the degree of managerial discretion.

*H2.* During an economic crisis, managerial discretion moderates the positive relationship between managerial sentiment and the firm's subsequent performance.

When research investigates the managerial practices across different countries, home country appears to be a reasonable proxy for managerial discretion at the national cluster level. This is because the degree of managerial discretion is systematically influenced by formal and informal national institutions of the organization's home country. Across different countries, individualism, uncertainty tolerance and cultural looseness were identified as informal institutions affecting managerial discretion, whereas dispersed ownership structure, common-law legal origin and employer flexibility were regarded as formal institutions affecting managerial discretion (Crossland and Hambrick, 2011). Guided by this past research, this study used two-country sample firms from the USA and Japan; this allows us to examine the effect of managerial discretion systematically at the national cluster level. These two countries are arguably extreme cases at the opposite ends of the spectrum of managerial discretion; the institutional factors in the USA support very high degrees of managerial discretion, while Japan's institutional factors substantially suppress it (Crossland and Hambrick, 2007, 2011). Accordingly, we expect to find a moderating effect of home country as a proxy for managerial discretion (e.g. the USA = high vs Japan = low) on the relationship between managerial sentiment and subsequent performance during the economic crisis.

## Methodology

### *Sentiment analysis*

Previous studies have examined the content of letters to shareholder because it is a concise, high-profile, publicly available document, and can be readily compared with those of previous years or other companies; and therefore, it is highly suited for content analysis research (e.g. Cho and Hambrick, 2006; Mcclelland *et al.*, 2010; Patelli and Pedrini, 2014; Staw *et al.*, 1983). In addition, unlike other parts of the annual reports, the letters themselves are not audited or required by the SEC, giving the CEO more freedom to put these together as they wish (Abrahamson and Amir, 1996).

While the content of letters to shareholders has been explored by the previous studies (e.g. Cho and Hambrick, 2006; Mcclelland *et al.*, 2010; Patelli and Pedrini, 2014; Staw *et al.*, 1983), this study focuses the sentiment aspect of the letters to shareholders which has been rarely studied in the literature. Although prior study has suggested that sentiment in the letters to shareholders is related to the firm performance (e.g. Boudt and Thewissen, 2019), this study extends those findings by including the environmental context (e.g. economic crisis) and organizational context (e.g. managerial discretion) in the investigation. Sentiment analysis can be conducted at various levels of text (e.g. word, sentence or document) and applied to several communication areas (e.g. Twitter) (Colleoni, 2013) and corporate news (Strauß and Meer, 2017; Strauss, 2019). In this study, sentiment analysis was conducted at the document level to extract the overall managerial sentiment from letters to shareholders.

Regarding the sentiment coding, there are a number of approaches that can be implemented to analyze sentiment from textual information (i.e. letters to shareholders).

While human coding has been widely used in the content analysis research, it is often constrained by time or the financial resources available for the study (e.g. Bligh and Kohles, 2014). Subsequently, computerized coding for content analysis was developed to automate the coding process using computers (e.g. Stone and Hunt, 1963). Computerized coding has been tested and improved over the years, and it has been widely used in the literature. Many studies have consistently provided evidence that the effectiveness of computerized coding is highly reliable and remarkably consistent with human coding, especially when the coding schemes are explicit (e.g. Morris, 1994; Bantum and Owen, 2009; Kondracki *et al.*, 2002).

Specifically, several studies in the strategic management literature have employed computerized coding in their investigation related to content analysis. For example, Ferrier (2001) analyzed competitive aggressiveness from business news headlines, Bling *et al.* (2004) examined language of leadership from the presidents' speeches in 2001–2002 and, more recently, Laskin and Samoilenko (2014) conducted a content analysis on investors' effort in communicating with shareholders based on business financial news.

Morris (1994) examined the human-coding and computerized-coding content analysis methods on corporate mission statements and provided evidence that both methods were equally effective. Adapted from Morris (1994), the major advantages and disadvantages of computerized coding compared to human coding are summarized in Table 1.

With the advancement in the computer processing capability, text mining techniques and machine learning algorithms, advanced computerized-coding approach has overcome the major limitations of the traditional computerized content analysis. For example, incorporating the *N*-gram technique of the natural language processing (NLP) algorithm, computerized coding has become more effective in analyzing textual information, and its accuracy has been significantly improved (e.g. Doddington, 2002). In addition, advanced topic modeling techniques, such as latent Dirichlet allocation (LDA), have enabled researchers to automatically extract important information from textual information based on a distribution of words in the document (e.g. Bottou and Bousquet, 2007).

Specifically, sentiment analysis, which is one of numerous text mining techniques, has been developed to further analyze textual information by classifying messages' sentiment polarity into positive, negative or neutral (Pang and Lee, 2008). In the management literature, there is a growing body of research that examines sentiment in organizations' unstructured textual information, such as corporates' mission statements, financial disclosures and other documents as presented in Table 2.

| Advantages | Disadvantages |
|---|---|
| (1) High consistency since the coding rules are always applied in the same way | (1) Lack of natural language processing capabilities and contextual information consideration |
| (2) High reliability when explicit coding rules are used | (2) Unable to recognize the communicative intent of words |
| (3) Low cost and short turnaround time when analyzing a large volume of data | (3) Sensitive to the subject such that it may be less effective when evaluating words with different semantics |
| (4) Ability to provide researchers with more flexible ways to analyze various and different aspects of textual content thanks to its ease of operation and manipulation | (4) Limited to the predefined categories of words |
| | (5) Lack of theoretical rationales for classification since it attempts to transforming meanings into numbers |
| | (6) Needs human coder in certain areas, especially those that the coding rules have not been developed |

