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Accounting Fraud Detection through a Text-Mining Analysis: Evidence from Construction and Retail Industries in Japan[1]

Masumi Nakashima

Yuka Nose

Hiromi Ujiie

Shota Yoshida

Part 1

An Application of Team-Based Learning as Active Learning Styles in Accounting Seminar Course in Japan

〈**Abstract**〉

(Part1) In colleges and universities in Japan, there are courses that use a teaching method called seminar. Seminar is defined as a group of advanced students studying under a professor with each doing original research and all exchanging results through reports and discussions. For the seminar, I have incorporated Team-Based Learning (TBL) as a form of active learning. Students are divided into teams to conduct their research and work together as team to achieve the same goal of presenting a research report at an annual accounting competition where students from all over Japan gather to compete on their research.

〈**Keywords**〉

team-based learning; seminar; active learning

I. INTRODUCTION

Part 1 of this paper reports the findings of a case-study of where and how faculty-student collaboration in accounting has been implemented in Japan. The faculty-student collaboration through seminar courses in Japan is a unique feature of teaching and learning methods in the world.

[1] We thank Professor Robert Van Benthuysen for precious comments and useful suggestions. We also thank the conference judges and participants at the 6th (2019) Nihon University Accounting Competition, the Eigth International Conference of Journal of International Accounting Research (JIAR), and 2021 Faculty-Students Collaboration in Accounting Workshop (FASTCA-22) at American Accounting Association. As for the first author, this study is supported by grant-in-aid as a scientific study of the fiscal year 2019-2022 by the Ministry of Education, Culture, Sports, Science and Technology (Representative: Masumi Nakashima 16K03997: The Integrated Research of Theory and Archival Study for Managerial Discretion and Accounting Fraud).

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The Central Council for Education in Japan mentions the following as qualitative changes required in undergraduate education (Central Council for Education 2012):

> Human resources with the ability to continue to learn and think independently throughout their lives cannot be developed in a passive educational setting. It is necessary to shift from conventional class styles that focus on the providing of knowledge, to active learning, where students discover problems and find solutions on their own initiative, by creating a place for intellectual growth through mutual stimulation and friendly rivalry between faculty and students while communicating with each other. In other words, it is necessary to promote high-quality undergraduate education that encourages students to study independently by shifting to classes that focus on interactive lectures, exercises, experiments, practical training, and skills training, such as discussions and debates that draw out and develop the cognitive, ethical, and social abilities of individual students. Students can acquire the ability to continue learning throughout their lives only through repeated experiences of independent study (Central Council for Education 2012, 9).

In colleges and universities in Japan, there are courses that use a teaching method called seminar. A seminar is defined as a group of advanced students studying under a professor with each doing original research and all exchanging results through reports and discussions (Merriam-Webster 2021). In the second semester of the freshman year, students select a faculty member in the area of specialization they wish to explore and study the area of specialization in this manner for three years from the first semester of the sophomore year. In the seminars, students learn research methods themselves, mainly through research, and finally write and complete their graduation thesis in their senior year.

In recent years, team-based learning (TBL)[2] has been actively practiced in higher education institutions as a form of active learning that encourages students to study independently in Japan (Kanou and Nakamura 2014, 62). TBL involves a specific sequence of activities and feedback designed to quickly change groups of individual students into high performance learning teams in which participants know each other, need each other and hold each other the accountable for preparation and contribution (Sweet and Michaelsen 2012, 18).

[2] TBL is defined as an unusually powerful and versatile teaching strategy that enables teachers to take small group learning to a whole new level of effectiveness (Michaelsen et al. 2004).

II. TEAM-BASED LEANING STYLE

For the seminar, I have incorporated TBL as a form of active learning. TBL is not just group work of any kind (Sweet and Michaelsen 2012, 18). Students are divided into teams to conduct their research and work together as a team to achieve the same goal of presenting a research report at an annual accounting competition where students from all over Japan gather to compete on their research. As shown in Table 1, the research topics of the teams in my seminar are text analysis, accounting fraud, tone management (TONE), revenue recognition, and key audit matters (KAM).

TABLE 1

Research Themes of the Teams in My Seminar

FY2020			FY2021		
Team	Study Content	Number of Students	Team	Study Content	Number of Students
Team A	Text-Mining Analysis	2	Team A	Text and Tone Analysis	3
Team B	Tone Analysis	5	Team B	Tone Analysis	5
Team C	Revenue Recognition	6	Team C	KAM	5
Team D			Team D	Revenue Recognition	4
Team E			Team E	Accounting Fraud for Information Communication	1

*Team A won the top prize in an intercollegiate accounting competition in 2020. Team B received an award for excellence in all areas of the college-wide competition in 2020.

My seminar class meets twice a week. My university allocates the sophomore students as Seminar I, the junior students as Seminar II (juniors), and the senior students as Seminar II. However, I have implemented a vertically divided seminar system. In other words, I have students attend Seminar I and Seminar II (juniors) attend together, twice a week. Students from different years may be on the same team. This is a good opportunity for them to learn about the vertical society that is the foundation of Japanese management.

The annual schedule of the seminar course is as follows: In the first semester, students read accounting textbooks in a circle, not by team, but individually. In other words, they summarize the text by chapter and present it by using PowerPoint slides. Students learn basic knowledge of accounting by reading textbooks sequentially. During the summer break, each team decides a research theme and completes discussing prior studies and data acquisition. In the second semester, students begin analysis and summarize their research results in preparation for the competition and present their research in an intercollegiate competition in December.

