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What is the Role of Visuals in Earnings Conference Call Slides?

DISSERTATION

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by

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DEDICATION

To my parents, Li Lin and Yuesheng Wu

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ABSTRACT OF THE DISSERTATION

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By

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Professor Siew Hong Teoh, Chair

Using machine learning algorithms to analyze the format of the information in earnings conference call presentation slides, I examine how managers use diagrams, a salient visual presentation format and I analyze the effect of this format on investors and analysts. I find that managers use more diagrams when current quarterly earnings fall short of analyst expectations. In addition, firms that face a negative earnings surprise use more diagrams to discuss other positive key performance news including revenues, cash flows, and cost management. Also, firms increase their use of diagrams for non–GAAP earnings when current GAAP earnings fail to meet analyst forecasts. These results suggest that managers use diagrams strategically in their conference call presentations. I also find that the use of diagrams is associated with a higher initial response to earnings news at the announcement date. The use of diagrams is also associated with a lower post–earnings announcement drift over the post announcement window. Collectively, these results suggest that when earnings fall short of analyst expectations, managers use more diagrams to highlight the positive aspects of the firm's financial performance. As a result, managers' strategic choices regarding the presentation of earnings news hinders the efficient incorporation of earnings news into stock prices.

"Something is happening. We are becoming a visually mediated society. For many, understanding of the world is being accomplished, not through words, but by reading images."
—Paul Martin Lester, 2006

CHAPTER 1: Introduction

Over recent decades, the Securities and Exchange Commission (SEC) has increasingly focused on providing clear and readable financial disclosures. In 1998, the SEC passed the Plain English Rule 421 (d), which requires that issuers adhere to plain English principles in the design of firm prospectuses. This rule is accompanied by a *Plain English Handbook* (SEC 1998), which provides both linguistic and *formatting* suggestions for preparing plain English disclosures.[1] In this paper, I quantify a unique presentation attribute of financial disclosures using large-sample archival data, and I provide evidence on the economic determinants and consequences of the formatting choices in financial disclosures.

In response to the SEC's agenda, prior accounting literature uses techniques from computational linguistics to investigate disclosures' readability, and the effects of readability on the behavior of investors (Li, 2008; Miller, 2010; You and Zhang, 2009). These studies argue that less readable disclosures may limit investors' ability or willingness to extract information from complex and long financial documents (Bloomfield, 2008; Hirshleifer and Teoh, 2003).

Recently, a growing body of experimental studies have begun to explore the role of presentation attributes and its effects on investors' use of financial disclosures (Asay, Libby, and Rennekamp, 2018; Cox, Goeij, and Campenhout, 2018; Elliot, Grant, and Rennekamp, 2017; Rennekamp, 2012). In general, the experimental findings suggest that formatting choices can affect

[1] In its *Plain English Handbook*, the SEC encourages firms to adopt the handbook's suggestions in all their communications (SEC 1998).

the extent to which investors find a disclosure to be comprehensible or credible. [2] This paper extends this line of inquiry by focusing on one important type of presentation attribute: visual cues in earnings conference call presentations.[3] Specifically, I seek to understand (a) how managers use visuals to present information in conference calls that announce quarterly earnings news and (b) how capital market recipients of this news respond to the manager's visuals.

Prior literature in accounting recognizes that the cognitive processing of an information signal begins with awareness of the information signal, before the encoding and processing of the information can occur (Blankespoor, deHaan, and Marinovic, 2020). Research in neuroscience, biology, and psychology suggests that visual stimuli are more salient and vivid than text. Here, *salience* is the extent to which a stimulus stands out relative to other stimuli in the environment, and *vividness* is the inherent attention-grabbing feature of a stimulus regardless of the environment (e.g., Fiske and Taylor, 2016). Therefore, within a large disclosure report, information presented using visual stimuli is more likely to attract investors' attention, thereby increasing the likelihood that the information is impounded into the stock price.

Once they are aware of a certain piece of accounting information, investors must incur costs to process and integrate that information into their valuation process. Prior research on visuals also suggests that visuals have the ability to convey abstract and complex concepts and thus can improve comprehension of the information (e.g., Horn, 2001). This implies that managers can use visuals as an effective tool when explaining complicated financial news to investors, and the use of visuals can help reduce the cost of investors' information processing. On the other hand,

[2] Asay, Libby, and Rennekamp (2018) use lab experiments and find stronger reactions to good or bad news when the earnings disclosure includes a CEO's photo. This suggests that such a visual cue increases the perceived credibility of the disclosure. Elliott, Grant, and Rennekamp (2017) find that visuals in firm CSR reports significantly increases experimental subjects' willingness to invest in the firm. Cox, Goeij, and Campenhout (2018) find that mutual fund clients invest more optimally when key fund information (e.g., fees, past returns) are summarized visually.

[3] I focus on earnings conference calls because they are the most prominent type of accounting events, and their news content can be quantified (e.g., Bushee, Core, Guay, and Hamm 2010; Drake et al. 2012).

the literature on managers' strategic disclosure choices suggests that managers may exploit the low–processing cost attributes of visuals and may use visuals asymmetrically when presenting good versus bad news. In this paper, the use of archival data allows me (a) to explore the relation between managers' choice of visuals and firms' economic performance and (b) to tie my research to the wider literature in accounting on the determinants of disclosure choices.

While there is some experimental evidence on the effects of visuals on investors' decision-making; the magnitude, economic determinants, and capital market consequences have received less attention. At least in part, this likely reflects the challenge of assessing disclosure documents and categorizing and quantifying visual presentations for a large sample, especially given the fact that visual presentations are barely standardized or regulated.

In many ways, the issues in assessing visual content are similar to those faced in other literatures. For example, researchers in communication science have been interested in how visual symbols function in public communication (e.g., Schill, 2012). Researchers in the education literature seek to understand how visual literacy should be recognized as the fundamental goal of a liberal education (e.g., Felten, 2008). In marketing, researchers investigate how the properties of physical ads affect consumers' attention to advertising (e.g., Rosbergen, Pieters, and Wedel, 1997). In all these domains, the challenge is to analyze the properties of samples of visuals that are far too large for humans to review manually or summarize them in a way that is easily analyzable.

In this study, I adopt cutting-edge visual analysis software—Google Cloud Vision Artificial Intelligence (*Vision AI*) to extract the content and format features of conference call presentation slides.[4] AI functions can mimic the working of human brains in processing the visuals

[4] See Appendix A for a detailed discussion of my visual analysis technique and the advantages of implementing Google Cloud Vision AI in visual analysis.

for detecting objects or labels. Meanwhile, Vision AI allows for batch processing, which allows for the analysis of a large sample.[5]

Vision AI is not specifically designed for analyzing visuals in the context of a financial setting, but it is well suited to understanding the slides used in earnings conference calls. In general, Vision AI permits the analysis of the visual properties and textual content of a large group of conference call presentations in an objective and replicable manner. More specifically, Vision AI is designed to infer several specific types of visuals in conference call slides. For example, Vision AI can identify whether an individual conference call slide contains diagrams,[6] which is a salient visual presentation format (see Appendix B). Furthermore, Vision AI permits the extraction of textual content from each individual slide to determine the topic of each slide and to further infer the content of the diagrams in each slide.[7]

As a result, I construct a dataset that depicts a firm's use of diagrams across various accounting items in the firm's quarterly earnings conference call presentations. I can then assess the cross-sectional and within-firm variations in the use of diagrams over time, and I can relate them to changes in specific economic characteristics. Additionally, Vision AI allows me to assess whether the use of diagrams (as advocated in Chapter 7 of the SEC's *Plain English Handbook*) helps investors make more informed investment decisions.

In my empirical analysis, I examine 146,911 presentation slides of earnings conference calls for 843 US public companies and 8,495 firm–quarters over the period 2009–2019. In my

[5] Google Cloud Vision AI is also used commercially. For example, *The New York Times* uses Vision AI to find insights and untold stories in millions of archived photos. See https://cloud.google.com/vision

[6] A *diagram* is defined as a chart, figure, or graph that illustrates statistics or outlines the relationship between the parts of a whole.

[7] A limitation of Vision AI is that it cannot directly identify the topic of the diagrams within each slide. Hence, my assumption is that if the content of the slide is about sales-related news, then the diagram describes sales performance; if the content of the slide is about earnings-related news, then the diagram describes the earnings performance, and so on.

sample, the average quarterly earnings conference call presentation contains 14 slides. Of these slides, 17.9% contain at least one diagram, and 42.2% (28.5%) of the slides mention earnings-related (revenue-related) items in their text. After interacting the format and the content of the information in each slide, I find that the unique conference call presentation uses 0.8 (0.6) slides, on average, to present earnings (revenues) using diagrams.

In the first set of tests, I use a within-firm design to examine the relation between (a) the use of visual presentations in earnings conference call slides and (b) the firms' financial performance. A key advantage of using a within-firm design is that it helps alleviate concerns that my measure of visual presentations captures omitted, firm-specific characteristics, and it controls for persistence in both independent and dependent variables. In addition, prior literature documents the influence of manager-specific characteristics on disclosure decisions (e.g., Bamber, Jiang, and Wang 2010). To alleviate concerns about managerial style in the choice of using visuals, I control for CEO fixed effects in the models.

I find that within a firm, more extensive use of diagrams is associated with negative earnings surprises. The prior literature argues that bad news is more complicated for investors to understand, and therefore investors may demand more simplification in managers' presentation of bad news. The use of diagrams can help aid managers as they explain the bad earnings news effectively and efficiently within the time limitations of conference calls.

On the other side, describing bad earnings news using salient diagrams may induce overreaction to the bad news and result in a price crash. Therefore, managers who are concerned about negative capital market consequences would not use diagrams to draw attention to the bad earnings news. Instead, managers could strategically exploit the higher salience of diagrams by using diagrams to divert attention toward other good key performance dimensions, such as revenue

growth, strong cash flows, or effective expense management in bad states (e.g., when earnings fail to meet or beat analyst forecasts). For investors that have processing constraints, such diversion can lead investors to overweight the good performance metrics and underweight the bad news in overall earnings.

I test empirically whether this use of diagrams is strategic or informative for investors. Using a within-firm analysis, I find that firms that encounter a negative earnings surprise increase their use of diagrams (a) when the current quarter shows good performance in other key financial items (i.e., non-earnings), including a growth in revenues, a growth in cash flows, or a reduction in operation expenses, and (b) when the current quarter earnings are outstanding when using alternative performance benchmarks, including when return-on-assets is in the top quintile of its industry peer group or when non–GAAP earnings are higher than GAAP earnings. Overall, these findings suggest that managers strategically use more diagrams when discussing other good performance metrics when earnings fail to meet or beat expectations.

In my second set of tests, I investigate whether the strategic use of diagrams leads to mispricing. If investors who have limited attention are fooled by managers' strategic use of diagrams, then they may respond only to the highlighted good performance without properly discounting the lower persistent earnings news (Hirshleifer and Teoh, 2003). As a result, I find that (a) earnings response coefficient increases when firms use more diagrams in their earnings conference call slides and (b) this result is driven by a subsample of firms with negative earnings surprises. Additional cross-sectional analyses suggest that mispricing is more pronounced when investors are more distracted by other same-day earnings announcements. In addition, I find a reversal in reaction for firms that use more diagrams in the post-announcement period. Overall, these results are consistent with Rennekamp (2012), who suggests that investors may be too quick

to accept information that is presented in a way that is easy to process, which includes information presented using visuals. More importantly, these findings imply that the benefits of more readable disclosures may be less clear cut than the benefits promoted by the SEC (SEC, 1998).

Investors vary in sophistication and in their vulnerability to misperceptions from the strategic use of diagrams. Therefore, I also examine a subclass of investors, *short sellers*, who are more sophisticated than the average investor, to analyze how they respond to the use of diagrams. The evidence of the market's underreaction to bad news presented using diagrams suggests that earnings announcements that include more diagrams (due to managers' strategic use of diagrams) may increase the information asymmetry between informed and uninformed investors. Therefore, this increased information asymmetry presents profitable trading opportunities for skilled information processors such as short sellers.

Using a pathway analysis, I find that (a) short sales are higher for firms that use more diagrams in their earnings call slides and (b) firms that have high short interest exhibit less drift after earnings announcements, and these results are driven by firms that experience negative earnings surprises. Viewed collectively, these results suggest that short sellers properly interpret news of less persistent earnings, and they are less misled by the use of diagrams to highlight good performance in other areas.

This study contributes to the growing body of literature investigating the presentation attributes of financial information and, more generally, to the literature on disclosures. Prior research documents the relation between firm performance and the presentation attributes of disclosures, including readability in annual reports (Li, 2008), the tone of words used in earnings press releases (Huang, Teoh, and Zhang, 2014), and managers' tone of voice in earnings conference calls (Mayew and Venkatachalam, 2012).

Researchers have only recently begun to explore the role of visuals as an additional presentation attribute in experimental settings (e.g., Asay, Libby, and Rennekamp, 2018; Elliott, Hodge, and Sedor, 2012).[8] To the best of my knowledge, this paper represents the first large-sample archival study to examine the economic determinants of using visual presentations in earnings conference calls and its consequences in the capital market.[9,10] This study extends the nonverbal information disclosure literature by showing that managers use visuals, a vivid and more comprehensible communication instrument, to convey financial information to outside investors. This provides initial evidence that the US public firms respond to the SEC's call to provide clearer and more informative disclosures by using visuals.

Second, the use of archival data is well suited to investigate managers' disclosure decisions. Research in visual sociology supports the prediction that the choice of visual presentation may vary in line with specific goals and incentives.[11] My findings add new evidence to the accounting literature by demonstrating that as firm performance varies, managers use salient visual cues,

[8] DeSanctis and Jarvenpaa (1989); Preston, Wright, and Young (1996); Beattie and Jones (1997, 2000); and Dilla and Javrin (2010) investigate the use of graphs in annual reports in small-sample settings, mainly due to the difficulty in identifying and analyzing the properties and features of visuals.

[9] Nekrasov, Teoh, and Wu (2020) consider the visuals that firms disseminate through Twitter on earnings announcement dates. Twitter provides a small space for firms to upload images (i.e., up to four per tweet), which renders their sample subject to less variation in the *type* of visuals. However, in this paper, the use of earnings conference call slides enriches our understanding of these visual types.

[10] Beattie, Dhanani, and Jones (2008) examine the format changes in the annual reports of companies listed in the UK from 1965 to 2004. They find that graphical measurement distortion and manipulation of the length of time series are common when using graphs. This paper examines a sample of US public companies, which is distinct from Beattie et al. (2008) in several ways. First, there is less extensive litigation in the UK, and this may affect the nature of visual manipulation. Second, this paper considers the use of visuals during earnings conference calls over a more recent sample period. Compared to annual reports, earnings conference calls provide more timely information to investors, and they trigger the most prominent spike in information acquisition and processing (e.g., Drake, Roulstone, and Thornock 2012). This provides stronger incentives to managers to earn capital market benefits by using visuals strategically. On the other hand, the increased regulatory scrutiny after Reg FD may prevent firms from using visuals to manipulate the perception of earnings news. Overall, due to these differences, it is unclear *ex ante* whether the prior findings can be generalized to my setting. In addition, Beattie et al. (2008) do not study the capital market consequences of the use of graphs in annual reports. This paper fills that gap.

[11] For example, Thorson, Christ, and Caywood (1991) investigate how visual background of commercials can be strategically used in political commercials to affect voters' attitudes toward the candidates' personal characteristics and their abilities.

whether intentional or not, to influence investors' reactions (Huang et al., 2018). This paper also has potential important implications for the SEC's efforts to improve the readability of disclosures. Although the SEC encourages the use of visual presentations in disclosures, as if they were unambiguously positive (SEC, 1998), my results indicate that visuals may actually lead investors to overreact to information.

Last, in response to Teoh's (2018) call for research on nonverbal data, I demonstrate the value of machine learning techniques such as Vision AI in understanding the visual attributes of financial disclosures. To the best of my knowledge, this paper is the first research to use earnings conference call presentation slides, a dataset rich in visuals, to understand the role of visual presentations in financial disclosures. I show that Vision AI has the potential to be a powerful tool for understanding visual presentations in the context of financial content because it provides an approach for evaluating the visual properties of large samples consistently and objectively over time.

This paper proceeds as follows. Section 2 discusses the history of using earnings conference calls to disseminate earnings news, background information on visual presentations in financial disclosures, and hypothesis development. Section 3 describes the data, sample construction, and definitions of diagram measures. Section 4 presents the research designs and empirical results, and Section 5 concludes.

CHAPTER 2: Background and Hypothesis Development

2.1 The history of conference calls

In 1995, a *Wall Street Journal* report stated that "the process of communicating large chunks of information to the investment community has shifted to the conference call" (WSJ, 1995). Since then, conference calls allow managers to (a) expand on periodic earnings releases,

(b) provide their perspectives on the prospects of the firm, and (c) respond to questions from the audience. Before Regulation Fair Disclosure (Reg FD), relatively few firms allow individual investors real-time access to these conference calls (Thompson, 2000).

The limitation of real-time access is largely due to two reasons. The first is the direct cost. Early in the 1990s, it was costly for the investor relation department to inform individual investors about the dates, times, and call-in numbers of conference calls (Bushee, Matsuomto, Miller, 2003). The second reason is the indirect cost. Managers are concerned that individual investors would overreact to the negative information released in conference calls (Bushee et al., 2003; Bushee, Matsumoto, Miller, 2004).

With the passage of Reg FD, the SEC requires publicly traded firms to provide open access to conference calls. Since then, the SEC has issued a series of releases to level the playing field. For example, in August 2008, the SEC acknowledged the use of a company website as a channel for disseminating information to the market. In April 2013, the SEC issued a guidance stating that a company is permitted to use social media outlets to disseminate public information. Public companies are encouraged to release the date and time of their earnings conference calls at least one week before the earnings announcement date through a wire service, corporate website, or social media, where the information is collected and presented to investors as an "earnings calendar" by some public websites such as Yahoo! Finance. Therefore, regulatory and technological changes over the past two decades have substantively reduced the information acquisition cost of the schedule of earnings announcements.