**Table 1.**
Summary of the major advantages and limitations of computerized coding

| Study | Textual data | Initial findings |
|---|---|---|
| Papadaki *et al.* (2019) | Posts on Ewitter | Positive sentiment in Twitter posts is an indicator of organizations' success in risk management, project management and organizational project success |
| Boudt and Thewissen (2019) | CEO letters | Sentiment in CEO letters can be used to predict firms' performance |
| Confente *et al.* (2019) | Social media content | During crisis, customers' perceptions (indicated by sentiment from social media content) is an indicator of firms' reputation |
| Si *et al.* (2019) | Investor sentiment data from RavenPack News Analytics database | Investors' sentiment is positively related to firms' operating performance |
| Tetlock *et al.* (2008) | S&P 500 firms' news stories | Sentiment in news stories is related to firms' earnings, stock prices and fundamentals |
| Caylor *et al.* (2017) | Analysts' reports | Sentiment in analysts' reports can be used to predict firms' future earnings |
| Henry and Leone (2016) | Firms' financial disclosures | Tone (sentiment) in firms' financial disclosures can be used to predict the market reaction to the firms' earnings announcements |
| Hooghiemstra *et al.* (2015) | Newspaper articles | Negative CEO press coverage is related to the growth and investment opportunities, poorer performance and smaller proportion shares held by board members |
| Yukselturk and Tucker (2015) | Analysts' reports | Sentiment in analysts' reports is an indicator of firms' performance during crisis |
| Franco *et al.* (2014) | Debt analysts' reports | Sentiment in analysts' reports is an indicator of credit spreads, trading volume and offer yields |
| Huang *et al.* (2014) | Analysts' reports | Sentiment in analysts' reports is a predictor of stock prices and future earnings growth |
| Davis *et al.* (2012) | Firms' earnings press release disclosures | Positive language in earnings press releases is positively associated with firms' future return on assets (ROA) and market responses |
| Li (2010) | MD&A text | Tone of forward-looking in the Management Discussion and Analysis statements is positively associated with future financial performance |

**Table 2.**
Recent sentiment analysis studies in the management literature

*Sentiment analysis tools*

Sentiment analysis is typically available as a feature of the NLP tools, both open-source and proprietary. However, most of the open-source tools are in the early stages of being developed and typically require manual coding for the text-mining algorithm based on specific text domain (e.g. see an extensive list of open-source NLP tools on Neubig's (2019) web page and Klein's (2019) web page).

Among the proprietary sentiment analysis software, one of the most well-known sentiment analysis tools that has been widely used in the previous studies is Watson Natural Language Understanding (NLU) developed by IBM™. Watson NLU is a cloud-based application that provides a set of NLP services to analyze textual information. The sentiment analysis feature of Watson NLU relies on a supervised lexicon-based machine learning technique to identify sentiment polarity in documents. Watson NLU is considered a domain-independent application, which generates sentiment scores from the correlations between the embedding pre-trained sentiment words and the documents. Specifically, Watson NLU relies on the Matrix Factorization with Lexical (MFLK) approach developed based on a non-negative matrix factorization method to derive the sentiment scores. MFLK is reported to be

more effective than the traditional simple dictionary-based sentiment approach when performing domain-independent sentiment analysis (Li *et al.*, 2009).

Watson NLU has been adopted in many research areas that investigated textual information. For example, in the human-computer interaction domain, Watson NLU was used to analyze users' input to improve the efficiency of the automated assistants' communication (e.g. Gao *et al.*, 2015; Bhowan and Mccloskey, 2015; Ali, 2016; Mašek and Růžička, 2014). In addition, Watson NLU has been broadly adopted in the medical service area to analyze patients' health records and information (e.g. Trivedi *et al.*, 2018; Herath *et al.*, 2016; Devarakonda *et al.*, 2014; Salvi *et al.*, 2017). Previous studies in the business domain have also employed Watson NLU to analyze firms' unstructured textual data, such as financial disclosures (e.g. Agarwal *et al.*, 2019; Moreno-Sandoval *et al.*, 2019), customer reviews (e.g. Nakayama and Wan, 2018) and employer branding messages (e.g. Dabirian *et al.*, 2017).

In our study, since we did not create a custom sentiment analysis model and develop sentiment word lexicon to specifically extract sentiment from the letters to shareholders, a proprietary sentiment analysis software package, such as Watson NLU, appeared to be an appropriate tool to perform sentiment analysis. In addition, Watson NLU provided several automatic NLP features that could effectively extract sentiment from generic text document (e.g. Canonico and De Russis, 2018). Therefore, we adopted Watson NLU to extract sentiment polarity in letters to shareholders in our study. However, it is important to note that, while Watson NLU has proven to be a reliable sentiment analysis tool, it relies on a proprietary "black box" algorithm. Therefore, the sentiment analysis parameters of Watson NLU algorithm are not customizable and cannot be fine-tuned by end users. Figure 1 depicts a general procedure of the sentiment analysis feature.

*Sample selection and data gathering*

The data used to test our proposed hypotheses were drawn from letters to shareholders and financial reports of firms in the USA and Japan. Our sample consisted of firms in these two countries, as the US institutional context is very high in managerial discretion, while the Japanese context is very low (Crossland and Hambrick, 2011). This sample composition,

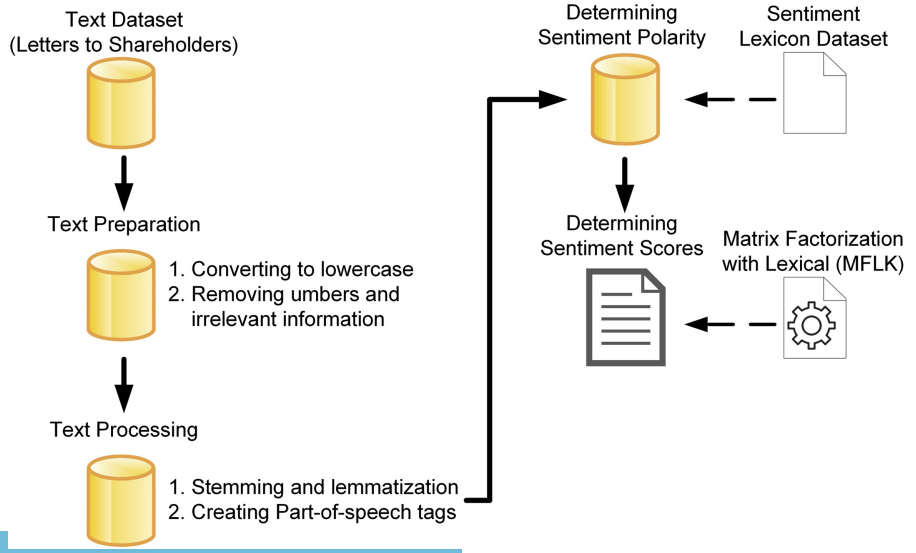


**Figure 1.**
Sentiment analysis procedure

therefore, allows us to examine the moderating effect of managerial discretion, systematically varying between the US and the Japanese companies at the aggregate level, on the relationship between managerial sentiment and subsequent performance during the economic crisis. Additionally, the use of this two-country sample also allows us to maintain comparability with past studies of letters to shareholders, which have typically relied on US samples. While Japan and US contexts are nearly opposite in terms of managerial discretion, they are similar in their level of economic development and disclosure requirements for publicly traded firms.