A student's final grade for a TBL course must come from three sources: individual performance,

team performance, and peer evaluation (Sweet and Michaelsen 2012, 28). My syllabus indicates that the seminar course grades are 20%, 20% and 60% for contribution to the seminar, a presentation and a report. I consider contribution to the seminar as team's performance, graduation thesis as individual performance, and the result of the competition as peer evaluation. It seems that students' grades improve since teamwork helps them gain practice at finding and offering evidence in support of an argument (Bill and Reimers 2004, 141).

III. COLLABORATION OF RESEARCH

I describe my seminar research here. In Japan, the number of accounting fraud increases, with 54 firms in 2018 and 70 firms in 2019 (TSR 2019). My mission is to conduct research that will help prevent and detect accounting fraud. In order to fulfill this mission, I have conducted research that has been based on the fraud triangle theory and studies of fraud detection methods by a text analysis. My seminar students are accounting majors who joined my seminar because they sympathize with my mission.

They are interested in my accounting fraud research, especially in detecting accounting fraud with qualitative information rather than quantitative information. I recommended that they use the construction and retail industries as samples, where the number of accounting fraud is great among industries. They decided to conduct a text analysis of MD&A disclosure of fraudulent firms in those industries. I just recommended that the students conduct a text analysis for the construction and retail industries, but the text analysis itself was conducted by the students themselves, who learned the text analysis method and derived the analysis results.

The results were consistent with previous studies. The conceptual research, readability, and interpretation of the text analysis were done by the faculty myself, but the text analysis and the translation of the analysis results into English were all done by the students. It seems that they discussed how to translate the huge amounts of Japanese into English in a consistent and appropriate way.

IV. CONCLUSIONS

What the students acquire in this TBL process is not only the analytical skills of a text mining, but also communication skills through the presentations at the competition and Q&A sessions, as well as a sense of self-affirmation by showing the acquired knowledge and new insights.

In the process of learning the theories of accounting, by using database to verify financial statement figures, students sometimes come up with answers before I teach them. By using database to analyze financial statement figures, the students themselves seem to have developed a positive attitude toward studying (Nakashima 2021).

When a seminar student says, “I really enjoy doing research,” it means that the student has learned the joy of analyzing with data, and it is a great honor to be an instructor. The theme of the seminar is an advanced one, so the students must have discovered the joy of working on their own in highly original research that no one else is doing. I consider this to be very meaningful for the students’ lives (Nakashima 2021).

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Part 2

This study presents the result of research conducted in collaboration with faculty and seminar students in Part 2.

Accounting Fraud Detection through a Text-Mining Analysis: Evidence from Construction and Retail in Japan

〈**Abstract**〉

(Part2) This study conducts a text-mining analysis on the Management and Discussion and Analysis (MD&A) disclosure of fraudulent firms that belong to construction and retail industries in Japan. First, we find that the rate of words per the entire text during the period of fraud-involvement is higher than that during the post of fraud detection for both industries. This indicates that the fraudulent firms might confuse users of financial statements to hide fraud during the period of involving fraud. Second, as results of the text-mining analyses, we observe differences in the connections between words with strong co-occurrence relationships and the distance from 0 for the pre-and the post-fraud detection period in both industries. Our finding is that during fraud-execution periods, managers are unable to explain logically in order to cover up the accounting fraud, resulting in incoherent sentences.

〈**Keywords**〉

accounting fraud; text-mining; MD&A information; co-occurrence networks; correspondence analysis; readability

I. INTRODUCTION

Fraud research has been focused on finding effective approaches to fraud detection using financial statement data (Beneath 1998; Beasley 1999; Dechow et al. 2011; Song et al 2016; Nakashima 2021). However, these approaches have limitation: it is difficult for individuals to identify a manager's intention as rationalization which is a major factor of the fraud triangle theory (Cressey 1953) through financial statement numbers (Nakashima et al. 2019).

In recent years, accounting narrative information has been acting as a means of communication for stakeholders even in the case of studies that are not dedicated to fraud detection. Existing studies have examined the determinants of the readability of narrative information (Li 2008[3]; Hirose et al. 2017). We extend fraud detection approaches in this study based on narrative information to a setting that does not use English as its main language. Japan possesses a different management style from Western

[3] Li (2008) indicates that although the readability of annual reports of firms with poor performance is lower, the readability of annual reports of firms with good performance is higher, suggesting that managers choose the readability of annual reports to hide information from investors. Hirose et al. (2017) use the same approach as Li (2008) and present that firms with high market capitalization and firms that report extraordinary income have lower readability, while firms with long years in business have shorter length.

countries, such as group endeavor, diligence, consensual decision making (Debroux 2003, 105). As such, the involvement of the cover-up mentality might influence the length of narrative disclosure in Japan.

First, we examine whether there are differences in the length between the pre-and post-fraud detection through the Management Discussion and Analysis (MD&A) disclosures of construction and retail industries. In this study, we use length of the text. Length is examined in terms of the rate of words per the entire text. Second, we discuss whether a text-mining analysis can detect accounting fraud by investigating whether there are differences in the results of co-occurrence analysis and correspondence analysis between the pre-and post-fraud detection periods.

MD&A disclosures are considered as narrative information because they provide written disclosures of significant past and future prospects that enable investors and other users of the information to assess the performance of a listed entity in terms of its the financial position, changes in financial position, results of operations, and future prospects (FSA 2019). Analysis by the management of financial conditions, operating results and the cash flow status of firms should be in line with the management's point of view regarding the situation of management results in the term under review. This entails analyzing the situation from management results in the term under review, which is the outcome of operating business in accordance with business policies and strategies, and examining the main causes in its increases or decreases (FSA 2019, 13).