A 2016 National Investor Relations Institute (NIRI) survey reports that 70% of participating companies conduct quarterly earnings calls by webcasting, a majority of which are composed of a formal live presentation by top executive members followed by a live Q&A. After

Reg FD, companies must provide unlimited access to all investors, but they may limit participants who may ask questions and restrict others' participation to a listen-only mode (Cohen, Lou, and Malloy, 2020). After the earnings conference call, companies are encouraged to make available a replay of the audio, along with presentation slides, on their website for at least one year to avoid an Reg FD violation (NIRI, 2016). [12]

2.2 Increasing demand and supply for more visual presentations in corporate disclosures

Regulators have long recognized the importance of making corporate disclosures understandable for investors. In 1967, the SEC established an internal study group to examine the operation of the disclosure provisions of the Security Act of 1933. This study resulted in the 1969 *Wheat Report*, which notes that prospectuses included unnecessary information and were often too long or complex for the average investor to readily understand them.

Over the years, the SEC has attempted to address this problem by removing arcane, complex, or incomprehensible language. Then, in October 1998, the SEC issued new "plain English" guidelines that show securities lawyers and companies how to use well-established techniques to create clearer and more informative SEC disclosure documents. Specifically, the SEC adopted the Securities Act Rule 421(d) as the *Plain English Rule* of the SEC. It requires that the issuers of securities use "plain English" when they compose the cover page, summary, and risk factors section of their prospectuses. In 2008, the plain English requirement was extended to mutual fund summary prospectuses.

The Plain English rule aims to guide preparers in providing clear, concise, and understandable prospectuses based not only on their lexical properties (e.g., length of sentences, active vs. passive voice) but also on the graphical design of the document (e.g., the use of charts

[12] See Appendix B for a NIRI proposed timeline of distributing and disseminating quarterly earnings news.

and figures). During the 2007 open meeting of the SEC advisory committee on improvements to financial reporting, a Moody's managing director commented that the inclusion of images, graphs and charts in face-to-face meetings with management offers more clarity and insight than reading the *Management Discussion and Analysis* sections of company filings. The director asked for the addition of graphical information to financial reports (SEC, 2007).

In a recent public statement, the SEC acknowledged that "perhaps we could expect retail investors to flip through and take seriously of boilerplate language if its presentation was *visually dynamic* [italics added] and engaging" (SEC 2018). As a follow-up action, the SEC solicited public comments from individual investors about their use disclosures and how they believe mutual funds could improve disclosures to help make investment decisions. As a result, feedback from a total of 110 investors was posted on the SEC's website. When asked, "*Would you prefer more tables, charts, and graphs?*", 94% of the participants answered *yes* to this question. This indicates high investor demand for the visual presentation of investment information.

More recently, Covestro AG, a German company, published a digital version of its 2019 annual report which included video messages, interactive graphics, and even a quiz.[13] This led to more engagement with investors, because more corporate website page views leads to more comments and more mentions in the media (WSJ 2019). Such anecdotal evidence increases confidence that visual corporate disclosures are welcomed by investors who want information for a comprehensive understanding of the company.

In terms of using visual elements in quarterly earnings announcements, which is one of the most prominent types of accounting events, Figure 1 presents the time trend of S&P 1500 Index firms in providing presentation slides to investors when announcing earnings news. Around 70%

[13] The digital version of Covestro's 2019 annual report is available at https://report.covestro.com/annual-report-2019/?mod=article_inline

of these firms provided slides for their earnings calls in 2019, increasing from less than 20% in 2009. Also, the use of slides is slightly higher in the fourth fiscal quarter.

2.3 The power of visuals in neuroscience, biology, and psychology

It is well known that words are processed by our short-term memory,[14] while images go directly into long-term memory,[15] where they are indelibly etched. Prior research in neuroscience and biology provides ample evidence on how visuals can transmit messages faster. Thorpe, Fize, and Marlot (1996) document that the human brain requires only about one fourth of a second to process and attach meaning to a symbol. By comparison, it requires an average of six seconds to read 20–25 words. A study by 3M's Visual System Division documents that visuals can improve *learning* by up to 400%. Horn (2001) explains this phenomenon by stating

> …when words and visual elements are closely entwined, we create something new and augment our communal intelligence. Visual language has the potential for increasing "human bandwidth"—the capacity to take in, comprehend, and more efficiently synthesize large amounts of new information.

Last but not the least, visual cues trigger emotions. This is because visual memory is encoded in the medial temporal lobe of the brain, the same place where emotions are processed. And, emotion has a substantial influence on human cognitive processes, including memory, perception, attention, learning, and reasoning (Tyng, Amin, Saad, Malik, 2017).

2.4 Hypothesis development

Investor attention is a limited cognitive resource. The form of a presentation can affect whether, and how effectively, the earnings news is processed and impounded into valuations. Prior

[14] Human brains can retain only about seven bits of information, ± 2 (Burmark, 2002).
[15] Dale (1969) finds that after three days, a user retained only 10–20% of written or spoken information, but almost 65% of visual information.

studies in psychology document that visuals are more vivid and salient than textual information (e.g., Fiske and Taylor 2016). Therefore, visuals increase the recipients' awareness of the information. In the accounting literature, Nekrasov et al. (2020) provide initial evidence that visuals in firm earnings announcements increase investor attention to the earnings news.[16]

Visuals can be a double-edged sword. Graphs and charts can be very helpful in aiding the understanding of data, but they can also be deployed to lie about the data (Tufte, 2001). Prior studies of financial disclosures find that managers behave strategically in their choice of words and tone to convey a more favorable impression of the earnings news (Li, 2008; Bushee, Gow, and Taylor, 2018; Huang et al., 2018). To the extent that visuals increase the salience of some good accounting metrics and portray a positive financial view to the market, managers can use more visual presentation as an instrument to obfuscate the true nature of the firms' current and future performance.

In addition, prior literature states that conference calls arguably provide stronger managerial incentives to obfuscate than the 10-K setting (Bushee et al., 2018). Bushee, Matsumoto, and Miller (2003) document that high individual investor attention to the company during the conference call, and before Reg FD, a commonly expressed reason for restricting individual investor access to calls was managers' concerns that investors would overreact to the negative information released during the call. Therefore, the high visibility of the earnings conference call provides a powerful setting for examining managers' obfuscation incentives

[16] In addition to footnote 9, another major distinction between this study and Nekrasov et al. (2020) is that Nekrasov et al. study the use of visuals in social media, in which the utilizing of "push" technology allows the firm to transmit information to the investor rather than requiring the investor to request the information from the firm. In such a setting, the first-order effect of visuals is to increase the dissemination of earnings news and attract investor attention from other firms to the focal firm. In this paper, I consider that investors must first pay attention to the firm's conference call event, then they can access the conference call webcast before they see the visuals in presentation slides.

through the strategic use of visual presentation. Therefore, in my first hypothesis, I posit that firms will use more diagrams to "sell" good accounting metrics:

H1. Firms will use more diagrams in conference call presentation slides to highlight good performance items.

Investors, regulators, and standard setters have expressed concern that the *textual* content in corporate disclosures has become longer, less readable, and less effective in communicating with shareholders over time (Li, 2008; SEC, 2013). The SEC and the Financial Accounting Standards Board (FASB) have ongoing agendas to reduce the complexity of financial disclosures (FASB, 2012; SEC, 2013; SEC, 2019), but the textual complexity caused by organizational structures or business transactions is difficult to reduce effectively while also maintaining the same level of informativeness.

Visuals differ from textual information in the way they rely on *spatial* rather than linguistic intelligence (Tufte, 1997). Prior research in psychology and decision science provides ample experimental evidence that the use of diagrams improves performance when solving decision problems. For example, Umanath and Vessey (1994) find that the use of diagrams improves the accuracy of a bankruptcy prediction task relative to the use of tables. The notion is that diagrams facilitate the information *integration* process while preserving characteristics of the underlying data. Tables, on the other hand, do not aid the decision maker in integrating information.

In the context of a financial setting, in order to assess how a firm performed in past accounting cycles, investors often seek to compare (a) a firm's performance metrics across different time periods, (b) competitors' performance, or (c) analyst forecasts. Visuals, which consist mostly of charts, histograms, and graphs; can effectively communicate the spatial relations between several objects and can further enhance comprehension of the information content.

Therefore, in my second hypothesis, I posit that firms use more diagrams when quarterly earnings news is complicated and less likely to be efficiently explained using text:

H2. Firms will use more diagrams in conference call presentation slides when earnings news is difficult to deliver effectively. [17]

If managers choose to use visual information to facilitate the communication and explanation of complex financial news, and if investors efficiently incorporate this information into firm valuation, then stock prices should be more responsive to earnings news immediately after its release, thereby increasing price efficiency. Alternatively, managers may decide to use visuals strategically to highlight good performance. Since investor attention is a limited cognitive resource, inattentive investors may respond only to the highlighted good news without properly evaluating bad news presented less saliently. As a consequence, managers' strategic use of visuals in presenting financial news can result in mispricing (Hirshleifer and Teoh, 2003). I state the third hypothesis in the alternative form; however, the directional implication depends on the results of testing H1 and H2:

H3a. The immediate market reaction to earnings news will change with the use of diagrams in conference call presentation slides.

H3b. The post-earnings announcement return reaction will change with the use of diagrams in conference call presentation slides.

Prior studies have documented that the market reacts to news faster when earnings information is presented more saliently, with quantitative information in the headlines of earnings press releases (Huang et al., 2019) and with visuals in earnings announcements disseminated via

[17] H1 and H2 are not necessarily mutually exclusive, in the sense that the incentives for meeting investor information demand do not prevent managers from acting strategically in their use of visuals.

social media (Nekrasov et al., 2020). In this paper, I test for the salient attention effect in a different setting, one that relates to the use of salient presentation formats in earnings conference calls, which provides a rich set of visuals that enables me to exploit the effect of a specific type of visuals (i.e., diagrams) on market reactions.

Prior studies suggest that short sellers are informed traders (e.g., Asquity et al., 2005; Boehmer et al., 2008) and they have a trading advantage over average traders. Engelberg, Reed, and Ringgenberg (2012) document that a substantial portion of short sellers' trading advantage derives from their superior ability to process information when analyzing publicly available information. Under the assumption that short sellers have superior ability in analyzing information presented with diagrams, I examine whether the level of short sales is different for firms that use more diagrams in earnings call slides.

H4. Short selling is higher when firms use more diagrams in their earnings conference call presentations.

CHAPTER 3: Data and Sample

3.1 Extracting Earnings Call Slides from SEC EDGAR

I begin with a list of S&P 1500 Index firms from January 1994 to July 2019. The sample period starts with 1994 because this is when public filings are available through the EDGAR dissemination service, and it ends in July 2019 when my data collection process began. I first acquired the CIK for each firm from Compustat, since EDGAR uses it as an identifier when searching for company filings and because it enables me to identify each firm's *EDGAR Search Results* pages.[18] Then, from each company's EDGAR search result pages, I search for all 8-K

[18] For example, the Uniform Resource Locator (URL) of the Albany International Corp webpage on EDGAR is https://www.sec.gov/cgi-bin/browse-edgar?CIK=819793&owner=exclude&action=getcompany, which requires the use of Intel's CIK number to identify its EDGAR webpage.

filings and collect information about the filing date and the corresponding accession number, which is assigned by EDGAR and unique for each filing.

The above two steps allow me to visit the *Filing Detail* page for each company's 8-K filings.[19] The *Filing Detail* page lists all the documents that firms uploaded to the EDGAR system for the specific filing, and it indicates the type of each document. Specifically, all the earnings call slide uploads are identified as "GRAPHIC" under the description column, which allows me to distinguish documents related to earnings call slides from other plain text documents (e.g., exhibits or XBRL). In addition, the EDGAR *Filing Detail* page lists each individual slide, along with its URL, separately rather than the entire PDF document of earnings call presentation slides, thus it is possible to further analyze the visual attributes and textual content of each slide (see Section 3.2 for further discussion).

In the final step, I collect all the GRAPHIC–type files and their related information: (a) the URL of each GRAPHIC file saved on the EDGAR server, (b) the sequence of the file (which helps determine the order of the slides), and (c) the size of the GRAPHIC file. In addition, I merge the slide-level information with (a) the firm identifier CIK, (b) the filing identifier SEC accession number, and (c) the filing date.

Form 8-K can be used to announce different kinds of major events that are not limited to earnings announcements,[20] and firms can use presentation slides in other types of major events such as investor day presentations or company conference presentations (Bushee, Jung, and Miller 2011). To restrict my sample to include only the graphic files directly related to earnings call slides,

[19] See https://www.sec.gov/Archives/edgar/data/819793/000115752316006351/0001157523-16-006351-index.htm as an example for one of the Albany International Corp's 8-K *Filing Detail* pages. The URL is composed of Albany International's CIK (i.e., 819793) and accession number (i.e., 000115752316006351, with and without the hyphen) for its 8-K filing on August 1, 2016.

[20] See https://www.sec.gov/fast-answers/answersform8khtm.html for a detailed list of the types of events that trigger a public company's obligation to file an 8-K report.

I merge the filing date with the earnings announcement date (*RDQ*) acquired from Compustat. I also require the filing date to be within the [0,+4] window of *RDQ*, since companies may require a few days to complete 8-K filings after the quarterly earnings announcement date[21] and because after March 2004, the SEC requires firms to file current reports on Form 8-K within four business days of a triggering event.[22]

In addition, after checking the completeness and accuracy of the downloaded data, I find that some firms have only a few number of graphic files uploaded for each 8-K filing, and those graphics do not come from the earnings call slides; rather, most are firm logos. To exclude these kinds of GRAPHIC files, I require at least five GRAPHIC files per 8-K filing.[23]

The above process produces a total of 380,106 individual earnings call slides, which represent 10,181 firm–quarters and 1,128 unique firms.

Given the intensity of the slide level data, and due to the cost constraint in processing the attributes and contents of the slides (see Section 3.2.1 for details), I further restrict the sample to earnings calls starting from 2009, after the Financial Crisis. I merge the sample with financial data from Compustat, stock prices and returns data from CRSP, and analyst forecasts and actual earnings numbers from I/B/E/S. I also remove slides that contain boilerplate.

The final sample includes 146,911 individual earnings call slides, which represent 7,264 firm–quarters and 843 unique firms. Among these 843 firms, some chose to use presentation slides in their earnings conference calls sporadically.[24] To examine the determinants of the choice of

[21] See IBM's 07/18/2019 filing as an example in which they uploaded slides about non–GAAP supplemental material related to their 07/17/2019 earnings announcement.

[22] See https://www.sec.gov/rules/final/33-8400.htm for the SEC Final Rule: Additional Form 8-K Disclosure Requirements and Acceleration of Filing Date.

[23] See Eversource's 2018 Third Quarter Financial Results presentation for an example in which Eversource uses a total of five slides to present informative financial performance: https://www.eversource.com/content/docs/default-source/investors/2018-q3-investor-call.pdf?sfvrsn=6f68cd62_0

[24] Firms can choose to hold earnings conference calls with audio only. During 2009 to 2019, among S&P 1500 Index firms, 16% of the firms never used presentation slides during their conference calls, and 3.6% of the firms always use

using presentation slides (rather than the use of diagrams per se), I add the firm–quarter level financial and stock valuation data for the firm–quarters that do not use presentation slides during my sample period.

Table 1 Panel A presents details of the sample selection. Panel B reports the distribution of the sample across industries, using the 12 Fama–French industry classifications. In my sample, the industries with the most earnings call slides and firm–quarter observations are *finance*, *manufacturing*, *business equipment*, and *utilities*. Relative to the overall industry distribution of publicly traded common stock during my sample period, *finance* and *manufacturing* are relatively overrepresented in the use of earnings call slides, while *business equipment* and *healthcare* are underrepresented.

3.2 Descriptive Statistics of Earnings Call Slides

3.2.1 Content of Information in Earnings Call Slides

To understand the topics of information presented in earnings call slides, I first extracted the textual information in each earnings call slide using Google Vision AI pre-trained machine learning models. Given the text extracted from the earnings call slides, I identify and remove the slides with boilerplate such as safe harbor statements, forward-looking statements, or legal disclaimers, as described in Section 3.1. Next, I examine whether the textual information in each slide is related to: (a) specific accounting terms, including earnings, revenue, cash, charge, cost, loss, reserve, and order backlog (following Huang et al. (2018)), (b) forward-looking information using a list of future-oriented keywords and phrases (see Muslu, Radhakrishnan, Subramanyam, and Lim 2015; Bochkay, Chychyla, and Nanda 2019), and (c) non–GAAP information.

presentation slides during their conference calls. For the remaining firms, the average number of switching between using or not using presentation slides is 3.

Table 2 Panel A reports the descriptive results. Among the slides, 32% contain forward-looking information, and 17.9% of slides mention non–GAAP items. In terms of the accounting terms, 42.2% of the slides contain earnings-related items (e.g., EPS, EBITDA, loss), 28.5% of slides contains revenue-related items (e.g., sales, revenues), 26.1% of slides contain cost-related items (i.e., various types of expenses or costs), and 6% of slides mention cash-related items.

Next, to measure the linguistic tone of the content in earnings call slides based on the textual information in the slides, I use Loughran and McDonald's (2011) financial sentiment dictionary (*L&M dictionary*) to identify the positive and negative words in each slide. Then, I calculate the tone in each slide as the number of positive words minus the number of negative words, divided by the total words per slide.

Table 2 Panel A also reports the slide-level descriptive statistics. On average, each slide contains 80 words, and each word has 6 characters. More than 75% of the slides have a non-negative tone. For each slide, 1.37% of the words have a positive tone, and 1.11% have a negative tone. The information intensity varies cross the slides. The top 1% of slides contain more than 500 words per slide (untabulated), thus the large amount of text information can inflate investors' information processing cost during the earnings calls. Therefore, I control for information intensity in my further tests.