Since the role of sentiment may be particularly important during crisis, our study used a time frame in the midst of economic crisis ensuing Lehman Brothers' bankruptcy announcement in September 2008. This crisis became worldwide affecting both Japanese- and US-based firms. To investigate our inquiry while mitigating potential biases, the firms in our data set were selected through judgmental and stratified sampling approaches (Babbie, 1995). Random sampling was not practical for our study since Japanese firms may not provide their letters to shareholders in English. In addition, the predominance of firms in different industries varies in Japan and in the USA, and such variation could lead to industry-specific biases. With these considerations, we first created an initial sample of publicly traded Japanese and US firms in major, representative industries. Then, Japanese firms that did not provide letters to shareholders in English were dropped. Finally, we adjusted the composition of the sample to ensure that both Japanese and US subsamples in our study had similar industry representations. The combination of judgmental and stratified sampling approach has also been established in previous research (Lehmberg and Tangpong, 2018). Our final sample had 100 firms: 50 from the USA and 50 from Japan, with broad industry representation ranging from heavy machinery to food. We then obtained the sample firms' letters to shareholders published immediately after the Lehman Brothers bankruptcy announcement in September 2008.

We also acknowledged that it would be problematic to our research design if the content of the English language versions of the letters to shareholders from the Japanese firms in our sample substantially deviate from that of their Japanese original letters. To rule out this possible concern, seven randomly selected Japanese original letters to shareholders of our sample firms were translated into English. We then compared these Japanese-to-English translated letters to their corresponding English version provided by the firms. No major differences between these two versions for any of the companies were found, thus giving us a reasonable degree of confidence that the Japanese and English versions of letters to shareholders provided by Japanese firms in our sample are comparable for our research purpose.

*Dependent, independent and control variables*

The dependent variables investigated in this study included (1) postcrisis profitability performance (PCP) and (2) postcrisis performance improvement trajectory (PCT). PCP was a measure derived from the firms' return on assets (ROA) and return on sales (ROS) – important indicators of firms' performance suggested by the literature (e.g. Lehmberg and Tangpong, 2018; Daniel *et al.*, 2004). Since these two performance indicators were highly correlated, a principal component analysis (PCA) was performed to create a composite measure of the firms' PCP. In addition to PCP, we examined PCT to capture the changes in ROA and ROS over the 2-year period after the crisis. In line with previous studies in the management literature (e.g. Bell and Song, 2005; Zavattaro *et al.*, 2015), the use of PCT as a within-firm performance measure, comparing the firm's performance at one point and at another point, would help mitigate issues related to systematic biases between firms, such as different reporting calendars and organizational features, that may influence the between-firm

performance variation. Similar to that of PCP, the PCT measure was derived from a PCA of the ROA and ROS improvement over a 2-year period.

Two independent variables were included in the analysis – managerial sentiment and the interaction between managerial sentiment and the level of managerial discretion. Managerial sentiment was assessed as the sentiment score, which was a continuous variable obtained from sentiment analysis when the letters to shareholders of each sample firm were analyzed. Regarding managerial discretion, as previously mentioned, Japan and the USA were the home countries for the firms with the lowest and the highest managerial discretion scores, respectively (Crossland and Hambrick, 2011). Therefore, we decided to use the firms' home countries as proxies for the managerial discretion variable in our analysis. In addition, rather than confirming, this study focused on exploring the interaction effect of managerial discretion on the firms' subsequent performance; therefore, we created a binary categorical variable representing two levels of managerial discretion (low = Japan, high = the USA) so that the effect of the levels of managerial discretion could be clearly differentiated. An interaction term was created from the sentiment score and the country categorical variable to observe the moderating effect of managerial discretion on the relationship between managerial sentiment score and subsequent performance (e.g. PCP and PCT).

In addition, a set of control variables was included in the data analyses to control for the potential confounding effects of the firms' pre-crisis conditions on firm performance (e.g. Lahiri and Narayanan, 2013; Tangpong *et al.*, 2015). These control variables included (1) the firms' pre-crisis profitability performance, the PCA factor score of ROA and ROS a year before the crisis, (2) pre-crisis performance trajectory, the PCA factor score of the changes in ROA and ROS during the 2-year period prior to the crisis, (3) the leverage level measured by debt-to-asset ratio, (4) the liquidity level measured by current ratio and (5) firm size measured by total sale, a year before the crisis. Leverage, liquidity and firm size were log-transformed to correct the distribution skewness. Finally, managerial discretion, which was captured by a categorical variable represented by country dummy (Japan = 0 and US = 1), was entered to the model as a control variable as well.

## Results

### *Descriptive statistics and correlation analyses*

The descriptive statistics and correlations of the variables investigated in the study are reported in Table 3. In order to ensure the reliability of Watson NLU sentiment analysis, a subsample of 12 letters to shareholders (12% of our total sample) was randomly selected from the data set to perform a cross-validation of the sentiment coding. The sentiment scores of the sample derived from Watson NLU were cross-validated with those from two human coders. The results suggested that the sentiment scores from Watson NLU and human coders were significantly correlated ($r = 0.615$, $p = 0.033$). Therefore, we concluded that the reliability of Watson NLU in determining sentiment polarity of the letters to shareholders was satisfactory.

Multicollinearity was checked, and an issue arose when the interaction term between the sentiment score and country variables entered the model. Therefore, the sentiment score was mean-centered to remove the multicollinearity produced by the interaction, and the concern for multicollinearity was adequately mitigated with all the variance inflation factors being below the multicollinearity threshold. In addition, based on the standard residual approach, two outliers were detected and removed from the analyses in this study. Note that the country variable was a categorical variable; hence, it was not included in the correlation analysis.

### *Hypothesis testing*

A series of regression analyses was conducted to test the proposed hypotheses. The results are presented in Table 4 for the firm's PCP, and in Table 5 for the firm's PCT as the dependent

| | *M* | SD | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. Postcrisis profitability performance | −0.02 | 0.99 | 1.00 | 0.83* | 0.59* | 0.25* | −1.41 | 0.19 | 0.07 | 0.27* |
| 2. Performance improvement trajectory$^{m}$ | 0.00 | 1.00 | 0.82* | 1.00 | 0.56* | 0.34* | −0.18 | 0.14 | 0.16 | 0.26* |
| 3. Precrisis profitability performance | 0.01 | 0.99 | 0.59* | 0.56* | 1.00 | 0.16 | −0.04 | 0.06 | 0.18 | 0.10 |
| 4. Precrisis performance trajectory | 0.02 | 1.00 | 0.25* | 0.34* | 0.16 | 1.00 | −0.01 | 0.14 | −0.09 | 0.28* |
| 5. Leverage$^{L}$ | 0.07 | 0.12 | −0.14 | −0.18 | −0.04 | −0.01 | 1.00 | −0.12 | 0.23* | 0.01 |
| 6. Liquidity$^{L}$ | 0.08 | 0.27 | 0.19 | 0.14 | 0.06 | 0.14 | −0.12 | 1.00 | −0.27* | 0.05 |
| 7. Firm Size$^{L}$ | 4.00 | 0.72 | 0.07 | 0.16 | 0.18 | −0.09 | 0.22* | −0.27* | 1.00 | 0.03 |
| 8. Sentiment$^{m}$ | 0.00 | 0.22 | 0.26* | 0.25* | 0.10 | 0.17 | 0.01 | 0.05 | 0.29 | 1.00 |