Therefore, we predict that if the firm in question is involved in accounting fraud, MD&A disclosures might automatically reflect the management's involvement in it. This is because MD&A information is supposed to describe the management's viewpoint based on financial statement figures.

This study contributes to the existing literature in three ways. First, this study can identify a manager's intention as rationalization which is a major factor of the fraud triangle theory. Second, we present the existing differences in the pre-and post- fraud-detection periods through the co-occurrence network and correspondence analyses that is consistent with the previous study (Ohno 2019). Third, we find that managers are unable to provide logical explanations to cover up fraud, resulting in incoherent sentences through a text-mining analysis of MD&A disclosure during fraud involvement periods.

The remainder of this study proceeds as follows. Section 2 provides a brief review and Section 3 develops the hypotheses. Section 4 describes the methodology used. Section 5 discusses the empirical results. Section 6 summarizes this study and presents its conclusions.

II. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Several studies have analyzed Japanese text by using the security report. Noda (2006) and Nakano (2010) show a significant association between MD&A information and the market. Shirata et al. (2009) conduct a corporate evaluation analysis using text-mingling technology on the security report by

using the OmniFindTM Analytics Edition to exact "regrettable," a keyword associated with apology as the characteristic word of bankrupt companies. Ito (2016) indicates that stock market volatility tends to be higher for companies with more characters and information in their texts.

Hypotheses Development

Churyk et al. (2009) and Lee et al. (2013) suggest that restatement firms or fraudulent firms use more words than those in paired-sample. The results of these studies are consistent with those of Bushee et al. (2017), stating that managers of restatement firms or fraudulent firms may use more words to obfuscate fraudulent accounting transaction.

However, Nakashima et al. (2019) find that there is no significant difference in the length of MD&A information between fraudulent firms and non-fraudulent firms. Following Nakashima et al. (2019), based on the bad news hypothesis of the information content theory (Bushee et al. 2017) and the cover-up mentality of corporate culture (Mito 1991), we predict that there is shorter length in the fraud-execution periods than in the post-fraud detection periods:

H1: There is no difference in the length of the MD&A disclosures of fraudulent firms for the pre- and post-fraud detection periods in the construction and retail industries.

Ohno (2020) uses KH Coder software to extract feature words that represent the accounting fraud of fraudulent firms. He finds that when applied to correspondence analysis, MD&A disclosure of fraudulent firms contains numerous feature words plotted near them. We predict that there exists a difference in the use of words during the periods of pre-and post-fraud detection. Thus, we propose the following hypothesis:

H2: There exist no differences in the use of words in the MD&A disclosures of fraudulent firms during the periods of pre-and post-fraud detection in the construction and retail industries.

Nakashima et al. (2019) indicate that there exists a significant difference in the grade of MD&A information between fraudulent firms and non-fraudulent firms. Ohno (2020) is the first to provide a fraud-detection model using KH-Coder (Higuchi 2020) considering MD&A disclosures in Japan. The results of co-occurrence network analysis showed that fraudulent firms had a number of distinctive terms plotted in their MD&A information (Ohno 2020). Therefore, we predict that a difference in the results of text-mining arises from the KH Coder for the pre-and post-fraud detection periods:

H3a: There is no difference in connections between words with strong co-occurrence relationships for the periods of the pre- and post-fraud detection in the construction and retail industries.

H3b: There is no existing difference in a distance from 0 for the periods of the pre-and post-fraud detection in the construction and retail industries.

III. METHODOLOGY

Data of Fraudulent Firms

We use data on MD&A disclosure from the business description of the annual security report (yukashoken hokokusho). While MD&A disclosure does not contain audit information, it includes specific requirements regarding its content following FSA's *Principles Regarding the Disclosure of Narrative Information* (FSA 2019).

Approach

Hypothesis 1 examines the difference in the length before and after the fraud detection periods. Hypothesis 2 clarifies the difference in co-occurrence network results and correspondence analysis results before and after the fraud detection from the text analysis by KH coder.

Sample Selection

We obtain fraudulent firm data from the Tokyo Shoko Research (TSR) Investigation Report (Tokyo Shoko Research 2019) for the period of 2007 to 2019, consisting of 490 fraudulent public firms (Tokyo Shoko Research 2019). The sample of fraudulent firms disclosed that inappropriate accounting affects prior or future in their annual reports (Tokyo Shoko Research 2019). We choose the construction and retail industry as our sample. If there is a common result by analyzing the industries in which the operating cycle that is circulation from purchase to collection by cash, is extremely different, we can clarify that there is universality in the detection of accounting fraud. Figure 1 shows the number of fraudulent firms in the construction and retail industries by fiscal year. Although the number of fraudulent firms in the construction industry decreased, those in the retail industry increased.

FIGURE 1

Number of Company-Wide Fraud Firms By Fiscal Year for Construction and Retail

Table 1 shows the sample selection process. In case of both industries, we exclude firms that involve fraud by subsidiaries and affiliates, fraud by employees, and fraud by individual executives, while ensuring a company-wide focus. In the case of construction industry, out of 36 firms, we remove 11 firms that are associated with fraud by subsidiaries and affiliates, 8 firms that involved fraud by employees, and 1 firm that commit fraud through individual executives. The final sample of the construction industry, depicting company-wide fraud, consisted of 16 firms. Out of 51 firms in the retail industry, we remove 12 firms that are affected from fraud by subsidiaries and affiliates, 9 firms that commit fraud by employees, and 2 firms that are associated with fraud by individual executives, such that the final sample includes 27 firms.