3.2.2 Format of Information in Earnings Call Slides

To capture the information presented in visual format in earnings calls slides, I use Google Vision AI to identify whether each slide contains diagrams. The Google-based AI tool uses pre-trained machine learning models to analyze the images and provide several labels that the algorithm suggests are likely types of images in the earnings slides. [25] In total, more than 2,000

[25] See Appendix C for examples of Google Vision AI analyzed results.

distinct labels are detected using all slides in my sample. To decide which AI-detected labels are related to diagrams, I first obtain the list of the top 50 most frequently used labels in my sample and then check each of them. As a result, I find that *diagram*, *plot*, *parallel*, and *graphics* are the words related to charts and figures that describe statistical information.

Next, I construct and validate three visual attribute measures that capture whether a slide contains information presented using diagrams. I define *DIAGRAM1_SLIDE* as equal to 1 if the AI algorithm assigns to the slide the labels *diagram*, *plot*, *parallel*, or *graphics*; and 0 otherwise. The variable *DIAGRAM2_SLIDE* equals 1 if the AI algorithm assigns to the slide the labels *diagram* only, or both *diagram* and *parallel*, or *plot*, or *parallel*; and 0 otherwise. The difference between *DIAGRAM1_SLIDE* and *DIAGRAM2_SLIDE* is that if a slide is labeled with *parallel* without a diagram, then it is defined as 1 (0) for *DIAGRAM1_SLIDE* (*DIAGRAM2_SLIDE*). See Appendix C, Example 1 and Example 2.

A slide labeled with *parallel* only is likely to contain tables rather than charts. To further exclude the misclassification of non-performance-related graphics as diagrams, I define *DIAGRAM3_SLIDE* as equal to 1 if the AI algorithm assigns to the slide the labels *diagram* only, both *diagram* and *parallel*, or *plot*; and 0 otherwise. The three slide-level *DIAGRAM* measures capture the use of visuals in slightly different dimensions. I then compare the differences and diagnose the accuracy of each measure using randomly selected slides.

The results are shown in Appendix D. As shown in Appendix D, *DIAGRAM3_SLIDE* outperforms the other two measures in capturing the diagram-related attributes of each slide. Therefore, I use *DIAGRAM3_SLIDE* to construct firm–quarter-level diagram measures, and I label them with *DIAGRAM* in the rest of my analysis. Table 2 Panel A presents the descriptive statistics, where 17.9% of the slides include diagrams and plots (*DIAGRAM_SLIDE*).

Next, I construct three types of firm–quarter-level *DIAGRAM* measures: (a) #*DIAGRAM* equals the total number of slides with diagrams per earnings call presentation, (b) %*DIAGRAM* calculates the percentage of slides that include diagrams in each earnings call presentation over the total number of slides, and (c) and *D_DIAGRAM* equals 1 if the firm uses at least one slide with a diagram per earnings call presentation, and 0 otherwise. On average, 53.5% of the firms use at least one diagram in their earnings call slides, 15.3% of the earnings call slides contain diagrams, and the average number of slides containing diagrams is 2.6 per firm–quarter.

3.2.3 Interaction of the Content and the Format of Information-Univariate Analysis

Do firms tend to use diagrams uniformly across different topics of financial information? To generally understand what topics of financial information are more likely to be presented using diagrams, Table 2 Panel B reports the correlation between content measures and diagram measures at the slide level. The correlation between *DIAGRAM_SLIDE* and *FWLK** is −0.09 ($p < .001$), which indicates that firms are less likely to use diagrams for slides about forward-looking information. The correlation between *DIAGRAM_SLIDE* and *NONGAAP** is −0.10 ($p < .0001$), which indicates that firms are less likely to use diagrams for slides that discuss non–GAAP–related information. In addition, the correlation between *DIAGRAM_SLIDE* and accounting terms (i.e., *EARNINGS**[26], *REVENUE**, and *CASH**) are all significantly negative. The above univariate results suggest that firms are more likely to use diagrams when presenting non-forward-looking information and non-financial-related information.

Anecdotal evidence suggests that firms are more likely to present diagrams with operational-related information (e.g., key performance indicators) because financial analysts, who are the major participants of earnings calls, are interested in these measures. Using a list of eight

[26] * is used to distinguish textual content–based variables from the numerical variables that appear later in the analysis.

industry-specific KPI items, as defined in the I/B/E/S QFS User Guide,[27] I first identify whether each slide contains KPI-related information. Then, I calculate the correlation between the use of diagrams and the mention of KPI items. The untabulated results indicate significantly positive correlations between *DIAGRAM_SLIDE* and KPI items related to airlines, banks, energy, and pharmaceuticals. This supports the conjecture that diagrams are more likely to be used to explain operational-related items.

3.2.4 Interaction of the Content and the Format of Information-Multivariate Analysis

The descriptive statistics show that, on average, a firm uses 14 slides to discuss their quarterly financial results during their earnings conference calls. Only 3 of the 14 slides contain information presented using diagrams. Therefore, we must ask how managers decide which items to present using diagrams.

On one hand, as discussed in Section 2, managers can benefit from the use of diagrams by either clarifying the complicated financial results or attracting investor attention to items that highlight good performance. However, these benefits do not come without tension. First, the SEC *Plain English Handbook* recommends that firms hire a graphic designer to work closely with managers and consider how to present the complex information more visually and effectively. Therefore, firms and managers bear some costs in the preparation of visual elements for financial disclosure documents. Second, some firms, especially bad news firms, may not be able to use visuals strategically to portray a positive image. A firm must have some good performance metrics to highlight with visuals. Third, prior studies in psychology have shown that visuals can facilitate the understanding of complex information and can also attract more attention, but there is no prior

[27] See https://wrds-www.wharton.upenn.edu/documents/1337/2018_IBES_QFS_User_Guide_-_August_2018.pdf, page 11, for a complete list of KPI items for the following sectors: airline, banks, energy, insurance, real estate, mining, pharmaceuticals, technology, and telecom.

research on how the use of visuals affects investors in the financial setting. Firms with a majority number of sophisticated investors may already have superior resources to digest complicated information and be attentive. In these situations, the use of visuals may not provide significant capital market benefits. Therefore, it is an empirical question to examine the determinants of the use of visuals in conference calls.

Before turning to the regression analysis, I examine the use of diagrams for various accounting items. Among the 8,495 firm–quarters that use presentation slides during conference calls, the average firm uses four slides to explain financial news with diagrams. Of these four slides, one slide describes the bottom-line earnings, one slide shows sales performance, and the remaining two slides describe cash flows, expenses, and capital structures.

The univariate analysis provides some evidence that suggests that diagrams are not uniformly used for all types of information discussed in a firm's conference call. Therefore, to capture firms' use of diagrams in describing a specific type of accounting-related information, I construct a slide level variable, *DIAGRAM_ACCTITEM_SLIDE*, which equals 1 if the slide mentions a certain type of accounting information or if the slide contains diagrams, and 0 otherwise. For example, I define *DIAGRAM_EARN_SLIDE*, which equals 1 if the slide mentions earnings-related news in the slide text or if the slide contains diagrams, and 0 otherwise. Then, based on *DIAGRAM_EARN_SLIDE*, I construct two firm–quarter-level diagram proxies for earnings-related news: (a) *#DIAGRAM_EARN*, which equals the total number of slides containing earnings-related diagrams per earnings call presentation, and (b) *%DIAGRAM_EARN*, which is calculated as the number of slides using diagrams that mention earnings-related items over the total number of slides per earnings call presentation. The same procedure applies to other accounting-related items while constructing the firm–quarter-level diagram proxies.

CHAPTER 4: Multivariate Analysis Results

4.1 Why Use Slides during Conference Calls?

As discussed in Section 2.1, among S&P1500 Index firms during my sample period, about 80% use presentation slides in a sporadic manner. The use of presentation slides, even without any diagrams, can provide visual elements for the conference call audience (e.g., organizing text using bullet points) to increase attention to the information. Therefore, the choice to use presentation slides may reflect managerial discretion in the information dissemination and, as a result, may affect the processing of the information by investors.

To study the determinants of using presentation slides during conference calls, I examine how the quarterly choice of using slides is related to certain firm characteristics, including the information environment (*SIZE* and *ANALYSTS*), financial performance (*ROA*, *POS_SUE*, *SALES_GROWTH*, and *LOSS*), and the business complexity (*MERGER* and *#SEGMENTS*), using the following regression:

$$PRE\_SLIDE_{jt} = \alpha + \beta_1 SIZE_{jt} + \beta_2 ANALYSTS_{jt} + \beta_3 BTM_{jt} + \beta_4 MERGER_{jt}$$
$$+ \beta_5 \#SEGMENTS_{jt} + \beta_6 ROA_{jt} + \beta_7 POS\_SUE_{jt} + \beta_8 SALES\_GROWTH_{jt} + \beta_9 LOSS\ \varepsilon_{jt}, \qquad (2)$$

where *PRE_SLIDE* is an indicator variable equal to 1 if the firm provides presentation slides for the quarterly earnings conference call, and 0 otherwise. Equation (2) is estimated using firm, CEO, year, and quarter fixed effects to control for firm-, CEO-, or time-specific characteristics.

In Table 3, the significantly positive coefficients on *ANALYSTS* and *#SEGMENTS* show that firms with more analyst coverage and business segments are more likely to use slides during their conference call presentations. This suggests that managers use slides as a tool to meet higher information demand. In the meantime, these results show no significant relation between the use

of presentation slides and financial performance. This implies that the decision to use slides during the conference call is, on the whole, not driven by quarterly performance.

4.2 Is the Use of Diagrams Related to Current Performance?

To investigate whether the use of diagrams is related to firms' quarterly performance, I first examine the relation between the use of diagrams and current earnings performance using the following regression:

$$DIAGRAM\_EARN\_VAR_{jt} = \alpha + \beta_1 POS\_SUE_{jt} + \beta_2 LOSS_{jt} + \beta_3 EARN\_VOL_{jt} + \beta_4 INST.OWN_{jt} + \beta_5 WORDCOUNT_{jt} + \beta_6 NUMCOUNT_{jt} + \beta_7 \#SLIDES_{jt} + \beta_8 TONE_{jt} + \varepsilon_{jt}, \quad (3a)$$

where *DIAGRAM_EARN_VAR* is one of the two diagram measures: (a) *%DIAGRAM_EARN*, which is the percentage of the number of slides that use diagrams to mention earnings-related news over the total number of slides per earnings conference call presentation or (b) *#DIAGRAM_EARN*, which is the number of slides that use diagrams to mention earnings-related news per earnings conference call presentation.

The variable of interest is *POS_SUE*, an indicator equal to 1 if the actual earnings for the quarter are greater than or equal to the consensus analyst forecast, and 0 otherwise. I control for linguistic features of the conference call presentation slides, including (a) *WORDCOUNT*, the natural logarithm of the total number of words in the slide, (b) *NUMCOUNT,* the natural logarithm of the total number of words in the slide, and (c) *TONE*, the net tone of textual information in the slides, which is calculated as the proportion of positive words minus the proportion of negative words in the slide. I also control for time-invariant firm characteristics and time-specific characteristics by estimating Regression (3a) with firm, year, and quarter fixed effects.

To corroborate the evidence from earnings performance, I estimate the association between the use of diagrams for revenue-related news and sales performance using the following regression:

$$DIAGRAM\_SALES\_VAR_{jt} = \alpha + \beta_1 POS\_SUR_{jt} + \beta_2 SG\_VOL_{jt} + \beta_3 INST.OWN_{jt} + \beta_4 WORDCOUNT_{jt} + \beta_5 NUMCOUNT_{jt} + \beta_6 \#SLIDES_{jt} + \beta_7 TONE_{jt} + \varepsilon_{jt}, \quad (3b)$$

where the dependent variable *DIAGRAM_SALES_VAR* is one of two diagram measures: (a) *%DIAGRAM_SALES*, which is the percentage of slides that use diagrams to mention revenue-related news over the total number of slides per earnings conference call presentation or (b) *#DIAGRAM_SALES*, which is the number of slides that use diagrams to mention revenue-related news per earnings conference call presentation. The independent variable *POS_SUR* is defined in a way similar to *POS_SUE*.

Table 4 presents the results. Panel A shows findings from estimating Equation (3a). The negative coefficients on *POS_SUE* indicate that firms with earnings that miss analysts' expectations use more visuals in their earnings conference call slides. Bloomfield (2002) argues that bad news is inherently more complicated to articulate, and investors could demand more information from managers when there is bad news. Since the use of diagrams can effectively communicate more information in limited amount of time, discussing bad earnings news with more visual information during the presentation section, which precedes the Q&A section, may *ex ante* resolve some of the audience's concerns.

In addition, Brown, Call, Clement, and Sharp (2019) conducted survey on 610 investor relation officers (IROs) that indicates that public earnings conference calls are the single most important tool for conveying the company's message to institutional investors. In a conference call, investors and analysts have 30–60 minutes of interactive discussion with managers to acquire

more information. Survey evidence from Graham, Harvey, and Rajgopal (2005) suggests that managers who miss analysts' earnings expectations face extensive questioning during the Q&A section of earnings conference calls. This suggests that investors and analysts demand more information from managers to help them understand the causes of the bad earnings news.[28]

Next, I examine the relation between the use of visuals and a firm's earnings persistence. If managers actually use more diagrams to help investors understand complicated earnings news, such as the findings above, then I expect that firms use more visuals when earnings are more volatile and less persistent. On the other hand, prior research finds that firms that present good current earnings performance using high-salience methods have lower earnings persistence (Huang et al., 2018; Nekrasov et al., 2020). This is consistent with managers trying to "make hay while the sun shines." If this is the case, I would also expect that firms that use more diagrams will have lower earnings persistence.[29]

To test this expectation, I regress one-quarter-ahead earnings on current quarter earnings with a set of controls that follows prior research (Huang et al. 2018):

$$\begin{aligned} ROA_{jt+1} = \alpha + \beta_1 DIAGRAM\_EARN\_VAR_{jt} * ROA_{jt} + \beta_2 SIZE_{jt} * ROA_{jt} + \beta_3 BTM_{jt} * ROA_{jt} \\ + \beta_4 STD.EARN_{jt} * ROA_{jt} + \beta_5 LOSS_{jt} * ROA_{jt} + \beta_6 ROA_{jt} + \beta_7 ROA_{jt-3} \\ + \beta_8 DIAGRAM\_EARN\_VAR_{jt} + \beta_9 SIZE_{jt} + \beta_{10} BTM_{jt} + \beta_{11} EARN\_VOL_{jt} + \beta_{12} LOSS_{jt} \\ + \varepsilon_{jt}, \end{aligned} \quad (4)$$

where ROA_{jt+1} is the return on assets for the next quarter, and *DIAGRAM_EARN_VAR* is *%DIAGRAM_EARN* or *#DIAGRAM_EARN.* The interaction of *DIAGRAM_EARN_VAR* and ROA_t captures the effect of using visuals on earnings persistence. In addition to size and book-to-market

[28] The coefficient on *POS.SUR* when estimating Equation (3b) is significantly negative when the dependent variable is either *%DIAGRAM_SALES* or *#DIAGRAM_SALES* (untabulated). Therefore, these results have implications consistent with the estimation of Equation (3a).

[29] Both interpretations are possible and yield prediction in the same direction. I try to distinguish between the two in the next section.

ratio, I control for earnings volatility, *EARN_VOL*, and the indicator of losses, *LOSS*, since volatile earnings and negative earnings are less persistent (e.g., Hayn 1995; Dichev and Tang 2009). I also include earnings for the same quarter of the previous year, ROA_{t-3}, to control for seasonality. If firms use more diagrams to explain less persistent earnings, the coefficient on the interaction between visuals and earnings should be negative.

Table 4 Panel B presents the results of estimating the earnings persistence using Equation (3). The first column presents the results when the dependent variable is %*DIAGRAM_EARN*, and the second column presents the results when the dependent variable is #*DIAGRAM_EARN*. The coefficients on $DIAGRAM\_EARN\_VAR \times ROA_t$ are negative and significant, which is consistent with the prediction that firms use more diagrams when their earnings news is less persistent.

One explanation is that firms that have more volatile earnings are more likely to experience less persistent earnings, and managers use more diagrams to explain volatile earnings. To test this explanation, I separate firms into *high* versus *low* earnings volatility to examine their earnings persistence. I find that both samples experience lower earnings persistence. This subsample analysis alleviates the concern that managers use more diagrams to communicate more volatile earnings when earnings are less persistent.

4.3 Do Managers Use Diagrams Strategically?

So far, the evidence suggests that managers use more diagrams when quarterly earnings do not meet or beat analyst forecasts or when earnings are less persistent. One inference may be that managers use visuals to better explain bad earnings news. Another inference may be that managers who are concerned about a potential stock price crash may use salient diagrams to distract viewers from the bad news and to direct attention to other good performance metrics. Managers may use diagrams to present bad earnings news directly (e.g., using a diagram that shows a time trend of

decreasing earnings), or they may use diagrams to present other metrics that show good performance, therefore diverting attention away from the bad earnings news (e.g., positive sales growth). To test this, I exploit within-firm variation to investigate the relation between the use of diagrams and *other* performance metrics, especially among firms that encounter negative earnings surprises.

The literature on self-serving attribution disclosure finds that managers are more likely to attribute bad news to external causes (Baginski, Hassell, and Hillison, 2000). For example, a macroeconomic shock may result in industry-wide underperformance. In this case, instead of using analyst forecasts as a reference point, managers may compare their firm's quarterly earnings performance to the average performance in their industry. To test this conjecture, I regress the use of earnings-related diagrams (*DIAGRAM_EARN_VAR*) on an indicator, *NEG_SUE*, and a list of controls with firm, CEO, year, and quarter fixed effects for subsamples partitioned by *ROA_HIGH*, where *ROA_HIGH* equals 1 if the firm's current earnings is in the top 2 deciles within the same Fama–French 12-industry category in the same quarter, and 0 otherwise.

The results are presented in Table 5 Panel A. Consistent with my prediction, the significantly positive coefficient on *NEG_SUE* in the *ROA_HIGH* = 1 subsample indicates that firms with bad earnings news use more visuals when current earnings are extremely good compared to industry peers. This evidence is consistent with the notion that managers strategically use more visuals to portray a positive view for investors.