**Note(s)**: $^{L}$ = log-transformed, $^{m}$ = mean-centered, *$p < 0.05$

**Table 3.**
Correlation analysis results

| | Model 1 $\beta$ | Model 2 $\beta$ | Model 3 $\beta$ |
|---|---|---|---|
| *Dependent variable* | | | |
| Postcrisis profitability performance (PCP) | | | |
| *Precrisis financials as control variables* | | | |
| Profitability performance | 0.551*** | 0.541*** | 0.530*** |
| Performance trajectory | 0.077 | 0.069 | 0.076 |
| Leverage | −1.043 | −1.036 | −1.137$^{t}$ |
| Liquidity | 0.394 | 0.389 | 0.375 |
| Firm size | −0.013 | −0.006 | 0.007 |
| Country (0 = Japan, 1 = USA) | 0.465** | 0.358* | 0.249 |
| *Independent variable* | | | |
| Sentiment | 0.581$^{t}$ | 0.111 | |
| Sentiment * Country | 2.766** | | |
| *Model summary* | | | |
| $R^2$ | 0.456 | 0.472 | 0.523 |
| Adjusted $R^2$ | 0.420 | 0.431 | 0.481 |
| $F$ | 12.718 | 11.492 | 12.216 |
| Effect size | 0.575 | 0.607 | 0.719 |

**Note(s)**: *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$, $^{t}p < 0.10$

**Table 4.**
Hypothesis testing results – DV: PCP

variables. In both Tables 4 and 5, Model 1 was developed as a baseline containing only the control variables to observe the effects of the independent variables in the subsequent models. Overall, the results in Model 1 indicated that among the pre-crisis attributes, the firms' pre-crisis profitability performance and country (as a proxy for managerial discretion) significantly influenced both PCP and PCT. The $r$-squared values for the baseline model were 45.6% for PCP and 49.3% for PCT. The effect size values were determined using Cohen's $f^2$ (Cohen, 1988), and the results suggested large effects for both PCP and PCT.

| | Model 1 $\beta$ | Model 2 $\beta$ | Model 3 $\beta$ |
|---|---|---|---|
| *Dependent variable* | | | |
| Performance improvement trajectory (PCT) | | | |
| *Precrisis financials as control variables* | | | |
| Profitability performance | 0.480*** | 0.471*** | 0.458*** |
| Performance trajectory | 0.187* | 0.182* | 0.192* |
| Leverage | −1.654* | −1.650* | −1.735** |
| Liquidity | 0.289 | 0.286 | 0.287 |
| Firm size | 0.130 | 0.137 | 0.154 |
| Country (0 = Japan, 1 = USA) | 0.503** | 0.441* | 0.317$^{t}$ |
| *Independent variable* | | | |
| Sentiment | 0.432 | 0.099 | |
| Sentiment * Country | | | 2.219* |
| *Model summary* | | | |
| $R^2$ | 0.493 | 0.501 | 0.531 |
| Adjusted $R^2$ | 0.458 | 0.461 | 0.487 |
| $F$ | 14.249 | 12.502 | 12.176 |
| Effect size | 0.651 | 0.668 | 0.739 |

**Note(s)**: *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$, $^{t}p < 0.10$

**Table 5.** Hypothesis testing results – DV: PCT

Hypothesis 1 proposed that, during an economic crisis, managerial sentiment found in letters to shareholders is related to the firm's postcrisis performance. Consequently, Model 2 was developed to test this hypothesis. Overall, the results indicated that the sentiment score was positively related to the firm's postcrisis performance. While the $p$-value was less than 0.1 for PCP (Table 4), it did not reach the significant level for PCT (Table 5). Therefore, Hypothesis 1 was partially supported. Compared to the baseline model that contained only the control variables (Model 1), the $r$-squared value of Model 2 with the sentiment variable increased approximately 1.6 and 0.8% in explaining PCP and PCT, respectively.

With respect to Hypothesis 2, proposing the interaction effect of managerial sentiment and managerial discretion on PCP and PCT, the results are presented in Model 3. Overall, the results indicated a statistically significant effect of the interaction on PCP (Table 4; $p < 0.01$) and PCT (Table 5; $p < 0.05$). These findings suggested that managerial discretion plays a significant role in moderating the relationship between managerial sentiment and the firm's postcrisis performance. In addition, compared to the baseline model (Model 1), the r-squared value of Model 3 with managerial sentiment and its interaction with the managerial discretion proxy increases 6.7 and 3.8% for PCP and PCT, respectively. Consequently, Hypothesis 2 was strongly supported.

## Discussion and conclusion

In this study, we have argued that during the economic crisis, managerial sentiment found in letters to shareholders can be a reflection of top managers' overall sense of the situations, organizational actions and climates, which collectively can, in turn, shape their subsequent firm performance. We have specifically hypothesized that (1) managerial sentiment identified in letters to shareholders is positively related to the firm's subsequent performance in the economic crisis, and (2) managerial discretion moderates the positive relationship between managerial sentiment and subsequent firm performance. According to our empirical analyses, the results reveal that the relationship between managerial sentiment and subsequent firm performance (Hypothesis 1) is partially supported and the moderating effect

of managerial discretion (i.e. operationalized aggregately at the firm's country level) on the relationship between managerial sentiment and subsequent firm performance (Hypothesis 2) is strongly supported.

A possible explanation for our findings on the moderating role of managerial discretion is that where managerial discretion is high, top managers are more willing to disclose their sentiment that better reflects their firm's situations and the efficacy of their firms' actions and organizational climates in addressing such situations, thus offering the forward-looking into what the companies may be facing and accomplishing in the near future. As such, under the high managerial discretion condition, the sentiment in the letters to shareholders becomes a more accurate indicator of the subsequent performance. Alternatively, our finding can also be interpreted that when the top management shares the positive sentiment "publicly" with shareholders and stakeholders, they may become more committed to making the positive future results happen. With managerial discretion, they are more likely to take action and own up to what they have communicated to shareholders and stakeholders publicly. Therefore, the managerial sentiment and subsequent firm performance relationship cannot be fully assessed without taking managerial discretion into account. Overall, we can conclude that, in the economic crisis, managerial sentiment extracted from letters to shareholder could be indicative of the firm's subsequent performance when the level of managerial discretion is high.