TABLE 1
Sample Selection Process

Construction Industry		Retail Industry	
All firms that belong to construction	36	All firms that belong to retail	51
Fraud in subsidiaries and affiliates	△11	Fraud in subsidiaries and affiliates	△12
Employee fraud	△8	Employee fraud	△9
Fraud by individual executives	△1	Fraud by individual executives	△2
Final sample: Company-wide fraud	16	Final sample: Company-wide fraud	27

The sample is from the Tokyo Shoko Research (TSR) Investigation Report (Tokyo Shoko Research 2019). Date covers FY2008 through FY 2019. Fraud firms consist of 490 public firms in Japan. The Fraud firm sample that disclosed that inappropriate accounting impact the prior financial statement or would impact in the future in their annual report though TSR Investigation

Descriptive Statistics

Table 2 reports the descriptive statistics of the variables employed in this study. The mean (standard deviation) of *OCF* in the construction and retail industries are 0.036 (0.095) and 0.053 (0.062), respectively. The descriptive statistics suggest that the mean (standard deviation) of *EARN* in the construction and retail industries are 0.008 (0.087) and 0.015 (0.122), respectively. The mean (standard deviation) of *LOSS* in the construction and retail industries are 0.212 (0.410) and 0.261 (0.440), respectively. This indicates that financial performances of both the industries are not satisfactory.

The mean (standard deviation) of *SIZE* in the construction and retail industries are 10.839 (1.237) and 10.513 (1.652), respectively. It should be noted that the size of the sample of construction industry is greater than that of the retail industry. The descriptive statistics indicate that the mean (standard deviation) of *ROE* in the construction and retail industries are 1.977 (52.270) and -0.703 (28.017), respectively. The differences in a firm's performance, measured with the help of *EARN*, *LOSS*, and *ROE*, are associated with a higher propensity to detect fraud. It is likely that poor firm performance is associated with the occurrence of accounting fraud.

TABLE 2

Descriptive Statistic of Firm Characteristics for Construction and Retail (2007-2019)

Panel A: Constraction

	In the Fraud-Involvement			In the Post-Fraud Detection			
Category	**Mean**	**SD**		**Mean**	**SD**	**t-value**	**significance**
OCF	0.029	0.085	<	0.035	0.082	-0.295	0.769
EARN	0.004	0.085	<	0.008	0.107	-0.162	0.872
SIZE	10.561	1.296	<	10.769	1.405	-0.647	0.519
LOSS	0.238	0.431	<	0.267	0.450	-0.272	0.786
GROWTH	-1.432	22.835	<	4.958	17.683	-1.282	0.204
BPS	506.614	283.824	<	592.013	308.072	-1.094	0.278
ROE	-2.554	83.812	<	-1.671	38.028	-0.054	0.957

Panel B: Retail

	In the Fraud-Involvement			In the Post-Fraud Detection			
Category	**Mean**	**SD**		**Mean**	**SD**	**t-value**	**significance**
OCF	0.050	0.058	<	0.058	0.047	-0.698	0.487
EARN	0.016	0.056	>	-0.002	0.078	1.312	0.193
SIZE	10.546	1.814	>	10.507	1.898	0.105	0.917
LOSS	0.240	0.431	<	0.314	0.469	-0.822	0.413
GROWTH	-0.628	19.931	<	-0.388	14.025	-0.069	0.945
BPS	12,397.093	23,241.914	<	277.955	224.856	3.612	0.001 ***
ROE	3.399	18.912	>	-6.327	36.847	1.644	0.105

All variables are deflated by total assets in the beginning of the year.

OCF	OCF (cash flows from operations) / Total Assets
EARN	Net income/Total Assets
SIZE	log of Total Assets
LOSS	1=EARN<0, 0=EARN>0
GROWTH	Sales in the beginning of the year / Sales in the end of the year
BPS	Net assets per share (BPS) [yen]:Net assets / Total number of shares issued
ROE	Return on Equity: (Current net income / average of 2 periods of own capital) × 100

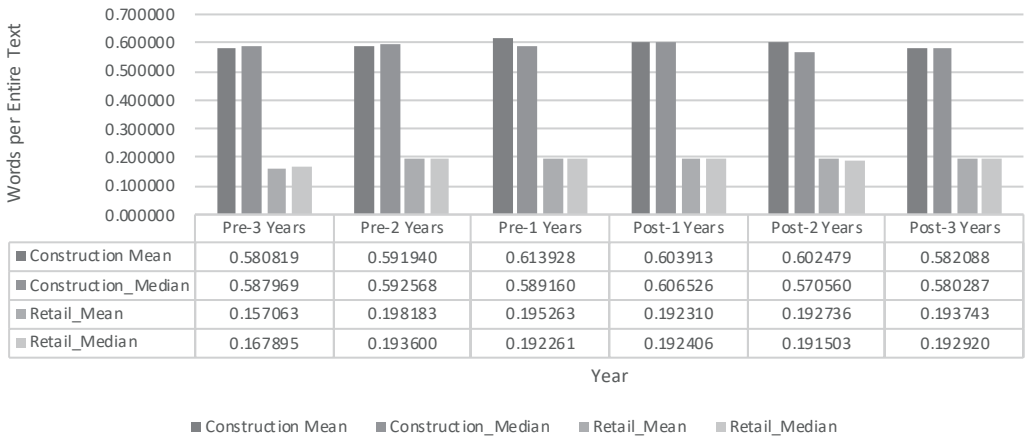
IV. RESULTS

Length (H1)