In addition to comparing the firm's performance to the performance of industry peers, managers may attempt to cloak their communication by highlighting other good performance metrics using visuals. The descriptive statistics in Table 2 Panel A show that earnings-related information appears in 42.2% of the total slides. Earnings information is, unsurprisingly, the

primary topic that managers discuss in the presentation slides. Next to earnings, firms frequently discuss information related to revenues, cash flows, and cost management (see Figure 2). This provides sufficient variation for studying the relation between the use of diagrams and these performances.

To test this, I partition the sample into observations of positive or zero growth versus negative growth of sales, cash flow, and operating expenses. Then, I regress the use of diagrams on an indicator, *NEG_SUE*, and a list of controls with firm, CEO, year, and quarter fixed effects. The results are presented in Table 5 Panels B to D. For the positive sales growth subsample (i.e., Panel B, Columns (1) and (3), the positive coefficients on *NEG.SUE* suggest that managers use more diagrams that discuss sales performance when revenue grows but earnings miss analyst forecasts. Similarly, the results in Panel C suggest that managers use more diagrams that discuss cash flow performance when cash flow increases but earnings miss expectations. The results in Panel D suggest that managers use more diagrams that discuss expenses when operating expenses decrease. Overall, these results are consistent with the notion that managers attempt to highlight other good performance metrics using diagrams to divert attention away from the bad earnings news.

In addition, there has been an increasing use of non–GAAP reporting in earnings announcements in the past decades. As shown in Figure 2, the words *non* and *GAAP* frequently appear in conference call slides. Prior literature on non–GAAP reporting shows that managers use non–GAAP exclusions to meet strategic earnings targets. To test whether managers use diagrams strategically when discussing non–GAAP measures, I examine the relation between the use of non–GAAP related diagrams and earnings performance. Table 5 Panel E presents the results. The positive coefficients on *NEG_SUE* in Columns (1) and (3) suggest that managers use more non–

GAAP diagrams when the current quarterly earnings do not meet or beat analyst forecasts and when non–GAAP earnings are higher than the GAAP earnings. This indicates a strategic move to highlight alternative earnings targets.

When viewed as a whole, the above cross-sectional analyses suggest that managers use salient presentation formats when presenting good accounting metrics. This is consistent with the prediction that managers use diagrams strategically.

4.4 Do Managers Use Diagrams to Explain Complicated News?

I test H2 by examining the relation between managers' use of diagrams and the complexity of firms' quarterly earnings news. Prior studies suggest that information complexity could arise from innate organizational complexity (e.g., the number of business segments, intangible assets) or from complicated business transactions (e.g., M&A activities, foreign transactions). Following the prior literature, I estimate the association between the use of diagrams and each of these complexity proxies. The regression is as follows:

$$\begin{aligned} DIAGRAM\_FIN\_VAR_{jt} = \alpha + \beta_1 COMPLEXITY_{jt} + \beta_2 SIZE_{jt} + \beta_3 BTM_{jt} \\ + \beta_4 LEVERAGE_{jt} + \beta_5 ANALYSTS_{jt} + \beta_6 INST.OWN_{jt} + \beta_7 RET\_VOL_{jt} + \beta_8 RET[-60,-3]_{jt} \\ + \beta_9 WORDCOUNT_{jt} + \beta_{10} NUMCOUNT_{jt} + \beta_{11} TONE_{jt} + \varepsilon_{jt}, \end{aligned} \quad (5)$$

where *DIAGRAM_FIN_VAR* is one of the two diagram measures: (a) *%DIAGRAM_FIN*, which is the percentage of the number of slides that use diagrams to mention financial information over the total number of slides per earnings conference call presentation, or (b) *#DIAGRAM_FIN*, which is the number of slides that use diagrams to mention financial information per earnings conference call presentation.

Note that the dependent variable in Equation (3a) differs slightly from the variable in Equation (4). In Equation (4), business complexity can relate to all types of accounting metrics,

including earnings, sales growth, or cash flow. Therefore, I use *%DIAGRAM_FIN* to capture the diagrams related to all topics of financial news. The regression is estimated with firm, year, and quarter fixed effects. I also control for other linguistic features of the information presented in the earnings call slides, including the total number of words (*WORDCOUNT*), the total amount of quantitative information (*NUMCOUNT*), and the average sentiment of the textual information in the earnings call slides (*TONE*), as well as firm, CEO, year, and quarter fixed effects.

Table 6 presents the results. Columns (1) to (4) list the results when the dependent variable is *%DIAGRAM_FIN*, and Columns (5) to (8) list the results when the dependent variable is *#DIAGRAM_FIN*. Across various complexity measures, the significantly positive coefficients provide consistent evidence that greater business complexity is associated with a heavier use of diagrams when discussing financial news.

4.5 Market Reactions to the Use of Diagrams in Conference Call Slides

I test H3 by examining the relation between the use of diagrams in conference call slides and the market reactions to earnings news around and after earnings announcements. The direction of the diagram–return association may provide insight on whether the use of visuals in disclosing earnings news leads to more efficient pricing of the earnings news.

So far, the evidence suggests that managers exploit different properties of visuals and use them for different purposes. On one hand, visuals can convey information faster and more clearly than text. I find that managers use more diagrams when high business complexity is induced by organizational structure or complicated transactions. This suggests that managers use visuals to enhance the communication of complex news. On the other hand, visuals are more vivid and more salient than text, and information presented using visuals attracts more attention. I find that firms that do not beat analysts' expectations use more visuals when they experience good current

earnings or sales performance. This suggests that firms use visuals to highlight certain good aspects of firm performance, and portray a positive view to outside investors.

It is unclear ex ante whether investors will benefit from the use of visuals through their improved comprehension of complex news and thus price earnings news more efficiently or (b) investors will be credulous about the highlighted good performance and will not properly discount the bad aspects of earnings news. To investigate how the use of visuals influences investors' perception of earnings news, I estimate the following regression of cumulative abnormal returns around earnings announcements, *CAR(0,+1)*, at the firm–quarter level, with firm, year, and quarter fixed effects:

$$\begin{aligned} CAR(0,+1)_{jt} = \alpha + \beta_1 DIAGRAM\_EARN\_VAR_{jt} * RSUE_{jt} + \beta_2 SIZE_{jt} * RSUE_{jt} \\ + \beta_3 ANALSYTS_{jt} * RSUE_{jt} + \beta_4 BTM_{jt} * RSUE_{jt} + \beta_5 GROWTH_{jt} * RSUE_{jt} \\ + \beta_6 INST.OWN_{jt} * RSUE_{jt} + \beta_7 WORDCOUNT_{jt} * RSUE_{jt} + \beta_8 NUMCOUNT_{jt} * RSUE_{jt} \\ + \beta_9 TONE_{jt} * RSUE_{jt} + Main\ Effects_{jt} + \varepsilon_{jt}, \end{aligned} \quad (6)$$

where *DIAGRAM_EARN_VAR* is *#DIAGRAM_EARN, %DIAGRAM_EARN,* or the residuals term *DIAGRAM_EARN_RES.* Using residual diagram measures is beneficial because it controls for the predicted determinants of firms' choice of diagrams.

Section 4.3 shows that firms that use more diagrams have less persistent earnings. Kormendi and Lipe (1987) and Collins and Kothari (1989) document that the earnings response coefficient is positively associated with earnings persistence. If the use of diagrams enables investors to better interpret the *less* persistent earnings news, then I expect that ERC decreases ($\beta_1 < 0$) with more diagrams explaining earnings items, all else being equal. Alternatively, if investors who have limited attention respond only to the highlighted good news without properly discounting the *lower* persistent earnings news (Hirshleifer and Teoh 2003), then I expect that ERC increases ($\beta_1 > 0$) as more diagrams highlight good earnings items.

Table 7 Panel A present the results. The coefficients on both %*DIAGRAM_EARN*×*RSUE* and #*DIAGRAM_EARN*×*RSUE* are positive and significant.[30] These results are consistent with the prediction that investors are credulous and do not properly incorporate bad earnings news into stock prices. An increase of three more slides that discuss earnings using diagrams is associated with an increase of 2.7% (3/14 × 0.015 × (10 − 1) = 2.7%) in the differential CAR between the top and bottom deciles. When compared to the average differential CAR of 5.9% (0.0065× (10 − 1) = 5.9%), the effect of using diagrams represents an economically significant increase of 45.8% (2.7% ÷ 5.9% = 45.8%) in the immediate market reaction.[31]

Next, I examine whether the diagram–return association differs between positive (Columns (2) and (4)) and negative (Columns (3) and (6)) earnings surprise subsamples. Firms that experience negative earnings surprises are likely to use visuals strategically, so I expect *ex ante* that the association is driven mainly by the negative earnings surprise (*SUE* < *0*) subsample. Columns (3) and (6) show that the coefficients on both %*DIAGRAM_EARN*×*RSUE* and #*DIAGRAM_EARN*×*RSUE* are positive and significant for the subsample when *SUE* < *0*, which indicates that investors overreact to bad earnings news when more diagrams are used to highlight the good aspects of earnings information.

Next, I examine the post-announcement return reactions to the use of diagrams in conference call slides. If more visual information leads to an immediate overreaction to earnings news, I expect a lower drift or a less positive post-announcement reaction ($\beta_1 < 0$). Specifically, I estimate the following regressions of cumulative abnormal returns during the +2 to +61 post-earnings announcement window, *CAR (+2,+61)*, at the firm–quarter level:

[30] To mitigate endogeneity concerns in my return tests, I also use residual diagrams from the regression of diagrams on an expanded set of explanatory variables. The (untabulated) results are robust to the use of residual diagrams.
[31] The figure 0.0065 is estimated from a baseline specification by regressing *CAR(0,+1)* on *RSUE*, *SIZE*, and *BTM*.

$$CAR(+2,+61)_{jt} = \alpha + \beta_1 DIAGRAM\_EARN\_VAR_{jt} * RSUE_{jt} + \beta_2 SIZE_{jt} * RSUE_{jt} + \beta_3 ANALSYTS_{jt} * RSUE_{jt} + \beta_4 BTM_{jt} * RSUE_{jt} + \beta_5 GROWTH_{jt} * RSUE_{jt} + \beta_6 INST.OWN_{jt} * RSUE_{jt} + \beta_7 LOG\_WORDCOUNT_{jt} * RSUE_{jt} + \beta_8 LOG\_NUMCOUNT_{jt} * RSUE_{jt} + \beta_9 TONE_{jt} * RSUE_{jt} + Main\ Effects_{jt} + \varepsilon_{jt}. \quad (7)$$

The results are presented in Table 7 Panel D. Consistent with my prediction, I find some evidence that the post-announcement reaction to earnings news is lower when firms use more diagrams to present earnings information in their conference call slides. In the subsample that includes firms that encounter a negative earnings surprise, the coefficients on both %*DIAGRAM_EARN*×*RSUE* and #*DIAGRAM_EARN*×*RSUE* are both negative and significant at the 1% level.

The market reaction evidence suggests that investors overreact to earnings news when more diagrams are used in earnings conference call presentations. Coupled with the finding that firms use more visuals to highlight good aspects of financial performance, the joint evidence suggests that the use of diagrams does not improve investor comprehension of earnings news. Instead, visuals may be deployed strategically by managers in earnings conference calls. Visuals, therefore, can be a double-edged sword.

4.6 Short Sales and Use of Diagrams in Conference Call Slides

Ample evidence shows that short sellers are informed traders. When short interest or short volume is high, future returns are predictably low (e.g., Asquity et al., 2005; Boehmer et al., 2008). This return predictability suggests that short sellers have an information advantage over average traders. This information advantage may arise from short sellers' advantage before information is released. For example, the SEC suggested that short sellers spread "false rumors" in an effort to manipulate firms that are "uniquely vulnerable to panic" (Cox, 2018). In addition, prior research finds that short selling increases before the initial public revelation of firms' financial

misrepresentation (Karpoff and Lou 2010), and informed short selling in the five days before earnings announcements (Christophe, Ferri, and Anger 2004).

More recently, Engelberg, Reed, and Ringgenberg (2012) provide an alternative explanation for the source of short sellers' information advantage. Engelberg et al. (2012) document that a substantial portion of short sellers' trading advantage comes from their superior information processing ability when they analyze publicly available information. So far, the evidence on market reactions and analyst responses suggests that earnings announcements that include more diagrams (due to managers' strategic use of visuals) may increase the information asymmetry between informed and uninformed investors. Therefore, it presents profitable trading opportunities for skilled information processors such as short sellers.

Based on this viewpoint, I examine whether short sales are higher for firms that use more diagrams in their earnings call slides. I measure short sales using the total shares sold short within 15 days after earnings announcements, divided by the total number of shares outstanding. Then, I regress this measure on two earnings-related diagram measures: *%DIAGRAM_EARN* and *#DIAGRAM_EARN*. I control for the return and trading volume performance around the earnings announcements, and I estimate the regressions with firm, year, and quarter fixed effects.

Table 8 presents the estimation results. Consistent with my predictions, the significantly positive coefficients on *%DIAGRAM_EARN* and *#DIAGRAM_EARN* suggest that short sellers properly interpret news about less persistent earnings, and they are less misled by the use of diagrams to highlight other good performance metrics.

4.7 Additional Analysis

In an untabulated univariate analysis, I consider whether managers are strategic in the *timing* of presenting good versus bad news. The results show that, on average, firms tend to present

good sales growth information earlier in the presentation (with the first mention on the third slide), and they defer discussion of poor sales growth to a later point (the first mention is on the 11th slide). In addition, descriptive analyses show that firms are more likely to discuss sales growth and earnings news when those measures increase. Specifically, 20% (36%) of the total slides mention increased sales growth (profitability), but only 9% (6%) of the total slides discuss decreased sales growth (profitability).

In addition to the strategic use of diagrams, I also examine managers' use of *tables* when presenting non–GAAP measures. Prior research provides evidence about the increased proportion of firms that disclose non–GAAP measures in their earnings announcements during the past decades.[32] This increased non–GAAP reporting is justified as a response to the increasing frequency of nonrecurring items (Bradshaw and Sloan, 2002). To further investigative managers' strategic choice of presentation formats, I examine the relationship between non–GAAP reporting and the use of visuals in earnings conference call presentations. The results show that firms are more likely to present nonrecurring items using tables when the firm has reported negative special items, but they are less likely to present positive special items using tables. This indicates that managers strategically highlight temporary losses but they are silent about temporary gains.

CHAPTER 5: Conclusion

This paper uses data on earnings conference call slides to investigate the determinants and consequences of using visual elements in conference call presentations. In the first part of my main analysis, I show that managers use more diagrams in conference call slides when the current earnings news is too complicated to be articulated efficiently using text. The evidence suggests that managers exploit the fact that visuals are more comprehensible than text when explaining

[32] In my sample, 18% of the slides contain non–GAAP information.

fundamentally complex news. Meanwhile, I find that firms use more diagrams when current earnings are less persistent or when they miss analyst forecasts.

More importantly, I document that firms that encounter negative earnings surprises increase their use of diagrams when (a) the current quarter's return-on-assets is outstanding relative to its industry peer group, (b) the current quarter experiences a growth in revenues or cash flows, (c) the current quarter shows a decrease in operating expenses, or (c) the firm discloses non–GAAP numbers in their earnings release. These findings are consistent with the notion that managers may exploit the high salience of visuals and may use them to highlight the good aspects of their firm's financial performance and thus portray a positive view to capital market participants.

In the second part of my analysis, I examine whether the use of diagrams influences investors' perception of earnings news. I find that investors overreact to earnings news when it is presented using more diagrams during the conference call presentation. This suggests that capital market participants are, on average, fooled by managers' strategic choice of diagrams when presenting firms' quarterly financial results. After the announcement date, investors realize that the firm's earnings missed analyst expectations, and the post-announcement return drift corrects the initial overreaction. Further, I provide some evidence that short sellers, a well-known type of informed trader, properly interpret news about less persistent earnings, and the level of short sales is higher for firms that use more diagrams in earnings call slides.

Overall, the evidence that managers use more diagrams when earnings news is difficult to explain is consistent with the SEC's contention that the clear presentation of complex information provides investors the best possible chance of understanding the disclosure documents and thus make informed decisions. However, managers' strategic use of visuals to highlight the good

aspects of the firm's financial performance diverts investors' attention away from bad earnings news and thus impedes the efficient incorporation of the earnings news into stock prices.

Because firms can exploit visuals to manage investor perception, this study is relevant to regulators by calling for policy guidance on information presentation formats. Given the increasing demand and supply of visual presentation in financial disclosures, it is important that regulators provide clear guidance on how to use visual presentations in a neutral and fair way and therefore protect investors from being misled by managers' strategic presentation choices.

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APPENDIX A—Introduction of Visual Analysis and the Use of Google Vision AI

I. Introduction to CBIR and Vision AI

With the explosive growth in the use of visual content, cutting-edge technologies have been developed in the field of visual information retrieval and management. These new technologies facilitate the understanding of the effects of visual information on our economy and society. *Content-based image retrieval* (CBIR) is a technique that analyzes the information contained in image data and creates an abstraction of its content in terms of visual attributes. CBIR has been an active and rapidly advancing research area since the 1990s (Long, Zhang, and Feng 2003).

An efficient visual content descriptor includes both visual and semantic content, as illustrated in Figure A1. To achieve this goal, the user provides the CBIR system with query images. The system then represents these images using *internal feature vectors*, which is a list of numbers used to characterize query images. The system compares the feature vectors of the query images to the feature vectors of the training images in the database, then it calculates the distance between these two sets of feature vectors to acquire the most similar image feature. This process is illustrated in Figure A2. Recent CBIR systems have incorporated users' relevance feedback to modify the retrieval process in order to generate retrieval results that are perceptually and semantically more meaningful (MacArthur et al. 2000; Picard et al. 1996; Rui et al. 1998; Worring et al. 2000).