*Contributions to research and practice*

This study makes three important contributions to the literature. First, our study expanded the current research on sentiment analysis and firm performance to the context of economic crisis in which managerial sentiment could be substantially provoked as firms are facing with stressful economic conditions. In the economic crisis context, the main effect of managerial sentiment on the firms' subsequent performance does not seem robust, but rather contingent, on the level of managerial discretion. From the theoretical standpoint, our findings suggest that certain broader external and/or organizational contexts (e.g. economic crisis, managerial discretion) could also be considered boundary conditions of the managerial sentiment and firm performance relationship. In other words, this study highlights such potential moderating role of contextual variables, thus extending beyond the previous research focusing primarily on the sentiment-performance link (Boudt and Thewissen, 2019). Future research along this line of inquiry will certainly enrich our understanding of the managerial sentiment and firm performance phenomena.

Second, our study broadens the scope of top management communication study or the research on letters to shareholders by investigating them at the sentiment level, which is a key departure from the mainstream research focusing the investigating efforts at the strategic and cognitive levels, particularly on management attribution of past performance (e.g. Lehmberg and Tangpong, 2018). This study provides an alternative venue in looking at managerial sentiment embedded in top management communication materials as a critical reflection of how top managers make sense of the current situations and how effective their firm's actions are in addressing them. Therefore, when firms are in challenging situations that require their top managers to exercise their discretion and take actions in addressing the challenges, managerial sentiment can potentially become an indicator of their firm's upcoming performance in the future. In that essence, this line of research also adds to the upper echelons literature (Hambrick, 2007; Hambrick and Mason, 1984) by redirecting future research attentions to the managerial sentiment of top managers, which is considered an emotional or affective characteristic, and extending from the domain of personalities of top managers in previous upper echelon research (e.g. Delgado-García and De La Fuente-Sabaté, 2010).

Finally, this study introduces an application of one of the text mining techniques, sentiment analysis, to communications from top management. Sentiment analysis is a novel

approach that can potentially evaluate the effectiveness of the firm's strategies based on communication text (e.g. Ahmadi *et al.*, 2018), especially under crisis conditions where emotional response might be a key factor in a manager's successful utilization of decision-making strategies (Sayegh *et al.*, 2004). Specifically, this study highlights that future management research studies can take advantage of sentiment analysis, combining text features with financial data, to help develop desirable strategies for a given decision situation.

In addition to the contributions to the literature, this study provides two practical insights. First, based on our findings, when the managerial discretion is high, firms' investors, partners and other stakeholders can use the sentiment in top management communications to public to gauge whether the firms' situation would be improving in the near future. This foresight would allow those stakeholders to determine whether or how much they should commit their investment of time, effort and money to the firms. If the situation is assessed as negative, some active interventions from stakeholders could soon be put in place to mitigate the potential adverse consequences. Second, from the perspective of the firms' top managers, if they plan to use their public communication via letters to shareholders as a mechanism to distribute the positive sentiments to shareholders or to use it as a reinforcing mechanism to compel them to strive for performance improvement, they should ensure that they would have adequate managerial discretion to deliver what they have publicly communicated.

*Limitations and future research*

Despite its contributions, there are important limitations of the study that warrant discussion. First, we restricted our investigation on top managers. In fact, lower-level managers and employers may also influence the development of strategic decisions of the firms. In this study, we speculate that while influence may emerge from numerous parts of the organization, the top managers and the CEO dominate the judgment and interpretation of the firm's situations and actions addressed in the letters to shareholders. Second, our sample was restricted to large firms during a major economic crisis. Therefore, our findings may not be generalized to a broader base. Third, we used the USA and Japan as a proxy for high and low managerial discretion, respectively. While this practice is supported by the literature (e.g. Crossland and Hambrick, 2011), it is a crude proxy, limiting our ability to examine the phenomena at a finer-grained level. Consequently, future research should consider assessing degrees of managerial discretion as a continuous variable to offer insight into a variation of its effects on the firms' performance. Fourth, we used a proprietary sentiment analysis tool provided by IBM Watson NLU to generate the sentiment scores. While the algorithm used by Watson NLU is considered a domain-independent technique that can effectively classify sentiments in text data, further studies may examine additional sentiment analysis techniques to ensure the robustness of our findings. Finally, while our work incorporates a temporal aspect, it only covers a short duration and is limited to the annual level. Future research could examine sentiments in quarterly earnings releases, which represent another publicly accessible form of managerial communication (e.g. Laskin and Samoilenko, 2014; Rosenkranz, 2016). This approach could facilitate more fine-grained, dynamic analysis over time.

## Conclusions

The current study contributes to the literature by conceptualizing managerial sentiment in the letters of shareholders as a reflection of top managers' sense of the firms' situations and actions in an economic crisis; thus, managerial sentiment can potentially be an indicator of the firms' postcrisis performance. Our empirical data, derived from a text mining technique, suggest that the effect of managerial sentiment on firm's postcrisis performance is stronger in the context of high managerial discretion. This study also provides evidence that machine learning can be an effective method for evaluating organizational functions and potentially

predicting firm performance. We hope that our study will motivate more research on the application of machine learning techniques to formulate better strategies for future management research and practice.

## References

Abrahamson, E. and Amir, E. (1996), "The information content of the president's letter to shareholders", *Journal of Business Finance and Accounting*, Vol. 23 No. 8, pp. 1157-1182.

Agarwal, A., Gupta, A., Kumar, A. and Tamilselvam, S.G. (2019), "Learning risk culture of banks using news analytics", *European Journal of Operational Research*, Vol. 277 No. 2, pp. 770-783.

Ahmadi, Z., Martens, P., Koch, C., Gottron, T. and Kramer, S. (2018), "Towards bankruptcy prediction: deep sentiment mining to detect financial distress from business management reports", in *2018 IEEE 5th International Conference on Data Science and Advanced Analytics (DSAA)*, 2018, pp. 293-302.

Ali, M. (2016), "Artificial intelligence and natural language processing: the Arabic corpora in online translation software", *International Journal of Advanced and Applied Sciences*, Vol. 3 No. 9, pp. 59-66.

Avey, J.B., Wernsing, T.S. and Luthans, F. (2008), "Can positive employees help positive organizational change? Impact of psychological capital and emotions on relevant attitudes and behaviors", *The Journal of Applied Behavioral Science*, Vol. 44 No. 1, pp. 48-70.