We calculate the rate of words per the entire text in the MD&A information of the fraudulent Japanese firms in using the Word of Software. The mean (median) of the rate of the construction industry are 0.58 (0.58), 0.59 (0.59), 0.61(0.58) and 0.60 (0.60), 0.61 (0.57), 0.58 (0.58) in the pre-and post-fraud

detection, and the mean (median) of the rate of the retail industry is 0.15 (0.16), 0.19 (0.19), 0.19 (0.19) and 0.19 (0.19), 0.19 (0.19), 0.19 (0.19) in the pre-and post-fraud detection, respectively. This indicates that the rate of words per the entire text in the construction industry is greater than that in the retail industry, and the readability of narrative information in the construction industry is lower than that in the retail industry.

FIGURE 2
Readability in the Construction and Retail Industries



	Pre-3 Years	Pre-2 Years	Pre-1 Years	Post-1 Years	Post-2 Years	Post-3 Years
Construction Mean	0.580819	0.591940	0.613928	0.603913	0.602479	0.582088
Construction_Median	0.587969	0.592568	0.589160	0.606526	0.570560	0.580287
Retail_Mean	0.157063	0.198183	0.195263	0.192310	0.192736	0.193743
Retail_Median	0.167895	0.193600	0.192261	0.192406	0.191503	0.192920

We compare the ratio of words per the entire text in the period of fraud involvement and post-fraud detection in order to test H1. Table 3 presents the results of the t-test of the ratio of words per the entire text, words in the entire text, characters in the entire text, and characters with space in the entire text. Table 3 shows that while there is no significant difference in rate of words per the entire text in construction industry, there is a significant difference in the rate of words per the entire text in the retail industry.

We can see the rate of words per the entire text in both industries decrease in the post-fraud detection. Since the word means “tango” and character means the “moji.” It seems that length in both industries in the period of the fraud execution period is shorter than that of firms during the fraud-detection period. This is the fraudulent firms might try to confuse users of financial statements in order to hide fraud during the period of involving fraud.

TABLE 3

Descriptive Statistics of Readability for Construcation and Retail (2007-2019)

Panel A: Construction

	In the Fraud-Involvement		In the Post-Fraud Detection			
Category	**Mean**	**SD**	**Mean**	**SD**	**t-value**	**significance**
WORDS PER ENTIRE TEXT	0.596	0.070	0.599	0.095	-0.142	0.887
WORDS IN ENTIRE TEXT	1062.239	351.116	1098.944	369.590	-0.459	0.647
CHARCTERS IN ENTIRE TEXT	1806.000	650.036	1839.972	573.422	-0.247	0.805
CHARCTERS WITH SPACE IN ENTIRE TEXT	1889.652	688.850	1929.306	625.193	-0.269	0.788

Panel B: Retail

	In the Fraud-Involvement		In the Post-Fraud Detection			
Category	**Mean**	**SD**	**Mean**	**SD**	**t-value**	**significance**
WORDS PER ENTIRE TEXT	0.179	0.053	0.193	0.006	-2.127	0.037 ***
WORDS IN ENTIRE TEXT	1020.629	616.952	1128.355	660.564	-0.938	0.350
CHARCTERS IN ENTIRE TEXT	5293.984	3271.165	5899.194	3560.437	-0.986	0.326
CHARCTERS WITH SPACE IN ENTIRE TEXT	6294.710	3877.767	6995.661	4198.294	-0.966	0.336

All variables are deflated by total assets in the beginning of the year.

WORDS PER ENTIRE TEXT	Words / Characters of the entire MD&A document
WORDS IN ENTIRE TEXT	Words in the entire MD&A document
CHARCTERS IN ENTIRE TEXT	Characters with no space in the entire MD&A document
CHARCTERS WITH SPACE IN ENTIRE TEXT	Charcters with space in entire MD&A document

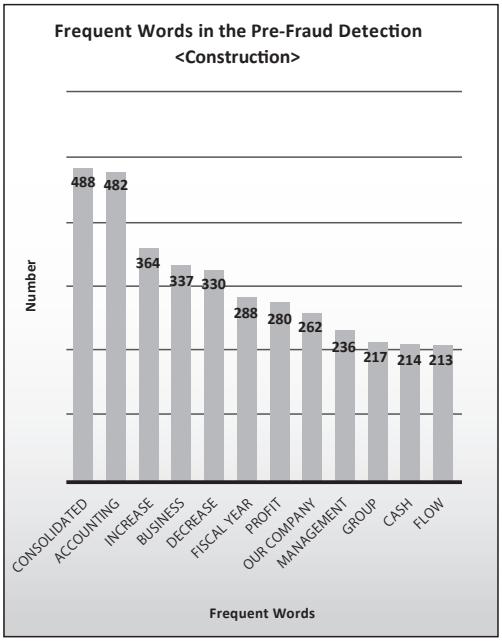
Frequent Words (H2)