The achievement of building a training images database, incorporating users' feedback into image processing, and ultimately automatizing the learning process from the data requires training on a large sample of images and millions of CPU hours for the training. To overcome these technical challenges, I adopt Google Cloud Vision Artificial Intelligence (*Vision AI*) to process visuals in financial disclosures. In general, Vision AI develops pre-trained deep learning image

analysis models. The AI function can mimic the operation of the human brain when processing visuals to detect objects or recognize semantic content. Meanwhile, the pre-trained models are simple to incorporate and can achieve consistent and replicable performance over time.

Specifically, Google Vision AI has the following advantages in understanding visuals in financial disclosures: First, Vision AI can detect important visual content in the context of financial disclosure–spatial relationships. For example, in Appendix B, the label "Diagram" describes the features of the sample image, which uses visuals to compare financial performance across different periods. Compared to text, diagrams can effectively and efficiently deliver a message within the limited space of a presentation slide and the limited time of the corporate disclosures. Second, Vision AI can also capture semantic content through extracting and analyzing the text-based annotations. The example in Appendix B shows that the textual content depicting the topic and the trend in financial performance in the image: sales growth. Therefore, the use of Vision AI enables me to quantify both the visual and semantic content in conference call presentation slides.[33] [34]

II. The Implementation of Vision AI

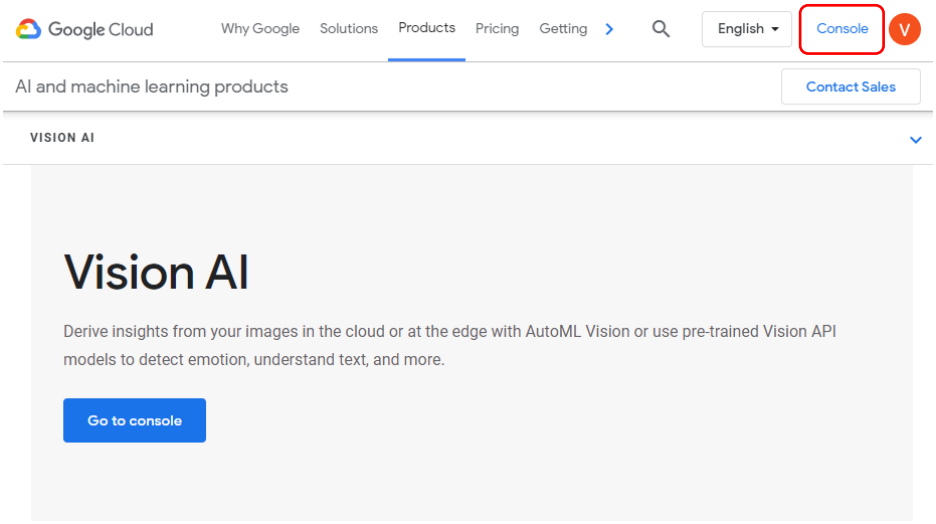
Step 1: I start with a list of URLs linking to conference call slides saved on the EDGAR server (See Section 3.1 for details), and I save them in a CSV file.

[33] Alternatively, there are other image analysis software packages, such as Amazon Rekognition. The key to distinguishing between Google Vision AI and Amazon Rekognition is that only Google Vision AI supports batch processing (as of July 2019), which is useful for large datasets, as in my case.

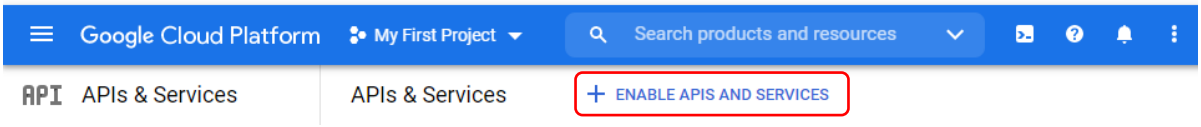
[34] According to a research by Code Academy, 93.6% of Vision AI's labels turned out to be relevant, with 6.4% of labels having errors, which may introduce measurement errors into my research design. To assess and address this concern, I validate the diagram measures constructed based on the Google Vision AI results shown in Appendix C.

URL	SEC_accession
https://www.sec.gov/Archives/edgar/data/1000180/000110465915071780/g213722mqi001.gif	0001104659-15-071780
https://www.sec.gov/Archives/edgar/data/1000180/000110465915071780/g213722mqi002.gif	0001104659-15-071780
https://www.sec.gov/Archives/edgar/data/1000180/000110465915071780/g213722mqi003.gif	0001104659-15-071780
https://www.sec.gov/Archives/edgar/data/1000180/000110465915071780/g213722mqi004.gif	0001104659-15-071780
https://www.sec.gov/Archives/edgar/data/1000180/000110465915071780/g213722mqi005.gif	0001104659-15-071780
https://www.sec.gov/Archives/edgar/data/1000180/000110465915071780/g213722mqi006.gif	0001104659-15-071780
https://www.sec.gov/Archives/edgar/data/1000180/000110465915071780/g213722mqi007.gif	0001104659-15-071780
https://www.sec.gov/Archives/edgar/data/1000180/000110465915071780/g213722mqi008.gif	0001104659-15-071780
https://www.sec.gov/Archives/edgar/data/1000180/000110465915071780/g213722mqi009.gif	0001104659-15-071780
https://www.sec.gov/Archives/edgar/data/1000180/000110465915071780/g213722mqi010.gif	0001104659-15-071780

Step 2: I create a free Google Cloud account and then click on "Console" to sign in to the Google Cloud Platform.



Step 3: I set up the authentications following the guidance found at https://cloud.google.com/vision/docs/libraries. I then create a new project and enable Vision API for the new project. I record my project ID, which will be used in Step 4.



Step 4: I enter the Google Cloud Shell Editor. There are a selection of sample codes that Google provides to connect to its Vision API and send data requests. Since my input CSV file is saved in GitHub, I follow and revise the example codes that Google provides for those who use the client

library (e.g., GitHub). Once the requests are completed, the output files will appear in the left column—Explorer, and can be downloaded to a local location for further analysis.

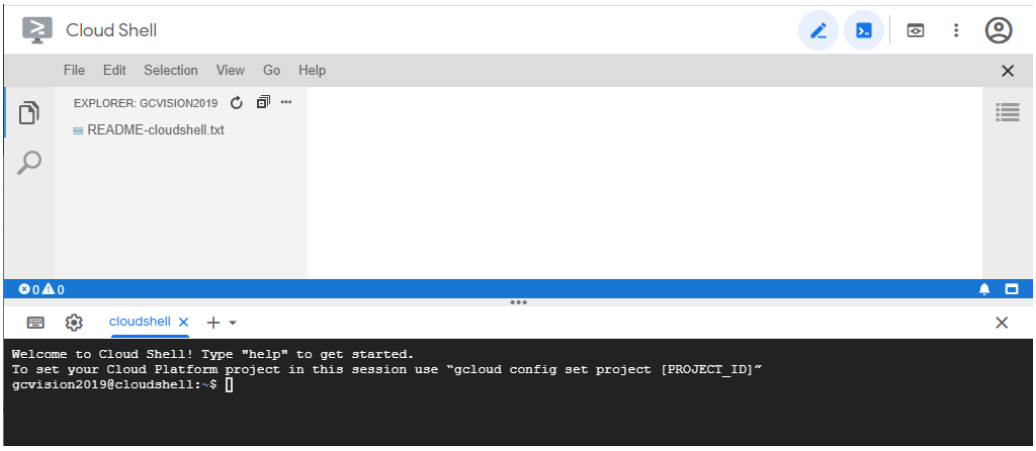


Figure A1
Image Descriptor

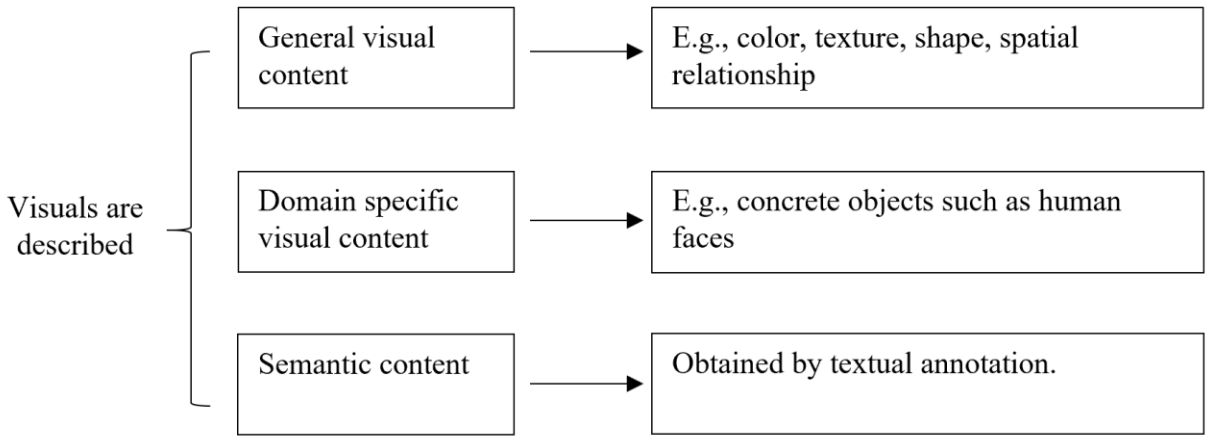
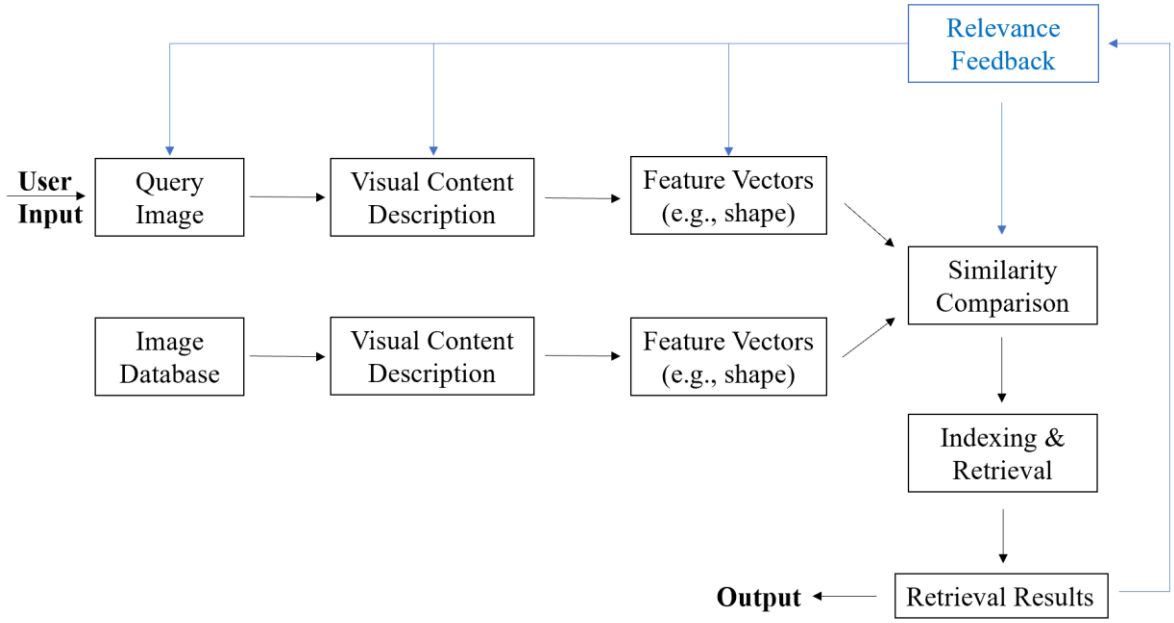
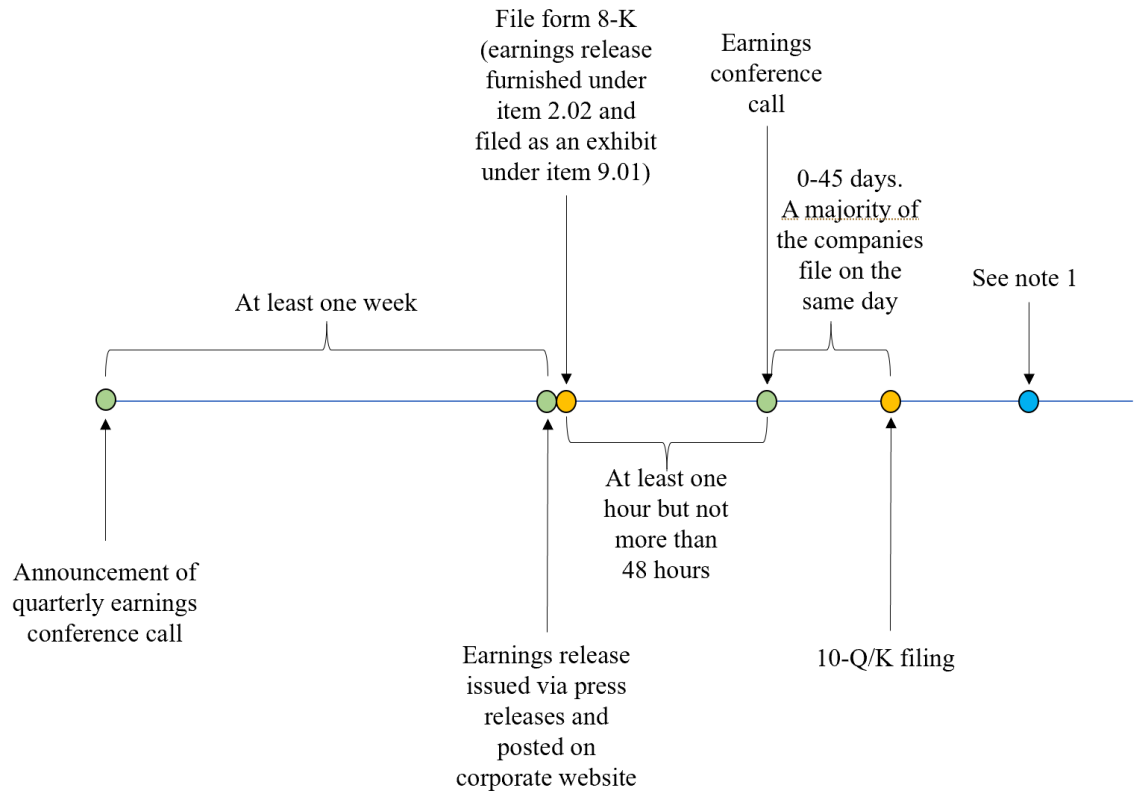


Figure A2
Architecture of a CBIR System (adapted from Long et al. 2003)



APPENDIX B—Timeline of Distribution and Dissemination Earnings News

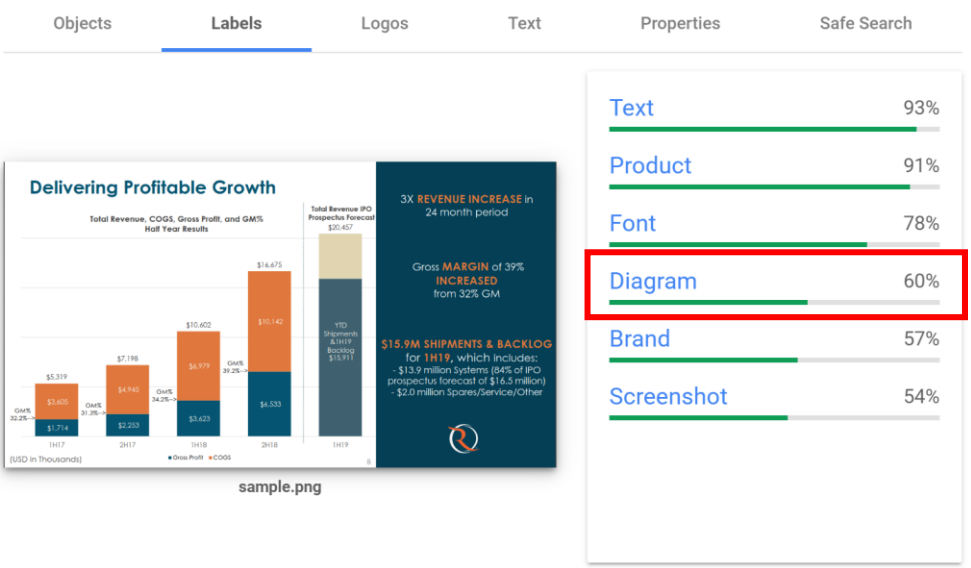
Adapted from 2016 NIRI's Standards of Practice for Investor Relations



Note 1: The blue dot represents other *ad hoc* disclosure events, such as analyst/investor days (e.g., Kirk and Markov 2016) and conference presentations (e.g., Bushee, Jung, and Miller 2011).

APPENDIX C—Google Cloud Vision AI Analysis Results

1. An earnings call slide ***with*** diagrams:



sample.png

2. An earnings call slide ***without*** a diagram:

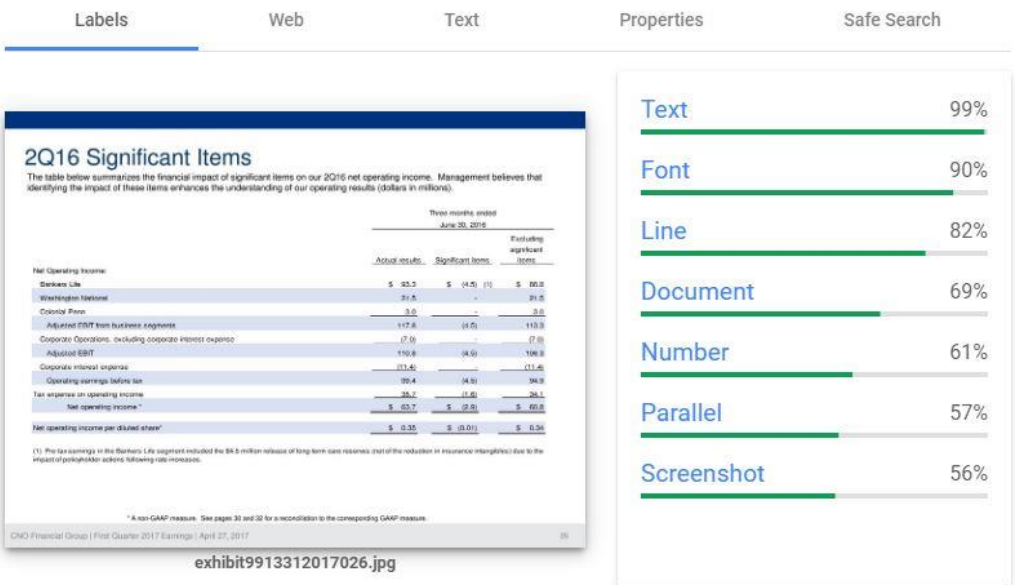


exhibit9913312017026.jpg

APPENDIX D—Validation of *DIAGRAM* Measures

Procedures:

For each slide-level diagram measure (*DIAGRAM1_SLIDE*, *DIAGRAM2_SLIDE*, and *DIAGRAM3_SLIDE* (see definitions in Appendix E), I randomly selected 200 slides for when *DIAGRAM_SLIDE* = 1 to evaluate the Type I error (i.e., a false positive), and I selected 200 slides for when *DIAGRAM_SLIDE* = 0 to evaluate the Type II error (i.e., a false negative).