Babbie, E. (1995), *The Practice of Social Research*, Wadsworth Publishing, Harrisonburg, VA.

Bantum, E.O.C. and Owen, J.E. (2009), "Evaluating the validity of computerized content analysis programs for identification of emotional expression in cancer narratives", *Psychological Assessment*, Vol. 21 No. 1, pp. 79-88.

Bell, C. and Song, F. (2005), "Emotions in the conflict process: an application of the cognitive appraisal model of emotions to conflict management", *International Journal of Conflict Management*, Vol. 16 No. 1, pp. 30-54.

Bhowan, U. and Mccloskey, D.J. (2015), "Genetic programming for feature selection and question-answer ranking in IBM Watson", in *Genetic Programming: 18th European Conference, EuroGP 2015*, Springer International Publishing, Copenhagen, Denmark, pp. 153-166.

Bligh, M.C. and Kohles, J.C. (2014), "Comparing leaders across contexts, culture, and time: computerized content analysis of leader–follower communications", *Leadership*, Vol. 10 No. 2, pp. 142-159.

Bligh, M.C., Kohles, J.C. and Meindl, J.R. (2004), "Charting the language of leadership: a methodological investigation of president bush and the crisis of 9/11", *Journal of Applied Psychology*, Vol. 89 No. 3, pp. 562-574.

Bottou, L. and Bousquet, O. (2007), "The tradeoffs of large scale learning", in *Proceedings of the 20th International Conference on Neural Information Processing Systems, Curran Associates, Vancouver*, British Columbia, Canada.

Boudt, K. and Thewissen, J. (2019), "Jockeying for position in CEO letters: impression management and sentiment analytics", *Financial Management*, Vol. 48 No. 1, pp. 77-115.

Canonico, M. and De Russis, L. (2018), "A comparison and critique of natural languageunderstanding tools", in *CLOUD COMPUTING 2018: The Ninth International Conference on Cloud Computing, GRIDs, and Virtualization*, 2018, Barcelona, Spain.

Caylor, M., Cecchini, M. and Winchel, J. (2017), "Analysts' qualitative statements and the profitability of favorable investment recommendations", *Accounting, Organizations and Society*, Vol. 57, pp. 33-51.

Cho, T.S. and Hambrick, D.C. (2006), "Attention as the mediator between top management team characteristics and strategic change: the case of airline deregulation", *Organization Science*, Vol. 17 No. 4, pp. 453-469.

Clapham, S.E. and Schwenk, C.R. (1991), "Self-serving attributions, managerial cognition, and company performance", *Strategic Management Journal*, Vol. 12 No. 3, pp. 219-229.

Clarke, G. and Murray, L.W.B. (2000), "Investor relations: perceptions of the annual statement", *Corporate Communications*, Vol. 5 No. 3, pp. 144-151.

Clatworthy, M. and Jones, M.J. (2003), "Financial reporting of good news and bad news: evidence from accounting narratives", *Accounting and Business Research*, Vol. 33 No. 3, pp. 171-185.

Cohen, J. (1988), *Statistical Power Analysis for the Behavioral Science*, Lawrence Earlbaum Associates, Hillsdale, NJ.

Colleoni, E. (2013), "CSR communication strategies for organizational legitimacy in social media", *Corporate Communications*, Vol. 18 No. 2, pp. 228-248.

Confente, I., Siciliano, G.G., Gaudenzi, B. and Eickhoff, M. (2019), "Effects of data breaches from user-generated content: a corporate reputation analysis", *European Management Journal*, Vol. 37 No. 4, pp. 492-504.

Crossland, C. and Hambrick, D.C. (2007), "How national systems differ in their constraints on corporate executives: a study of ceo effects in three countries", *Strategic Management Journal*, Vol. 28 No. 8, pp. 767-789.

Crossland, C. and Hambrick, D.C. (2011), "Differences in managerial discretion across countries: how nation-level institutions affect the degree to which ceos matter", *Strategic Management Journal*, Vol. 32 No. 8, pp. 797-819.

Dabirian, A., Kietzmann, J. and Diba, H. (2017), "A great place to work!? Understanding crowdsourced employer branding", *Business Horizons*, Vol. 60 No. 2, pp. 197-205.

Daniel, F., Lohrke, F.T., Fornaciari, C.J. and Turner, R.A. (2004), "Slack resources and firm performance: a meta-analysis", *Journal of Business Research*, Vol. 57 No. 6, pp. 565-574.

Davis, A.K., Piger, J.M. and Sedor, L.M. (2012), "Beyond the numbers: measuring the information content of earnings press release language", *Contemporary Accounting Research*, Vol. 29 No. 3, pp. 845-868.

Delgado-García, J.B. and De La Fuente-Sabaté, J.M. (2010), "How do CEO emotions matter? Impact of ceo affective traits on strategic and performance conformity in the Spanish banking industry", *Strategic Management Journal*, Vol. 31 No. 5, pp. 562-574.

Devarakonda, M., Zhang, D., Tsou, C. and Bornea, M. (2014), "Problem-oriented patient record summary: an early report on a watson application", in *2014 IEEE 16th International Conference on e-Health Networking, Applications and Services (Healthcom)*, 2014, pp. 281-286.

Doddington, G. (2002), "Automatic evaluation of machine translation quality using n-gram co-occurrence statistics", in *proceedings of the second international conference on Human Language Technology Research,* Morgan Kaufmann Publishers, San Diego, California.

Espedal, B. (2007), "Why rules rather than discretion: when the leadership intends to transform a desired policy into reality", *Journal of Organizational Change Management*, Vol. 20 No. 1, pp. 95-108.

Ferrier, W.J. (2001), "Navigating the competitive landscape: the drivers and consequences of competitive aggressiveness", *Academy of Management Journal*, Vol. 44 No. 4, pp. 858-877.

Franco, G.D., Vasvari, F.P., Vyas, D. and Wittenberg-Moerman, R. (2014), "Debt analysts' views of debt-equity conflicts of interest", *The Accounting Review*, Vol. 89 No. 2, pp. 571-604.

Gao, T., Dontcheva, M., Adar, E., Liu, Z. and Karahalios, K.G. (2015), "Datatone: managing ambiguity in natural language interfaces for data visualization", in *The 28th Annual ACM Symposium on User Interface Software & Technology*, ACM, Charlotte, NC.

Gupta, V.K., Dutta, D.K. and Xiujian, C. (2014), "Entrepreneurial orientation capability and firm performance under conditions of organizational learning", *Journal of Managerial Issues*, Vol. 26 No. 2, pp. 157-173.

Hambrick, D.C. (2007), "Upper echelons theory: an update", *Academy of Management Review*, Vol. 32 No. 2, pp. 334-343.