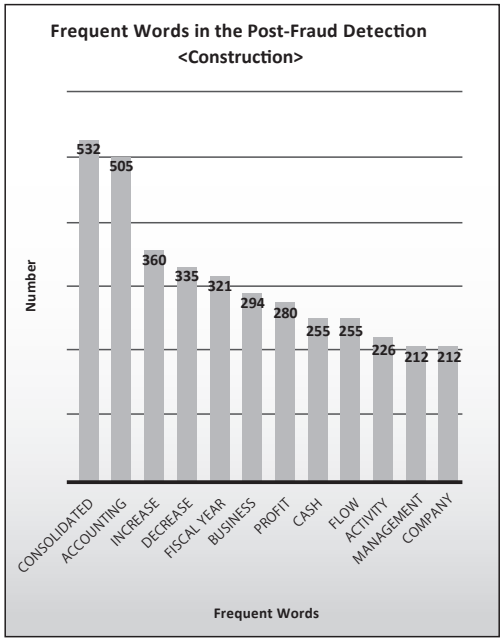
We test H2 by analyzing MD&A information with the help of the KH Coder for text-mining, which is a free software for the statistical analysis of textual data. We compare the frequent words from MD&A information for the pre-and post-fraud detection period using this software. Figure 3 presents the frequent words used for the pre-and post-fraud detection period in both the industries. We report that post-fraud detection, considered words such as “review” and “compliance” in the retail industry and “improvement” in the construction industry, as the characteristic words, which was not the case during the occurrence of fraud.

Figure 3 presents the 12 most frequently used words for the period of pre-and post-fraud detection in the retail industry. Although there are no differences in the use of frequent words in construction industry, differences exist in the retail industry. During the pre-fraud detection for the retail industry, differences are observed between the Top 4 words and those below them. The Top 4 words, “implement,” “consolidated,” “accounting,” and “increase” are polarized in the pre-fraud detection, but during the post-fraud detection, the use of them decreases slowly. The number has been gradually decreasing since the fraud was detected. Thus, testing of H2 reports mixed results in the use of frequent words.

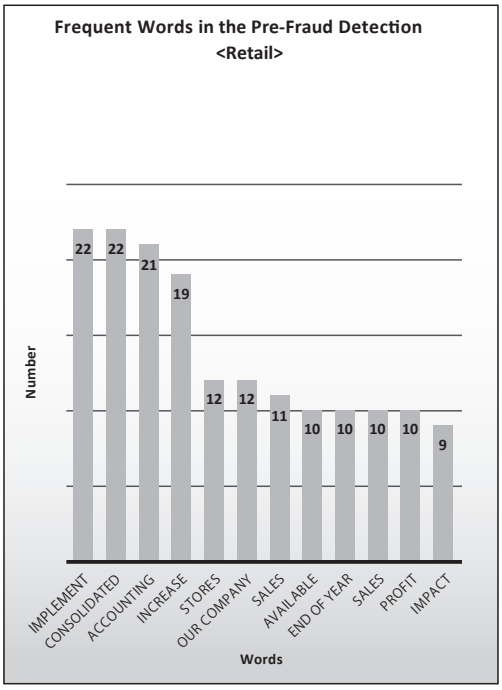
FIGURE 3
Frequent Words of Construction and Retail in the Pre-and Post-Fraud Detection

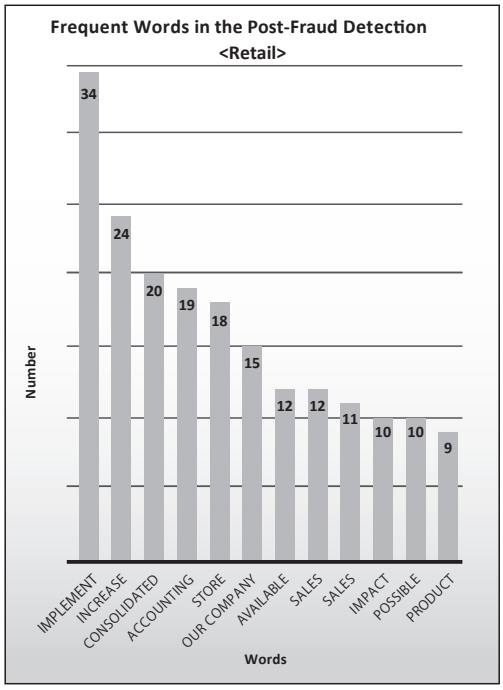
Panel A: Frequent Words <Construction>





Panel B: Frequent Words <Retail>





Results of Co-occurrence Network and Correspondence Analyses (H3)

We conduct the test through the KH Coder to examine the relevance of H3a and H3b. We compare the results of co-occurrence network and correspondence analyses using MD&A information for the periods of pre-and post-fraud detection.

Results of Testing Hypothesis 3a:

Panel A in Figure 4 presents the biplot of the results obtained from the co-occurrence network analysis on the construction industry. The one on the left depicts fraudulent involvement. Figure 4 reveals that although cash flows and an analysis are originally related to each other, management analysis during fraud execution periods is not related to cash flows. A closer inspection reveals that "debt" and "borrowing" emerge as real estate and sales are related to financial statements. Managers are likely to attempt to distort the issue into be a complication. During post-fraud detection periods, Panel A reveals that cash flows and business analysis are related to each other.

Panel B in Figure 4 shows the biplot of results of co-occurrence network analysis on the retail industry. The results of the co-occurrence network analysis on the left side reveals that the word "sales" is not used in the retail industry during pre-fraud detection periods. The results of co-occurrence network analysis on the right side reveals that "store" and "youth" are related to each other, while "sales" and "product" are associated with each other and word "sales" comes up during the periods of fraud-detection.

Taken together, managers are unable to provide logical explanations to cover up the fraud, resulting in incoherent sentences.