Results:

1. Type I error (*DIAGRAM_SLIDE* = 1 when there is NO diagram included in the slide)

	DIAGRAM1_SLIDE	*DIAGRAM2_SLIDE*	*DIAGRAM3_SLIDE*
Type I	52.7%	29.7%	4.8%

The Type I error of *DIAGRAM1_SLIDE* is 52.7%, mostly due to the false classification of slides with tables (likely captured by the *parallel* label, see Example 2 in Appendix B) and nonperformance or operational-related graphs (likely captured by the *graphics* label). To reduce the measurement error induced by the *parallel* label, I require that *DIAGRAM2_SLIDE* equals 1 if the slide is labeled with *diagram* only or with both *diagram* and *parallel* (see Examples 1 and 2), or with *plot* or *graphics*; and the Type I error of *DIAGRAM2_SLIDE* is 29.7%. Further on, the exclusion of graphics labels effectively reduces the Type I error of *DIAGRAM3_SLIDE* to 4.8%.

2. Type II error (*DIAGRAM_SLIDE* = 0 when there is a diagram included in the slide)

	DIAGRAM1_SLIDE	*DIAGRAM2_SLIDE*	*DIAGRAM3_SLIDE*
Type II	6.9%	15.5%	10.5%

Though *DIAGRAM1_SLIDE* and *DIAGRAM2_SLIDE* have high Type I errors, I still include these two measures into the analyses and as a comparison to *DIAGRAM3_SLIDE*.

APPENDIX E—Variable Definitions

Earnings Call Slide Level

DIAGRAM1_SLIDE	An indicator variable that equals 1 if the AI algorithm assigns to the slide the any of the following labels: *diagram*, *plot*, *parallel*, or *graphics*, and 0 otherwise.
DIAGRAM2_SLIDE	An indicator variable that equals 1 if the AI algorithm assigns to the slide the labels *diagram* only, or both *diagram* and *parallel*, or *plot*, or *graphics*, and 0 otherwise.
DIAGRAM3_SLIDE	An indicator variable that equals 1 if the AI algorithm assigns to the slide the labels *diagram* only, or both *diagram* and *parallel*, or *plot*, and 0 otherwise.
*FLK**	An indicator variable that equals 1 if the slide contains any forward-looking words, and 0 otherwise.
*EARNINGS**	An indicator variable that equals 1 if the slide contains any earnings-related words, based on the word list in Huang et al. (2018), and 0 otherwise.
*REVENUES**	An indicator variable that equals 1 if the slide contains any revenue-related words, based on the word list in Huang et al. (2018), and 0 otherwise.
*CASH**	An indicator variable that equals 1 if the slide contains any cash-related words, based on the word list in Huang et al. (2018), and 0 otherwise.
*CHARGE**	An indicator variable that equals 1 if the slide contains any charge-related words, based on the word list in Huang et al. (2018), and 0 otherwise.
*COST**	An indicator variable that equals 1 if the slide contains any cost-related words, based on the word list in Huang et al. (2018), and 0 otherwise.
*LOSS**	An indicator variable that equals 1 if the slide contains any loss-related words, based on the word list in Huang et al. (2018), and 0 otherwise.
*RESERVE**	An indicator variable that equals 1 if the slide contains any reserve-related words, based on the word list in Huang et al. (2018), and 0 otherwise.
*ORDER**	An indicator variable that equals 1 if the slide contains any order-related words, based on the word list in Huang et al. (2018), and 0 otherwise.
NONGAAP	An indicator variable that equals 1 if the slide contains any non–GAAP words, and 0 otherwise.
WORD_COUNT	The natural logarithm of the total number of words in the slide, based on the *Loughran and McDonald Financial Dictionary*.
POS%	The proportion of positive words in the slide, based on the *Loughran and McDonald Financial Dictionary*.

NEG%	The proportion of negative words in the slide, based on the *Loughran and McDonald Financial Dictionary*.
TONE%	*POS%−NEG%*
#NUMBERS	The natural logarithm of the total number of numbers (i.e., collection of digits) in the slide, based on the *Loughran and McDonald Financial Dictionary*.
WORD_LEN	Average word length for all the words in the slide, based on the *Loughran and McDonald Financial Dictionary*.

Firm–Quarter Level

ANALYSTS	Analyst following, calculated as the natural logarithms of 1 + the number of analysts that have outstanding earnings forecasts for the firm for the quarter.
BTM	The book-to-market ratio at the end of the previous fiscal quarter.
CAR[+2,+61]	The cumulative abnormal return over the [+2,+61] window of the earnings announcement date, where daily abnormal returns are raw stock returns minus the market value–weighted return.
CAR[0,+1]	The cumulative abnormal return over the 2-day window of the earnings announcement date, where daily abnormal returns are raw stock returns minus the market value–weighted return.
D_DIAGRAM_EARN	An indicator that equals 1 if the firm has at least one slide using a diagram to mention earnings-related items per earnings call presentation.
%DIAGRAM_EARN	The percentage of the number of slides using diagrams to mention earnings-related items over the total number of slides per earnings call presentation.
#DIAGRAM_EARN	The number of slides using diagrams to mention earnings-related items over the total number of slides per earnings call presentation.
D_DIAGRAM_SALES	An indicator that equals 1 if the firm has at least one slide using a diagram to mention revenue-related items per earnings call presentation.
%DIAGRAM_ SALES	The percentage of the number of slides using diagrams to mention revenue-related items over the total number of slides per earnings call presentation.
#DIAGRAM_ SALES	The number of slides using diagrams to mention revenue-related items over the total number of slides per earnings call presentation.
EARN	Quarterly earnings before extraordinary items, scaled by the average total assets.
EARN_VOL	The standard deviation of *EARN* measured over the last eight quarters.
INST.OWN	Institutional ownership, calculated as the fraction of firm shares owned by institutional investors.
INTANGIBLE	Quarterly intangibles divided by the average total assets.
LEVERAGE	Total liabilities divided by the average total assets.
NUMCOUNT	The natural logarithm of the total number of numbers in the quarter earnings call slides.

WORDCOUNT	The natural logarithm of the total number of words in the quarter earnings call slides.
LOSS	An indicator variable that equals 1 if the quarterly earnings before extraordinary items is negative, and 0 otherwise.
MERGER	An indicator variable that equals 1 if the firm engages in mergers and acquisitions in the current quarter, and 0 otherwise.
MISS	An indicator variable that equals 1 if quarter *t* earnings are below the analyst forecast, and 0 otherwise.
NEG_SALESGROWTH	An indicator variable that equals 1 if the quarterly sales growth from the same quarter of the previous year is negative, and 0 otherwise.
NEG_SUE	An indicator variable that equals 1 if quarter *t* earnings are less than the consensus earnings forecast, and 0 otherwise.
POS.SUE	An indicator of positive earnings surprise that equals 1 if actual earnings for the quarter are greater than or equal to the consensus analyst forecast, and 0 otherwise. The consensus analyst forecast is the mean of the most recent forecasts made by individual analysts.
RET_60_3	The stock returns before the earnings announcement, measured over the window [−60, −3].
RSUE	The decile rank of unexpected earnings, SUE, scaled such that it varies from 0 (for the bottom decile) to 1 (for the top decile).
GROWTH	Sales growth, calculated as the percentage change in quarterly sales from the same quarter of the previous year.
SG_VOL	The standard deviation of sales growth over the last eight quarters.
SEGMENT_LOG	The natural logarithm of the total number of business and geographic segments.
SG_VOL_SEGMENT	The standard deviation of sales growth among all the business segments within a firm per quarter
SIR_HIGH	An indicator that equals 1 if the short interest ratio is among the top two deciles within the same year and quarter, and 0 otherwise.
SIZE	The natural logarithm of the market value of equity at the end of the previous fiscal quarter.
SPECIAL_ITEM	An indicator variable that equals 1 if the special item variable (SPIQ) in Compustat is nonzero, and 0 otherwise.

FIGURE 1—Use of Presentation Slides in Quarterly Earnings Conference Calls

This figure illustrates the time trend of using presentation slides during earnings conference calls for S&P 1500 Index firms during 2009–2019, by fiscal quarter. The *y*-axis (i.e., *% of firms using slides*) is calculated as the number of unique firms that use presentation slides during conference calls divided by the total number of unique firms that hold conference calls.

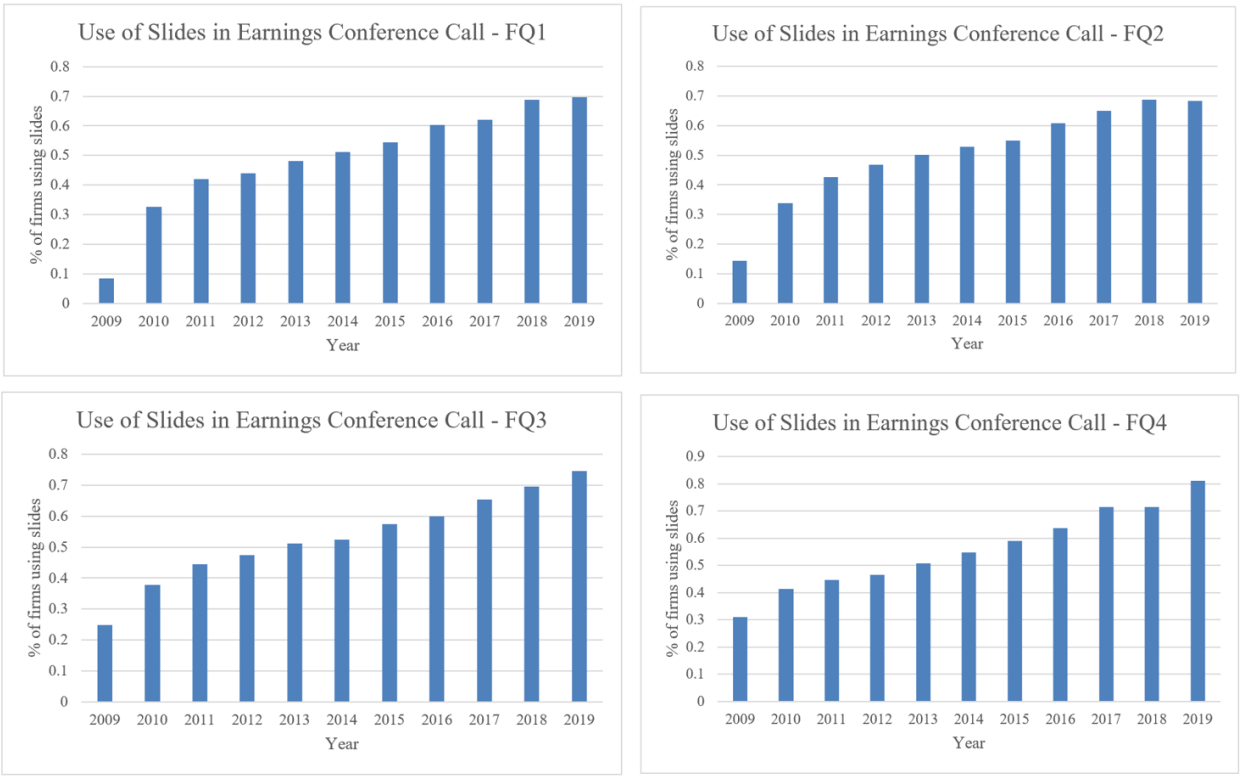


FIGURE 2—Frequency of Words in Conference Call Slides

This figure presents an image composed of the words used in the conference call slides, where the size of each word indicates its frequency.

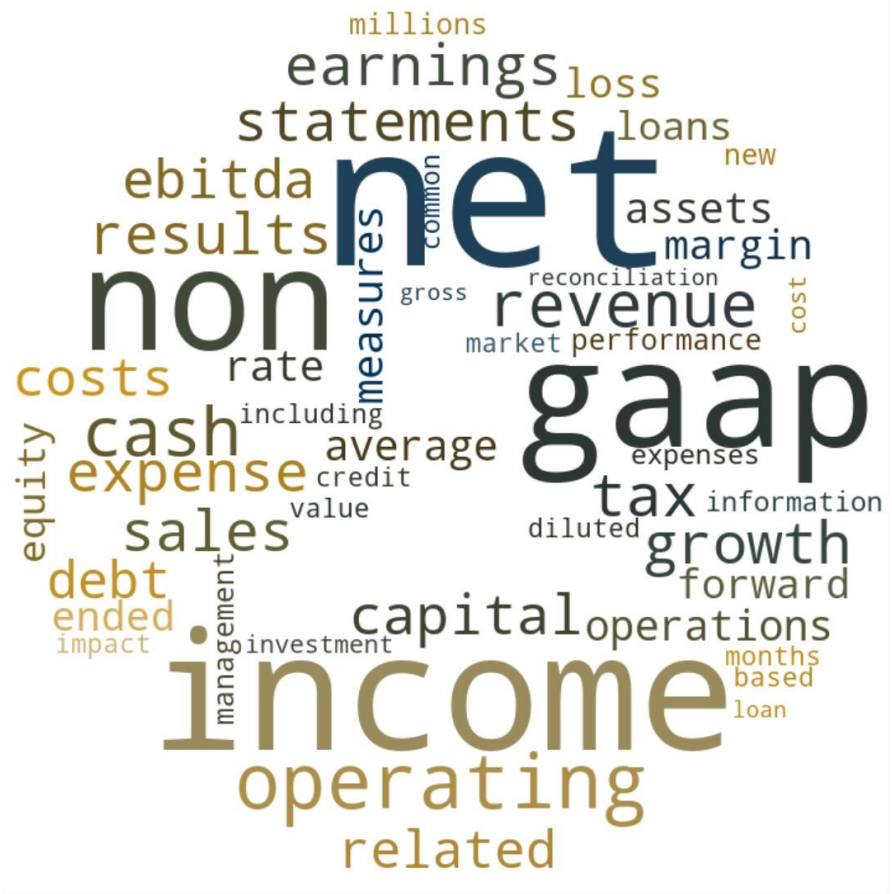


TABLE 1—Sample Selection

Panel A: Sample Selection

	# of slides	# of firm–quarters	# of unique firms
Attached documents in 8-K filings for S&P 1500 Index firms downloaded from SEC as of July 2019	2,053,283	354,701	3,545
Less:			
Attached documents in 8-Ks filed outside of the [0, +4] earnings announcement window	−1,376,206	−162,138	−304
Attached documents in 8-K filings for all years (Jan 1994–Jul 2019)	677,077	192,563	3,241
Less:			
If the attached document is not a graphic and if the total number of graphical documents per 8-K filing is less than 5	−296,971	−182,382	−2,113
Graphical documents before July 2019	380,106	10,181	1,128
Less:			
If the graphical documents were filed before January 2009	−164,085	−495	−179
Less:			
Missing Compustat/CRSP/IBES data	−34,867	−1,930	106
Less:			
Slides that consist of boilerplate	−22,576	−492	−51
Add:			
For firms that choose to use presentation slides in a sporadic manner across quarters, add Compustat/CRSP/IBES data for firm–quarters that do not use presentation slides in the earnings conference calls	-	+1,231	-
Final sample (Jan 2009–July 2019)	146,911	8,495	843

Panel B: Sample Distribution by Industry

	(1)	(2)	(3)		(4)	
	# of Earnings Call Slides	# of Firm–Quarters	# of unique firms	% in the full sample	# of publicly traded common stock on the major exchanges during the sample period	
Consumer Non-Durables	4,467	522	32	3.80%	239	4.94%
Consumer Durables	2,943	151	20	2.37%	105	2.17%
Manufacturing	15,728	1015	90	10.68%	406	8.39%
Energy	5,680	290	43	5.10%	241	4.98%
Chemicals and Allied Products	4,166	343	33	3.91%	105	2.17%
Business Equipment	13,052	1165	105	12.46%	787	16.26%
Telephone and Television Transmission	3,835	193	18	2.14%	153	3.16%
Utilities	12,946	419	40	4.74%	119	2.46%
Wholesales, Retails, and Some Services	8,893	935	69	8.19%	462	9.55%
Healthcare, Medical Equipment, and Drugs	6,980	559	62	7.35%	535	11.06%
Finance	52,644	2103	239	28.35%	976	20.17%
Other	15,577	800	92	10.91%	1,849	38.21%

TABLE 2—Descriptive Statistics

Panel A reports descriptive statistics for variables at the earnings call slide level. Panel B reports correlations between the key variables at the slide level. Panel C reports descriptive statistics for variables at the firm–quarter level. All variables are defined as in Appendix E.