Hambrick, D.C. and Mason, P.A. (1984), "Upper echelons: the organization as a reflection of its top managers", *Academy of Management Review*, Vol. 9 No. 2, pp. 193-206.

Heider, F. (1944), "Social perception and phenomenal causality", *Psychological Review*, Vol. 51 No. 6, pp. 358-374.

Henry, E. and Leone, A.J. (2016), "Measuring qualitative information in capital markets research: comparison of alternative methodologies to measure disclosure tone", *The Accounting Review*, Vol. 91 No. 1, pp. 153-178.

Herath, D.H., Wilson-Ing, D., Ramos, E. and Morstyn, G. (2016), "Assessing the natural language processing capabilities of ibm watson for oncology using real australian lung cancer cases", *Journal of Clinical Oncology*, Vol. 34 No. 15_suppl, p. e18229.

Hooghiemstra, R., Kuang, Y.F. and Qin, B. (2015), "Say-on-pay votes: the role of the media", *European Accounting Review*, Vol. 24 No. 4, pp. 753-778.

Huang, A.H., Zang, A.Y. and Zheng, R. (2014), "Evidence on the information content of text in analyst reports", *The Accounting Review*, Vol. 89 No. 6, pp. 2151-2180.

Irresberger, F., Mühlnickel, J. and Weiß, G.N.F. (2015), "Explaining bank stock performance with crisis sentiment", *Journal of Banking and Finance*, Vol. 59, pp. 311-329.

James, L.R., Choi, C.C., Ko, C.-H.E., Mcneil, P.K., Minton, M.K., Wright, M.A. and Kim, K.-I. (2008), "Organizational and psychological climate: a review of theory and research", *European Journal of Work and Organizational Psychology*, Vol. 17 No. 1, pp. 5-32.

Johnson, J.J. and Mcintye, C.L. (1998), "Organizational culture and climate correlates of job satisfaction", *Psychological Reports*, Vol. 82 No. 3, pp. 843-850.

Keusch, T., Bollen, L.H.H. and Hassink, H.F.D. (2012), "Self-serving bias in annual report narratives: an empirical analysis of the impact of economic crises", *European Accounting Review*, Vol. 21 No. 3, pp. 623-648.

Klein, H. (2019), "Text analysis info - overview on software that analyses texts and other sources of human communication", available at: http://textanalysis.info/pages/text-analysis-software—classified.php (accessed 21 December 2019).

Kohut, G.F. and Segars, A.H. (1992), "The president's letter to stockholders: an examination of corporate communication strategy", *Journal of Business Communication (1973)*, Vol. 29 No. 1, pp. 7-21.

Kondracki, N.L., Wellman, N.S. and Amundson, D.R. (2002), "Content analysis: review of methods and their applications in nutrition education", *Journal of Nutrition Education and Behavior*, Vol. 34 No. 4, pp. 224-230.

Krishnakumar, S. and Evglevskikh, M. (2016), "Acquiring emotional sea legs: navigating joy and sadness in ethical decisions", *Journal of Managerial Issues*, Vol. 28 Nos 1-2, pp. 101-117.

Lahiri, N. and Narayanan, S. (2013), "Vertical integration, innovation, and alliance portfolio size: implications for firm performance", *Strategic Management Journal*, Vol. 34 No. 9, pp. 1042-1064.

Laskin, A.V. (2018), "The narrative strategies of winners and losers: analyzing annual reports of publicly traded corporations", *International Journal of Business Communication*, Vol. 55 No. 3, pp. 338-356.

Laskin, A.V. and Samoilenko, S.A. (2014), "The investor communication strategies of newspaper corporations: a computerized content analysis", *International Journal of Strategic Communication*, Vol. 8 No. 3, pp. 196-214.

Lee, Y.-H., Tucker, A.L., Wang, D.K. and Pao, H.-T. (2014), "Global contagion of market sentiment during the us subprime crisis", *Global Finance Journal*, Vol. 25 No. 1, pp. 17-26.

Lehmberg, D. and Tangpong, C. (2018), "Do top management performance attribution patterns matter to subsequent organizational outcomes? A two-country study of attribution in economic crisis", *Journal of Management and Organization*, pp. 1-20.

Li, F. (2010), "The information content of forward-looking statements in corporate filings—a naïve bayesian machine learning approach", *Journal of Accounting Research*, Vol. 48 No. 5, pp. 1049-1102.

Li, T., Zhang, Y. and Sindhwani, V. (2009), "A non-negative matrix tri-factorization approach to sentiment classification with lexical prior knowledge", in *The Joint Conference of the 47th Annual Meeting of the ACL and the 4th International Joint Conference on Natural Language Processing of the AFNLP: Volume 1 - Volume 1, 2009*, Association for Computational Linguistics, Suntec, Singapore, pp. 244-252.

Loughran, T. and Mcdonald, B. (2011), "When is a liability not a liability? Textual analysis, dictionaries, and 10-ks", *The Journal of Finance*, Vol. 66 No. 1, pp. 35-65.

Marschan, R., Welch, D. and Welch, L. (1997), "Language: the forgotten factor in multinational management", *European Management Journal*, Vol. 15 No. 5, pp. 591-598.

Mašek, P. and Růžička, M. (2014), "Human-machine interface for mobile robot based on natural language processing", in Březina, T. and Jabloński, R. (Eds), *Mechatronics 2013: Recent Technological and Scientific Advances*, Springer International Publishing, Switzerland, pp. 583-590.

Mayfield, J., Mayfield, M. and Sharbrough, W.C. (2015), "Strategic vision and values in top leaders' communications: motivating language at a higher level", *International Journal of Business Communication*, Vol. 52 No. 1, pp. 97-121.

Mcclelland, P.L., Liang, X. and Barker, V.L. (2010), "CEO commitment to the status quo: replication and extension using content analysis", *Journal of Management*, Vol. 36 No. 5, pp. 1251-1277.

Mishra, A.K., Mishra, K.E. and Spreitzer, G.M. (2009), "Downsizing the company without downsizing morale", *MIT Sloan Management Review*, Vol. 50 No. 3, pp. 39-44.

Mishra, K.E., Spreitzer, G.M. and Mishra, A.K. (1998), "Preserving employee morale during downsizing", *MIT Sloan Management Review*, Vol. 39 No. 2, p. 83.

Moreno-Sandoval, A., Gisbert, A., Haya, P.A., Guerrero, M. and Montoro, H. (2019), "Tone analysis in Spanish financial reporting narratives", in *Second Financial Narrative Processing Workshop (FNP 2019)*, Linköping University Electronic Press, Linköpings Universitet, Turku, pp. 42-50.