Results of the Testing of Hypothesis 3b:

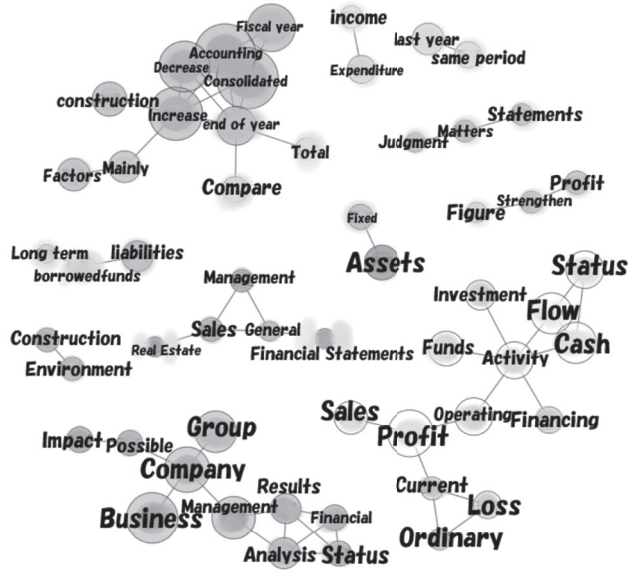
Panel A in Figure 5 presents the biplot of the results of the correspondence analysis on the construction industry. The left side shows the results of the correspondence analysis results for fraud execution periods. The left side of Panel A indicates that the words are plotted far away from the central point during the fraud execution periods, suggesting that many of them are characteristic with weak relevance between terms. The right side of Panel A shows that the words are close to the central point, indicating that the use of relatively common terms with strong relevance are placed close to each other.

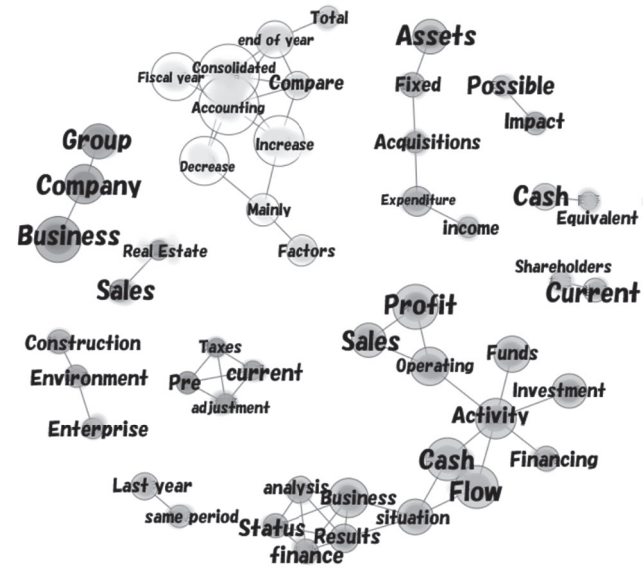
Panel B in Figure 5 shows the biplot of the results of the correspondence analysis on the retail industry. The left side of Panel B presents the results of the correspondence analysis during fraud execution periods, indicating that the words are plotted far away from the central point during fraud execution period. This suggests that many of words to be characteristic with weak relevance between terms. To cover up fraud, the logic of linking business performance with users of other information no

FIGURE 4 Results of Co-Occurrence Network Analysis

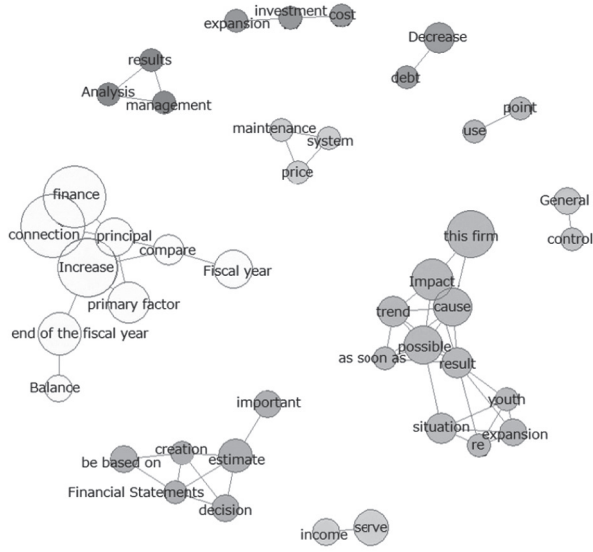
In the Fraud-Involvement | **In the Post-Fraud Detection**

Panel A: Construction





Panel B: Retail



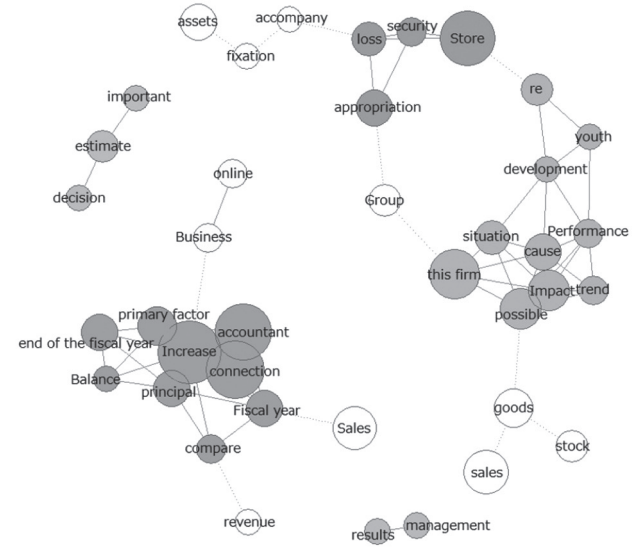
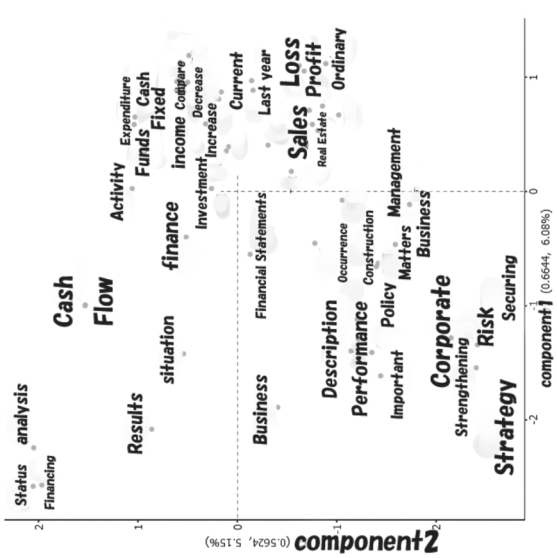