Panel A: Format and Content Variables, Slide Level

Variable	N	Mean	StdDev	p10	p25	p50	p75	p90
DIAGRAM_SLIDE	146,911	0.179	0.384	0	0	0	0	1
*EARNINGS** [35]	146,911	0.422	0.494	0	0	0	1	1
*REVENUE**	146,911	0.285	0.452	0	0	0	1	1
*CASH**	146,911	0.060	0.237	0	0	0	0	0
*COST**	146,911	0.261	0.439	0	0	0	1	1
*FLK**	146,911	0.321	0.467	0	0	0	1	1
*NONGAAP**	146,911	0.179	0.384	0	0	0	0	1
*UNUSUAL**	146,911	0.049	0.216	0	0	0	0	0
*SEGMENT**	146,911	0.074	0.261	0	0	0	0	0
WORD_COUNT	146,911	80.473	109.935	6	8	50	105	185
WORD_LEN	146,911	5.673	1.946	4.4	5.451	5.965	6.494	7.190
#NUMBERS	146,911	27.999	41.220	0	2	14	38	72
POS%	146,911	1.365	3.462	0	0	0	1.587	4.023
NEG%	146,911	1.108	3.390	0	0	0	1.176	3.390
TONE%	146,911	0.003	0.048	−0.022	0	0	0.004	0.033
UNCERTAIN%	146,911	0.589	1.877	0	0	0	0.503	1.852
LITIGIOUS%	146,911	0.369	1.738	0	0	0	0	1.111

Panel B: Pearson (above diagonal) and Spearman (below diagonal) Correlation Matrix, Slide Level

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) DIAGRAM_SLIDE	—	−0.09	−0.10	−0.10	−0.05	−0.06	−0.15	0.003	−0.005
		<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	0.25	0.05
*(2) FWLK**	−0.09	—	0.11	0.21	0.13	0.13	0.43	0.09	0.02
	<.0001		<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
*(3) NONGAAP**	−0.10	0.11	—	0.36	0.18	0.14	0.28	0.07	−0.08
	<.0001	<.0001		<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
*(4) EARNINGS**	−0.10	0.21	0.36	—	0.30	0.18	0.38	0.15	−0.07
	<.0001	<.0001	<.0001		<.0001	<.0001	<.0001	<.0001	<.0001
*(5) REVENUE**	−0.05	0.13	0.18	0.30	—	0.09	0.25	0.11	−0.01
	<.0001	<.0001	<.0001	<.0001		<.0001	<.0001	<.0001	<.0001
*(6) CASH**	−0.06	0.13	0.14	0.18	0.09	—	0.19	0.02	0.02
	<.0001	<.0001	<.0001	<.0001	<.0001		<.0001	<.0001	<.0001
(7) WORD_COUNT	−0.12	0.51	0.32	0.52	0.37	0.19	—	0.06	−0.05
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001		<.0001	<.0001
(8) WORD_LEN	−0.008	−0.04	0.03	0.04	0.03	−0.04	0.00	—	0.03

[35] * the variable is a variable that indicates whether a slide contains a certain type of accounting item based on textual analysis of the content in the slide.

	0.003	<.0001	<.0001	<.0001	<.0001	<.0001	0.18		<.0001
(9) TONE(%)	0.009	0.05	−0.15	−0.12	0.00	0.03	−0.03	0.04	—
	0.0003	<.0001	<.0001	<.0001	0.11	<.0001	<.0001	<.0001	

Panel C: Firm–Quarter Level

Variable	N	Mean	StdDev	p10	p25	p50	p75	p90
%DIAGRAM	8,495	0.153	0.380	0.000	0.000	0.053	0.214	0.400
#DIAGRAM	8,495	2.618	4.075	0	0	1	4	8
D_DIAGRAM	8,495	0.535	0.499	0	0	1	1	1
%DIAGRAM_EARN	8,495	0.038	0.077	0	0	0	0.051	0.129
# DIAGRAM_EARN	8,495	0.752	1.587	0	0	0	1	2
D_DIAGRAM_EARN	8,495	0.322	0.467	0	0	0	1	1
%DIAGRAM_SG	8,495	0.030	0.065	0	0	0	0.032	0.111
# DIAGRAM_SG	8,495	0.587	1.347	0	0	0	1	2
D_DIAGRAM_SG	8,495	0.271	0.445	0	0	0	1	1
MVE	8,495	8.015	1.617	6.074	6.925	7.919	8.996	10.186
AT	8,495	8.211	1.847	6.064	6.967	8.049	9.290	10.520
BTM	8,495	0.520	0.514	0.130	0.264	0.464	0.706	0.988
LEVERAGE	8,495	0.251	0.209	0.000	0.075	0.226	0.375	0.531
#ANALYSTS	8,495	7.663	7.426	1	2	5	11	19
SALES_GROWTH	8,495	0.044	5.676	−0.102	−0.011	0.056	0.142	0.285
EARN	8,495	0.011	0.034	−0.006	0.002	0.009	0.021	0.039
LOSS	8,495	0.160	0.367	0	0	0	0	1
car[0,+1]	8,495	0.002	0.079	−0.081	−0.033	0.002	0.038	0.085
CAR[+2,+61]	8,495	0.001	0.134	−0.146	−0.062	0.003	0.069	0.140
ABS.FE	8,495	0.033	0.341	0.000	0.000	0.003	0.007	0.033
INST.OWN	8,495	0.787	0.218	0.548	0.691	0.822	0.924	0.998
MERGER	8,495	0.392	0.488	0	0	0	1	1
SUE_MEDIAN	8,495	−0.002	0.343	−0.010	−0.001	0.000	0.003	0.010
RET_60_3	8,495	0.026	0.146	−0.136	−0.048	0.030	0.103	0.182
RET_VOL	8,495	0.020	0.009	0.011	0.014	0.018	0.025	0.032
EARN_VOL	8,495	0.014	0.024	0.001	0.003	0.007	0.015	0.030
SPECIAL_ITEM	8,495	0.611	0.487	0	0	1	1	1
NON–GAAP	4,456	0.584	0.493	0	0	1	1	1
SEGMENT_NUM	7,617	5.400	3.495	1	3	5	7	10
WORD_COUNT_SUM	8,495	1570.820	2742.220	46	360	1045	1937	3280
NUM_COUNT_SUM	8,495	551.981	801.634	24	143	348	691	1205
TONE(%)	8,495	4.383	41.578	−16.412	0.000	0.000	6.031	27.731
#SLIDES	8,495	13.672	15.048	0	0	12	21	31

TABLE 3—The Choice of Using Presentation Slides During Conference Calls

This table presents the results of estimating Equation (2), regressing *PRE_SLIDE* on firm characteristics at the firm–quarter level, with firm, CEO, year, and quarter fixed effects. *PRE_SLIDE* is an indicator equal to 1 if the firm provides presentations slides for the quarterly earnings conference call, and 0 otherwise. All variables are defined as in Appendix E. Standard errors are clustered by firm. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively (two-tailed tests).

	(1)	(2)	(3)	(4)
DEP.VAR = PRE_SLIDE	*ROA*	*POS_SUE*	*SALES_GRWOTH*	*LOSS*
SIZE	0.005	0.004	0.004	0.004
	(0.003)	(0.003)	(0.003)	(0.003)
ANALYSTS	0.057***	0.057***	0.057***	0.057***
	(0.003)	(0.003)	(0.003)	(0.003)
BTM	0.003	0.003	0.003	0.003
	(0.003)	(0.002)	(0.003)	(0.003)
MERGER	0.002	0.002	0.002	0.002
	(0.002)	(0.002)	(0.002)	(0.002)
#SEGMENTS	0.003***	0.003***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)
ROA	−0.015			
	(0.023)			
POS_SUE		0.001		
		(0.001)		
SALES_GRWOTH			0.000	
			(0.000)	
LOSS				−0.000
				(0.002)
Observations	8,495	8,495	8,495	8,495
Adjusted R-squared	0.988	0.988	0.988	0.988
Firm FE	Yes	Yes	Yes	Yes
CEO FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes
Cluster by Firm	Yes	Yes	Yes	Yes

TABLE 4—Earnings Performance and the Use of Diagrams

This table presents the results of estimating Equation (3a) and Equation (4) by regressing earnings-related diagram measures on firm characteristics at the firm–quarter level, with firm, year, and quarter fixed effects. In Panel A, the dependent variable is one of the two firm–quarter-level diagram measures: *%DIAGRAM_EARN*, which is the percentage of slides using diagrams when discussing earnings-related information, or *#DIAGRAM_EARN*, which is the number of slides using diagrams when discussing earnings-related information. In Panel B, the dependent variable is *ROA* in the next quarter. All variables are defined as in Appendix E. Standard errors are clustered by firm. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively (two-tailed tests).

Panel A: Use of Earnings Diagrams and Unexpected Earnings

	(1)	(2)
DEP.VAR.	*%DIAGRAM_EARN*	*# DIAGRAM_EARN*
POS_SUE	**−1.719***	**−0.134***
	(0.916)	**(0.075)**
EARN_VOL	−39.782	−5.339
	(33.204)	(5.286)
LOSS	−0.872	−0.212
	(1.775)	(0.164)
ANALYSTS	5.448*	0.518*
	(3.150)	(0.264)
#SEGMENTS	0.844**	0.123**
	(0.378)	(0.051)
INST.OWN	−10.195	−0.586
	(8.645)	(0.708)
WORDCOUNT	−3.962	−1.206***
	(3.990)	(0.308)
NUMCOUNT	0.644	0.798***
	(6.043)	(0.285)
#SLIDES	−33.568***	2.095***
	(12.954)	(0.328)
TONE	3.556**	0.523*
	(1.518)	(0.300)
Observations	8,495	8,495
Adjusted R-squared	0.529	0.736
Firm FE	Yes	Yes
CEO FE	Yes	Yes
Year FE	Yes	Yes
Quarter FE	Yes	Yes

Panel B: Use of Earnings Diagrams and Earnings Persistence

DV = ROA_{t+1}	(1) *%DIAGRAM_EARN*	(2) *#DIAGRAM_EARN*
DIAGRAM_EARN_VAR× ROA$_t$	**−0.723*** **	**−0.023*** **
	(0.178)	**(0.009)**
DIAGRAM_EARN_VAR	0.021***	0.001***
	(0.005)	(0.000)
SIZE× ROA$_t$	0.006	0.007
	(0.010)	(0.010)
BTM× ROA$_t$	−0.074***	−0.071***
	(0.006)	(0.006)
EARN_VOL× ROA$_t$	−2.226***	−2.216***
	(0.257)	(0.257)
LOSS× ROA$_t$	−0.039	−0.037
	(0.030)	(0.030)
SIZE	0.003***	0.003***
	(0.001)	(0.001)
BTM	−0.015***	−0.015***
	(0.001)	(0.001)
EARN_VOL	0.179***	0.175***
	(0.023)	(0.023)
LOSS	−0.000	−0.000
	(0.001)	(0.001)
ROA$_t$	0.300***	0.278***
	(0.082)	(0.082)
ROA$_{t-3}$	0.064***	0.065***
	(0.012)	(0.012)
Observations	8,495	8,495
Adjusted R-squared	0.499	0.498
Firm FE	Yes	Yes
CEO FE	Yes	Yes
Year FE	Yes	Yes
Quarter FE	Yes	Yes
Clustered by Firm	Yes	Yes

TABLE 5—Asymmetric Use of Diagrams Conditional on Financial Performance

This table presents the results of cross-sectional analyses that examine the relation between the use of diagrams and other performance metrics. The regressions are estimated at the firm–quarter level, with firm, CEO, year, and quarter fixed effects. In Panel A, the dependent variable is one of the two firm–quarter level diagram measures: %*DIAGRAM_EARN*, which is the percentage of slides using diagrams when discussing earnings-related information, or *#DIAGRAM_EARN*, which is the number of slides using diagrams when discussing earnings-related information. In Panels B to E, the dependent variables are %*DIAGRAM_SALES*, %*DIAGRAM_CASH_FLOW*, %*DIAGRAM_EXPENSE*, and %*DIAGRAM_NONGAAP*, respectively. These variables calculate the percentage of slides using diagrams when discussing sales, cash flow, cost, and non–GAAP-related information, respectively. *#DIAGRAM_SALES*, *#DIAGRAM_CASH FLOW*, *#DIAGRAM_EXPENSE*, and *#DIAGRAM_NONGAAP* represent the number of slides using diagrams when discussing sales, cash flow, cost, and non–GAAP-related information, respectively. All variables are defined as in Appendix E. Standard errors are clustered by firm. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively (two-tailed tests).

Panel A: Use of Earnings Diagrams Conditional on ROA

	(1)	(2)	(3)	(4)
	ROA_HIGH = 1	*ROA_HIGH* = 0	*ROA_HIGH* = 1	*ROA_HIGH* = 0
DEP.VAR.	*% DIAGRAM_EARN*		*# DIAGRAM_EARN*	
NEG_SUE	**0.793****	**−0.932**	**0.218*****	**−0.078**
	(0.310)	**(0.572)**	**(0.043)**	**(0.161)**
LOSS	−0.099	0.361	−0.089	0.061
	(0.412)	(0.440)	(0.097)	(0.092)
EARN_VOL	−5.459	16.620	−1.514	4.698
	(12.275)	(15.620)	(3.299)	(3.256)
ANALYSTS	0.286	−0.768	0.186	−0.280*
	(0.762)	(0.771)	(0.119)	(0.161)
#SEGMENTS	0.334**	1.012***	0.095***	0.246***
	(0.159)	(0.182)	(0.025)	(0.038)
INST.OWN	−2.524	4.503***	−0.010	0.857***
	(2.211)	(1.540)	(0.284)	(0.321)
WORDCOUNT	−0.742*	−0.914***	−0.068	0.175***
	(0.390)	(0.305)	(0.050)	(0.064)
NUMCOUNT	2.295***	1.996***	0.384***	0.200***
	(0.565)	(0.361)	(0.112)	(0.075)
#SLIDES	−0.140	−0.022	0.373***	0.371***
	(0.280)	(0.289)	(0.090)	(0.060)
TONE	0.383	−0.457	0.074	−0.165
	(0.423)	(0.581)	(0.115)	(0.121)
F-test (*p* value)	0.056		0.033	
Observations	5,482	3,013	5,482	3,013
Adjusted R-squared	0.609	0.611	0.589	0.630
Firm FE	Yes	Yes	Yes	Yes
CEO FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Quarter FE	Yes	Yes	Yes	Yes
Clustered by Firm	Yes	Yes	Yes	Yes

Panel B: Use of Sales Diagrams Conditional on Sales Growth

	(1)	(2)	(3)	(4)
	SG ≥ 0	SG < 0	SG ≥ 0	SG < 0
Dep. Var	*%DIAGRAM_SALES*		*#DIAGRAM_SALES*	
NEG_SUE	**0.493****	**−0.239**	**0.101*****	**−0.043**
	(0.215)	**(0.190)**	**(0.045)**	**(0.039)**
LOSS	0.175	0.192	0.057	0.043
	(0.264)	(0.281)	(0.055)	(0.058)
SALES_GROWTH_VOL	0.012	−0.001	0.005	−0.001
	(0.066)	(0.058)	(0.014)l	(0.012)
ANALYSTS	1.180**	0.057	0.124	0.056
	(0.508)	(0.438)	(0.106)	(0.090)
#SEGMENTS	0.623***	−0.090	0.075***	−0.015
	(0.124)	(0.116)	(0.026)	(0.024)
INST.OWN	3.555**	8.971***	0.411	0.785***
	(1.601)	(0.818)	(0.334)	(0.168)
WORDCOUNT	−0.754***	0.142	−0.091**	0.118***
	(0.222)	(0.170)	(0.046)	(0.035)
NUMCOUNT	1.873***	0.872***	0.452***	0.053
	(0.274)	(0.202)	(0.057)	(0.041)
#SLIDES	−0.057	−0.309*	0.579***	0.604***
	(0.167)	(0.183)	(0.035)	(0.038)
TONE	0.903***	0.213	0.206***	0.339***
	(0.349)	(0.269)	(0.073)	(0.055)
F-test (*p* value)	0.063		0.021	
Observations	5,364	3,131	5,364	3,131
Adjusted R-squared	0.632	0.550	0.675	0.628
Firm FE	Yes	Yes	Yes	Yes
CEO FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes
Clustered by Firm	Yes	Yes	Yes	Yes

Panel C: Use of Cash Diagrams Conditional on Cash Flow Performance

	(1)	(2)	(3)	(4)
	Cash Flow Increase = 1	Cash Flow Increase = 0	Cash Flow Increase = 1	Cash Flow Increase = 0
VARIABLES	*%DIAGRAM_CASH FLOW*		*#DIAGRAM_CASH FLOW*	
NEG_SUE	**0.148****	**0.001**	**0.035*****	**0.007**
	(0.069)	**(0.062)**	**(0.012)**	**(0.012)**
OCF_VOL	2.910	13.727***	0.859	3.098***
	(2.991)	(2.902)	(0.540)	(0.555)
ANALYSTS	0.022	−0.652**	0.043	−0.105*
	(0.383)	(0.312)	(0.069)	(0.060)
#SEGMENTS	0.073	0.352**	0.002	0.073***
	(0.166)	(0.137)	(0.030)	(0.026)
INST.OWN	−0.081**	0.035	−0.005	0.008
	(0.039)	(0.034)	(0.007)	(0.007)
WORDCOUNT	−0.076	0.095	−0.001	0.022*
	(0.063)	(0.060)	(0.011)	(0.012)
NUMCOUNT	0.226***	0.029	0.019	−0.008
	(0.077)	(0.072)	(0.014)	(0.014)
#SLIDES	−0.050	−0.043	0.034***	0.053***
	(0.057)	(0.061)	(0.010)	(0.012)
TONE	0.076	−0.032	0.037**	0.011
	(0.097)	(0.090)	(0.017)	(0.017)
F-test (*p* value)	< 0.001		< 0.001	
Observations	4,221	4,274	4,221	4,274
Adjusted R-squared	0.497	0.533	0.608	0.558
Firm FE	Yes	Yes	Yes	Yes
CEO FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes
Clustered by Firm	Yes	Yes	Yes	Yes