Morris, R. (1994), "Computerized content analysis in management research: a demonstration of advantages & limitations", *Journal of Management*, Vol. 20 No. 4, pp. 903-931.

Nakayama, M. and Wan, Y. (2018), "Is culture of origin associated with more expressions? An analysis of yelp reviews on Japanese restaurants", *Tourism Management*, Vol. 66, pp. 329-338.

Neubig, G. (2019), "Natural language processing tools", available at: http://www.phontron.com/nlptools.php (accessed 21 December 2019).

Ngambi, H. (2011), "The relationship between leadership and employee morale in higher education", *African Journal of Business Management*, Vol. 5 No. 3, pp. 762-776.

Pang, A., Hassan, N.B.B.A. and Chong, A.C.Y. (2014), "Negotiating crisis in the social media environment: evolution of crises online, gaining credibility offline", *Corporate Communications*, Vol. 19 No. 1, pp. 96-118.

Pang, B. and Lee, L. (2008), "Opinion mining and sentiment analysis", *Foundations and Trends in Information Retrieval*, Vol. 2 Nos 1/2, pp. 1-135.

Papadaki, M., Bakas, N., Ochieng, E., Karamitsos, I. and Kirkham, R. (2019), "Big data from social media and scientific literature databases reveals relationships among risk management, project management and project success", *PM World*, Vol. 7 No. 8, pp. 1-18.

Patelli, L. and Pedrini, M. (2014), "Is the optimism in ceo's letters to shareholders sincere? Impression management versus communicative action during the economic crisis", *Journal of Business Ethics*, Vol. 124 No. 1, pp. 19-34.

Pech, R.J. and Cameron, A. (2006), "An entrepreneurial decision process model describing opportunity recognition", *European Journal of Innovation Management*, Vol. 9 No. 1, pp. 61-78.

Permarupan, P.Y., Saufi, R.A., Kasim, R.S.R. and Balakrishnan, B.K.P.D. (2013), "The impact of organizational climate on employee's work passion and organizational commitment", *Procedia - Social and Behavioral Sciences*, Vol. 107, pp. 88-95.

Pritchard, R.D. and Karasick, B.W. (1973), "The effects of organizational climate on managerial job performance and job satisfaction", *Organizational Behavior and Human Performance*, Vol. 9 No. 1, pp. 126-146.

Rosenkranz, J. (2016), "The framing and reframing of corporate financial results: how corporate earnings releases become news", *Corporate Communications: An International Journal*, Vol. 21 No. 1, pp. 103-119.

Salvi, E., Parimbelli, E., Basadonne, A., Viani, N., Cavallini, A., Micieli, G., Quaglini, S. and Sacchi, L. (2017), *Exploring Ibm Watson to Extract Meaningful Information from the List of References of a Clinical Practice Guideline*, Springer International Publishing, Cham, pp. 193-197.

Sayegh, L., Anthony, W.P. and Perrewé, P.L. (2004), "Managerial decision-making under crisis: the role of emotion in an intuitive decision process", *Human Resource Management Review*, Vol. 14 No. 2, pp. 179-199.

Si, Y., Xia, C. and Yang, E. (2019), "The bright side of investor sentiment: evidence from real activities manipulation", *Asia-Pacific Journal of Accounting and Economics*, pp. 1-25.

Smith, J.E. and Smith, N.P. (1971), "Readability: a measure of the performance of the communication function of financial reporting", *The Accounting Review*, Vol. 46 No. 3, pp. 552-561.

Son, L., Fuller, B., Muriithi, S., Walters, B. and Kroll, M.J. (2015), "The influence of top managers' values on corporate social performance: a meta-analysis", *Journal of Managerial Issues*, Vol. 27 Nos 1-4, pp. 9-27.

Staw, B.M. and Barsade, S.G. (1993), "Affect and managerial performance: a test of the sadder-but-wiser vs. Happier-and-smarter hypotheses", *Administrative Science Quarterly*, Vol. 38 No. 2, pp. 304-331.

Staw, B.M., Mckechnie, P.I. and Puffer, S.M. (1983), "The justification of organizational performance", *Administrative Science Quarterly*, Vol. 28 No. 4, pp. 582-600.

Stone, P.J. and Hunt, E.B. (1963), "A computer approach to content analysis: studies using the general inquirer system", in *The May 21-23, 1963, Spring Joint Computer Conference*, ACM, Detroit, Michigan.

Strauss, N. (2019), "Buying on rumors: how financial news flows affect the share price of tesla", *Corporate Communications: An International Journal*, Vol. 24 No. 4, pp. 593-607.

Strauß, N. and Meer, T.G.V.D. (2017), "News media coverage and initial public offerings in Germany: explaining flotation performance", *Corporate Communications*, Vol. 22 No. 4, pp. 523-541.

Subramanian, R., Insley, R.G. and Blackwell, R.D. (1993), "Performance and readability: a comparison of annual reports of profitable and unprofitable corporations", *The Journal of Business Communication (1973)*, Vol. 30 No. 1, pp. 49-61.

Tangpong, C., Abebe, M. and Li, Z. (2015), "A temporal approach to retrenchment and successful turnaround in declining firms", *Journal of Management Studies*, Vol. 52 No. 5, pp. 647-677.

Tetlock, P.C., Saar-Tsechansky, M. and Macskassy, S. (2008), "More than words: quantifying language to measure firms' fundamentals", *The Journal of Finance*, Vol. 63 No. 3, pp. 1437-1467.

Thomas, J. (1997), "Discourse in the marketplace: the making of meaning in annual reports", *The Journal of Business Communication (1973)*, Vol. 34 No. 1, pp. 47-66.

Trivedi, H., Mesterhazy, J., Laguna, B., Vu, T. and Sohn, J.H. (2018), "Automatic determination of the need for intravenous contrast in musculoskeletal mri examinations using ibm watson's natural language processing algorithm", *Journal of Digital Imaging*, Vol. 31 No. 2, pp. 245-251.

Wagner, J.A. III and Gooding, R.Z. (1997), "Equivocal information and attribution: an investigation of patterns of managerial sensemaking", *Strategic Management Journal*, Vol. 18 No. 4, pp. 275-286.

Yukselturk, O. and Tucker, J. (2015), "The impact of analyst sentiment on UK stock recommendations and target prices", *Accounting and Business Research*, Vol. 45 Nos 6-7, pp. 869-904.

Zavattaro, S.M., French, P.E. and Mohanty, S.D. (2015), "A sentiment analysis of US. Local government tweets: the connection between tone and citizen involvement", *Government Information Quarterly*, Vol. 32 No. 3, pp. 333-341.

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