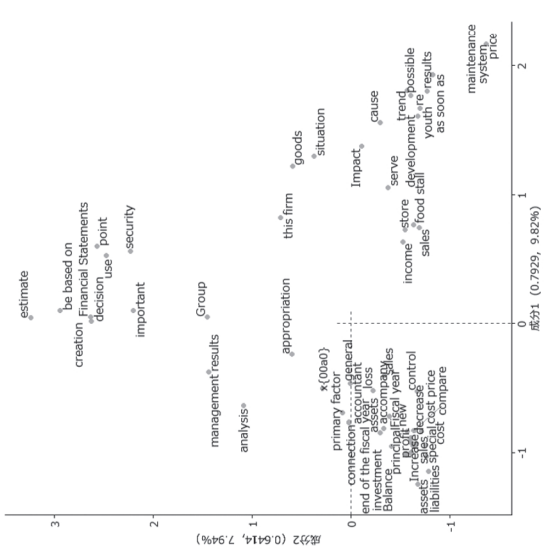
FIGURE 5 Results of Correspondece Analysis

In the Fraud-Involvement

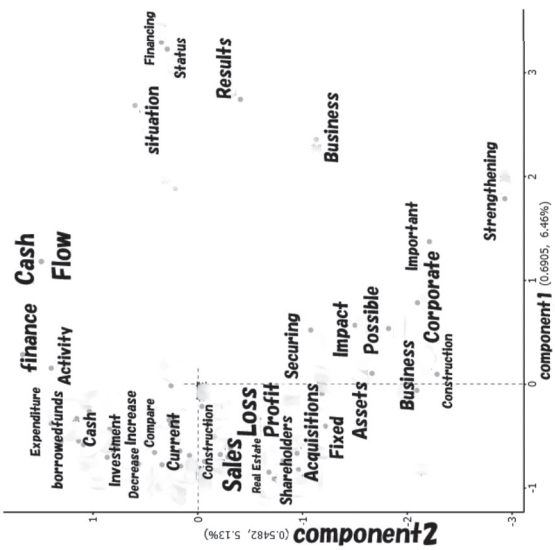
Panel A: Construction

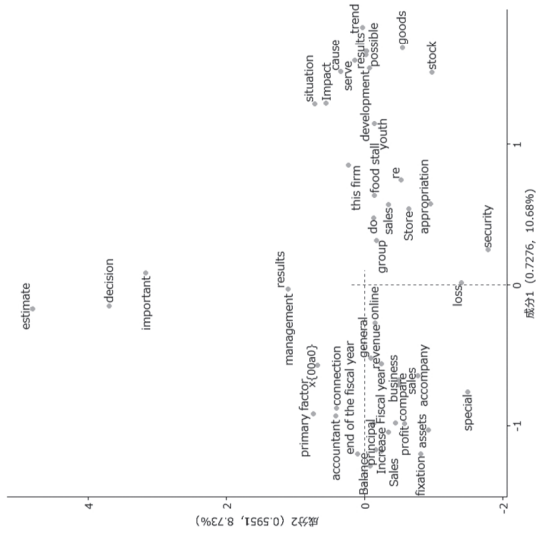


Panel B: Retail



In the Post-Fraud Detection





longer remains connected. As a result, low relevance between terms is reflected in MD&A information. The image on the right side of Panel B shows that words are close to the origin. Relatively common terms are used, with strong relevance such that they placed close to each other during the post-fraud detection periods.

V. CONCLUSIONS

In this study, we conduct a text-mining analysis on the MD&A disclosure of fraudulent firms belonging to the construction and retail industries of Japan and examine the possibility of detecting accounting fraud through the observation of differences during the pre-and post-accounting fraud detection periods.

First, we find that the length in both industries in the periods of the fraud execution is shorter than that of firms during the post-fraud detection periods. This indicates that the fraudulent firms might try to confuse users of financial statements in order to hide fraud during the period of involving fraud.

Second, the differences in co-occurrence networks and correspondence analysis results are observed in both the industries for the pre-and post-fraud detection periods in the text-mining analysis. As a result, managers are unable to provide logical explanations to cover up the fraud, resulting in incoherent sentences. We conclude that there is a possibility of detecting fraud because MD&A information gets logically broken in language during fraud execution periods.

This study analyzes MD&A information for the pre-and post-fraud detection periods in two industries in Japan. Future scope of this study may involve increase in the number of industries to be analyzed, and improvement in the robustness of the results of the text-mining analysis on the fraudulent firms. In addition, we should compare the results of a text-mining analysis on fraudulent firms with the results of non-fraudulent firms as a paired sample.

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