Panel D: Use of Cost Diagrams Conditional on Operating Expense Performance

	(1)	(2)	(3)	(4)
	Operating Exp Decrease = 1	Operating Exp Decrease = 0	Operating Exp Decrease = 1	Operating Exp Decrease = 0
VARIABLES	*%DIAGRAM_EXPENSE*		*#DIAGRAM_EXPENSE*	
NEG_SUE	**0.435*****	**−0.314**	**0.123*****	**−0.020**
	(0.167)	**(0.305)**	**(0.035)**	**(0.070)**
OPEXP_VOL	9.716	−3.703	2.855*	−0.063
	(7.194)	(3.789)	(1.506)	(0.811)
ANALYSTS	−0.468	−0.343	−0.050	−0.032

	(0.405)	(0.929)	(0.085)	(0.180)
#SEGMENT	0.387***	0.292	0.110***	0.046
	(0.104)	(0.191)	(0.022)	(0.044)
INST.OWN	1.210	−1.436	0.048	−0.279
	(0.884)	(1.606)	(0.185)	(0.283)
WORDCOUNT	0.269*	−0.035	0.018	0.072
	(0.146)	(0.474)	(0.030)	(0.076)
NUMCOUNT	0.221	0.456	0.092***	0.165
	(0.166)	(0.618)	(0.035)	(0.116)
#SLIDES	−0.803***	−2.140**	0.185***	0.107
	(0.145)	(0.744)	(0.030)	(0.084)
TONE	0.360	−0.062	0.143***	0.012
	(0.245)	(0.521)	(0.051)	(0.091)
F-test (*p* value)	< 0.001		< 0.001	
Observations	3,802	4,693	3,802	4,693
Adjusted R-squared	0.484	0.394	0.589	0.547
Firm FE	Yes	Yes	Yes	Yes
CEO FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes
Clustered by Firm	Yes	Yes	Yes	Yes

Panel E: Use of NON–GAAP Diagrams and Earnings Performance, Subsample Analysis

	(1)	(2)	(3)	(4)
	NONGAAP > GAAP	NONGAAP ≤ GAAP	NONGAAP > GAAP	NONGAAP ≤ GAAP
Dep. Var	*%DIAGRAM_NONGAAP*		*#DIAGRAM_NONGAAP*	
NEG_SUE	**0.131***	**−0.124****	**0.053***	**−0.036****
	−0.078	**(0.055)**	**(0.028)**	**(0.017)**
OPEXP_VOL	2.384	3.505	1.631	1.147
	(5.763)	(5.289)	(0.997)	(1.657)
ANALYSTS	−0.550**	−0.189**	−0.092**	−0.065***
	(0.227)	(0.073)	(0.039)	(0.023)
#SEGMENT	−0.000	−0.000	−0.000	−0.000
	(0.000)	(0.000)	(0.000)	(0.000)
INST.OWN	0.319	0.087	0.058	0.028
	(0.399)	(0.206)	(0.069)	(0.064)
WORDCOUNT	0.297***	0.413***	0.051***	0.129***
	(0.069)	(0.108)	(0.012)	(0.034)
NUMCOUNT	−1.115	1.628	−0.178	0.370
	(0.985)	(1.474)	(0.170)	(0.462)
#SLIDES	0.083	−0.169	0.030	−0.048
	(0.140)	(0.104)	(0.024)	(0.032)
TONE	0.015	0.280**	0.064**	0.083**
	(0.169)	(0.114)	(0.029)	(0.036)

F-test (*p* value)	0.078		0.086	
Observations	5,966	590	5,966	590
Adjusted R-squared	0.451	0.953	0.538	0.955
Firm FE	Yes	Yes	Yes	Yes
CEO FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes
Clustered by Firm	Yes	Yes	Yes	Yes

TABLE 6—Business Complexity and the Use of Diagrams

This table presents the results of estimating Equation (5) by regressing diagram measures on proxies of business complexity at the firm–quarter level. The dependent variable is one of the two firm–quarter level diagram measures: %*DIAGRAM_FIN*, which is the percentage of slides using diagrams when discussing financial information, or *#DIAGRAM_FIN*, which is the number of slides using diagrams when discussing financial information. The independent variables include four measures of business complexity: foreign transactions (*FOREIGN*), mergers and acquisitions (*MERGER*), the number of business segments (*#SEGMENTS*), and the intangible intensity (*INTANGIBLE*). All variables are defined as in Appendix E. Standard errors are clustered by firm. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively (two-tailed tests).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	*% DIAGRAM_FIN*				*# DIAGRAM_FIN*			
FOREIGN	**0.866****				**0.238*****			
	(0.337)				**(0.073)**			
MERGER		**0.374****				**0.207*****		
		(0.159)				**(0.035)**		
#SEGMENT			**1.445*****				**0.502*****	
			(0.498)				**(0.107)**	
INTANGIBLE				**0.032****				**0.587***
				(0.016)				**(0.347)**
SIZE	0.371	0.510**	0.251	0.012***	0.255***	0.168***	0.072	0.359***
	(0.389)	(0.214)	(0.215)	(0.003)	(0.084)	(0.048)	(0.046)	(0.070)
BTM	0.167	0.258	0.225	0.006*	0.044	0.071	0.053	0.157**
	(0.552)	(0.279)	(0.279)	(0.004)	(0.120)	(0.062)	(0.060)	(0.078)
ANALYSTS	−1.425***	-0.756***	−0.458**	-0.014***	-0.267***	−0.111**	−0.023	-0.240***
	(0.359)	(0.222)	(0.228)	(0.003)	(0.078)	(0.049)	(0.049)	(0.070)
INST.OWN	0.395	0.848	0.806	0.013*	0.413**	0.303***	0.332***	0.450***
	(0.920)	(0.525)	(0.549)	(0.007)	(0.200)	(0.117)	(0.118)	(0.150)
RET_VOL	−29.032	−18.905	-52.601***	−0.180	10.307**	4.872	-8.210***	9.757**
	(21.840)	(13.722)	(13.919)	(0.193)	(4.737)	(3.048)	(2.985)	(4.240)
RET[−60,−3]	0.989*	0.237	0.253	0.003	−0.094	−0.007	0.032	0.004
	(0.563)	(0.392)	(0.397)	(0.005)	(0.122)	(0.087)	(0.085)	(0.114)
WORDCOUNT	−0.473***	-0.672***	−0.893***	-0.006***	0.007	−0.007	−0.036	0.006
	(0.148)	(0.124)	(0.136)	(0.001)	(0.032)	(0.027)	(0.029)	(0.031)
NUMCOUNT	2.160***	2.227***	2.355***	0.022***	0.376***	0.442***	0.452***	0.436***
	(0.169)	(0.145)	(0.162)	(0.002)	(0.037)	(0.032)	(0.035)	(0.036)
TONE	−0.219	−0.303	0.008	−0.003	0.091*	0.086**	0.177***	0.080
	(0.238)	(0.190)	(0.202)	(0.002)	(0.052)	(0.042)	(0.043)	(0.049)
Observations	8,495	8,495	8,495	8,495	8,495	8,495	8,495	8,495
Adjusted R-squared	0.599	0.609	0.618	0.587	0.568	0.582	0.605	0.566
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CEO FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

TABLE 7—Market Reactions to the Use of Diagrams in Presentation Slides

This table presents the results of market reactions to the use of diagrams in earnings call slides by estimating Equations (6) and (7). The regressions are estimated with firm, year, and quarter fixed effects. In Columns (1) to (3), *%DIAGRAM_EARN* equals the percentage of the number of slides using diagrams to mention earnings-related items over the total number of slides per earnings conference call presentation. In Columns (4) to (6), *#DIAGRAM_EARN* is the number of slides using diagrams to mention earnings-related items over the total number of slides per earnings conference call presentation. In Panel A, the dependent variable, *CAR(0,+1)*, is a cumulative abnormal return around the earnings announcement date. Panels B and C report the cross-sectional ERC test results. In Panel D, the dependent variable, *CAR(+2,+61)*, is a cumulative abnormal return in the [+2, +61] earnings announcement window. Standard errors are clustered by firm. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively (two-tailed tests).

Panel A: Immediate Reaction to the Earnings News

	(1)	(2)	(3)	(4)	(5)	(6)
	%DIAGRAM_EARN			*#DIAGRAM_EARN*		
DEP.VAR = CAR[0,+1]	Full Sample	SUE ≥ 0	SUE < 0	Full Sample	SUE ≥ 0	SUE < 0
RSUE	0.016***	0.021***	0.014***	0.017***	0.021***	0.015***
	(0.002)	(0.007)	(0.007)	(0.002)	(0.007)	(0.007)
DIAGRAM3_EARN_VAR	−0.048***	0.019	0.014	−0.079***	−0.003	−0.059*
	(0.018)	(0.025)	(0.030)	(0.018)	(0.027)	(0.034)
DIAGRAM3_EARN_VAR×RSUE	**0.015*** **	**−0.006**	**0.030***	**0.012*** **	**−0.009**	**0.050****
	(0.003)	**(0.012)**	**(0.016)**	**(0.003)**	**(0.012)**	**(0.021)**
SIZE	−0.017***	−0.018***	−0.034***	−0.017***	−0.019***	−0.032***
	(0.003)	(0.004)	(0.005)	(0.003)	(0.004)	(0.005)
BTM	0.019***	0.008	0.016	0.019***	0.007	0.016
	(0.004)	(0.008)	(0.012)	(0.004)	(0.008)	(0.012)
SALES_GROWTH	0.003	−0.004	−0.008	0.004	−0.004	−0.009
	(0.003)	(0.003)	(0.012)	(0.003)	(0.003)	(0.012)
ANALYSTS	0.000	0.010**	0.006	0.000	0.009**	0.007
	(0.004)	(0.005)	(0.007)	(0.004)	(0.005)	(0.007)
#SEGMENTS	0.001	0.001	−0.004**	0.001	0.001	−0.004**
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)
INST.OWN	0.010	0.021*	0.019	0.011	0.021	0.016
	(0.008)	(0.013)	(0.018)	(0.008)	(0.013)	(0.018)
WORDCOUNT	−0.008***	−0.003	−0.003	−0.008***	−0.003	−0.003
	(0.003)	(0.003)	(0.005)	(0.003)	(0.003)	(0.005)
NUMCOUNT	0.005*	0.006	0.001	0.005*	0.005	0.002
	(0.003)	(0.003)	(0.005)	(0.003)	(0.003)	(0.005)
TONE	0.008**	0.005	0.009	0.009**	0.003	−0.006
	(0.004)	(0.006)	(0.006)	(0.004)	(0.009)	(0.006)
SIZE×RSUE	−0.002***	−0.004***	0.001	−0.002***	−0.004***	0.001
	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)
BTM×RSUE	−0.001	0.003	−0.003	−0.001	0.003	−0.003
	(0.000)	(0.003)	(0.004)	(0.000)	(0.003)	(0.004)
GROWTH×RSUE	−0.001	0.002	0.010*	−0.001	0.002*	0.010*

	(0.001)	(0.001)	(0.005)	(0.001)	(0.001)	(0.005)
ANALYSTS×RSUE	0.003***	0.005***	−0.006**	0.002***	0.005***	−0.006**
	(0.000)	(0.002)	(0.003)	(0.000)	(0.002)	(0.003)
#SEGMENTS×RSUE	0.000	0.001***	−0.000	0.000	0.001***	−0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
INST.OWN×RSUE	−0.000	0.006	−0.014**	−0.000	0.007	−0.013**
	(0.001)	(0.004)	(0.007)	(0.001)	(0.004)	(0.007)
WORDCOUNT×RSUE	0.001**	0.002	−0.005**	0.001**	0.001	−0.006**
	(0.000)	(0.001)	(0.002)	(0.000)	(0.001)	(0.002)
NUMCOUNT×RSUE	−0.001	−0.002	0.001	−0.000	−0.002	0.001
	(0.001)	(0.002)	(0.003)	(0.001)	(0.002)	(0.003)
TONE×RSUE	−0.000	0.003	−0.005	−0.001	0.000	−0.006**
	(0.001)	(0.009)	(0.012)	(0.001)	(0.001)	(0.002)
F-test (*p* value)		0.046			< 0.001	
Observations	8,495	5,097	3,498	8,495	5,097	3,498
Adjusted R-squared	0.289	0.225	0.421	0.288	0.226	0.419
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
CEO FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes

	CAR(0,+1)		*CAR(0,+1)*
Panel B: High- and Low-Distraction Days	***Low # of Same-Day Earnings Announcements***		***High # of Same-Day Earnings Announcements***
*(1) %DIAGRAM_EARN*RSUE*	0.009		0.051***
	(0.006)		(0.016)
F-test (p value*)*		< 0.001	
*(2) #DIAGRAM_EARN*RSUE*	0.003		0.018**
	(0.008)		(0.009)
F-test (p value*)*		0.022	
Observations	2,635		2,233
Panel C: With and Without Reporting of Special Items	***No Special Item***		***With Special Item***
*(1) %DIAGRAM_EARN*RSUE*	−0.006		0.014***
	(0.007)		(0.004)
F-test (p value*)*		< 0.001	
*(2) #DIAGRAM_EARN*RSUE*	−0.009		0.009**
	(0.007)		(0.004)
F-test (p value*)*		< 0.001	
Observations	3,398		5,097

Panel D: Market Reactions during the Post-Announcement Period

	(1)	(2)	(3)	(4)	(5)	(6)
	%DIAGRAM_EARN			*#DIAGRAM_EARN*		
DEP.VAR = CAR[+2,+61]	Full Sample	SUE ≥ 0	SUE < 0	Full Sample	SUE ≥ 0	SUE < 0
RSUE	−0.003	−0.016**	−0.028**	−0.003	-0.016**	−0.025**
	(0.002)	(0.007)	(0.012)	(0.002)	(0.007)	(0.012)
DIAGRAM_EARN_VAR	−0.022	−0.034	0.109***	−0.023	−0.012	0.147***
	(0.020)	(0.028)	(0.035)	(0.021)	(0.030)	(0.042)
DIAGRAM_EARN_VAR×RSUE	**0.002**	**−0.004**	**−0.054*** **	**0.006**	**0.003**	**-0.078*** **
	(0.004)	**(0.014)**	**(0.020)**	**(0.004)**	**(0.014)**	**(0.026)**
F-test (p value*)*		0.014			0.008	
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8,495	5,097	3,498	8,495	5,097	3,498
Adjusted R-squared	0.134	0.155	0.221	0.135	0.159	0.219
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
CEO FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
Clustered by Firm	Yes	Yes	Yes	Yes	Yes	Yes

TABLE 8—Short Selling and Use of Diagrams

This table presents the results of informed short sellers' reaction to the use of diagrams. Panel A regresses short interest ratios on the diagram measures. The regressions are estimated with firm, year, and quarter fixed effects. In Column (1), %*DIAGRAM_EARN* equals the percentage of slides that use diagrams to mention earnings-related items over the total number of slides per earnings conference call presentation. In Column (2), *#DIAGRAM_EARN* equals the number of slides that use diagrams to mention earnings-related items per earnings conference call presentation. In Panel B, the dependent variable, *CAR(+2,+61)*, is a cumulative abnormal return in the [+2, +61] earnings announcement window, and the variable of interest *SIR_HIGH* is an indicator equal to 1 if the short interest ratio is among the top two deciles within the same year and quarter. Standard errors are clustered by firm. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively (two-tailed tests).

Panel A: Use of Diagrams and Short Selling

	(1)	(2)
DEP.VAR = Short sales	%DIAGRAM_EARN	#DIAGRAM_EARN
DIAGRAM_EARN_VAR	0.028*	0.004***
	(0.014)	(0.001)
CAR[0,1]	0.004	0.013
	(0.013)	(0.011)
RET[−60,−3]	−0.030***	−0.046***
	(0.007)	(0.005)
VOL[0,1]	0.025***	0.050***
	(0.009)	(0.007)
Observations	8,495	8,495
Adjusted R-squared	0.621	0.909
Firm FE	Yes	Yes
CEO FE	Yes	Yes
Year FE	Yes	Yes
Quarter FE	Yes	Yes
Cluster by Firm	Yes	Yes

Panel B: Short Selling and Post Announcement Drift

	(1)	(2)	(3)
Dep. Var = CAR(+2,+61)	Full Sample	SUE ≥ 0	SUE < 0
RSUE	−0.000	−0.047***	−0.052***
	(0.003)	(0.011)	(0.019)
SIR_HIGH	−0.010	0.001	0.034**
	(0.007)	(0.008)	(0.015)
SIR_HIGH×RSUE	**−0.002****	**0.004**	**−0.015****
	(0.001)	**(0.004)**	**(0.006)**
SIZE	−0.077***	−0.095***	−0.100***
	(0.005)	(0.006)	(0.010)
BTM	−0.021***	−0.038***	−0.073***
	(0.007)	(0.010)	(0.023)
SALES_GROWTH	0.008	0.007	−0.021
	(0.005)	(0.005)	(0.020)
ANALYSTS	−0.009	0.005	−0.005
	(0.006)	(0.008)	(0.012)
OWN.INST	−0.018	−0.016	−0.025
	(0.014)	(0.021)	(0.030)
WORDCOUNT	−0.002	−0.007	0.009
	(0.004)	(0.004)	(0.007)
NUMCOUNT	0.001	0.003	−0.002
	(0.005)	(0.005)	(0.009)
SIZE×RSUE	−0.000	0.005***	0.007***
	(0.000)	(0.001)	(0.002)
BTM×RSUE	0.002**	0.019***	0.017**
	(0.001)	(0.004)	(0.007)
SALES_GROWTH×RSUE	−0.001*	−0.004*	0.014
	(0.001)	(0.002)	(0.009)
ANALYSTS×RSUE	0.000	−0.005*	−0.005
	(0.001)	(0.003)	(0.005)
INST.OWN×RSUE	0.001	0.011	0.008
	(0.002)	(0.007)	(0.011)
WORDCOUNT×RSUE	0.001	0.001	−0.003
	(0.001)	(0.002)	(0.004)
NUMCOUNT×RSUE	−0.001	0.000	−0.001
	(0.001)	(0.003)	(0.005)
F-test (p value*)*		0.016	
Observations	8,495	5,097	3,498
Adjusted R-squared	0.233	0.284	0.335
Firm FE	Yes	Yes	Yes
CEO FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes
Clustered by Firm	Yes	Yes	Yes