

17<sup>th</sup> International Conference in Knowledge Based and Intelligent Information and  
Engineering Systems - KES2013

## Towards the Profitability Trend Extraction from the Board Meeting Proceedings

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### Abstract

This paper provides the board meeting proceedings analysis with text mining. Corporate management is executed based upon the decision made by the board meeting in general. However, the research which considered the contents of proceedings left behind the minutes of the company, and the relation of corporate profit with text mining is not enough so far. Therefore, we make an intensive research for the board meeting proceedings analysis with text mining to capture the change of the board meeting contents. As a result, the shift in the proceedings contents from short-term, store-based measures to long-term, corporate based planning coincides with the improvement of corporate performance.

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Selection and peer-review under responsibility of KES International

*Keywords:* Board Meeting, Proceedings, Corporate Performance, Corporate Management, Text Mining, Service Science and Management Engineering

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### 1. Introduction

Every company has some meetings for the decision-making of the management. Meetings in the company have been made in a variety of positions such as the board of directors and the middle management so on. Especially, the decision-making matter in the board of directors which are the top legislative bodies in a company is the most important in order to lead the company. It is one of the important elements for the corporate management to deal with change of the environment which surrounds a company sharply. Therefore, it is required to see the transitions in the proceedings due to changes in the business environment of the company. The decision-making matter in a company is recorded on the minutes, and is transmitted into the company. In relation to the knowledge extraction from text information, the bankruptcy prediction was made with the annual reports. On the other hand, the research on the performance uptrend prediction from text information is unexplored so far. In this paper, we make use of the board meeting proceedings to capture the relation of the business environment change and the contexts of the proceedings with text mining. Especially, we focus on the contents transitions of the proceedings from the relations of the corporate performance and the transitions of the member of the board meeting.

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The rest of the paper is organized as follows: Section 2 discusses the backgrounds of the research and related work; Section 3 briefly summarize the gathered data on the target company; Section 4 describes analytics of the data and presents analytical results; and Section 5 gives some concluding remarks and future works.

## 2. Backgrounds and related work

In this chapter, we describe the related work. As for the research concerning to the evaluations from the customer with the text mining method was performed. Mikawa et al. indicated that the structure of customer loyalty changed with the users' gender or the characteristics of items from interviews and free answer documents in the questionnaire [1]. Sugiura et al. analyzed the free answer from the routine dentistry checkup questionnaire and found out that the discontinuation of consultation had not arisen almost in the clients who described in the comment such as relief or comfortable [2]. Kasubuchi et al. analyzed the contents of message card gathered at the university co-op and figure out that the improvement requests in polite wording were easy to be realized [3]. Tsujii et al. analyzed the comment of hotel reviews and proposed the method of extracting the significant information for the potential stay customer [4]. As for the research concerning to the prediction for corporate performances with the text mining method was also performed. Izumi et al. proposed the method of predicting the interests of Japanese government bond and the Nikkei Average from the descriptive content of the monthly report of recent economic trend issued by the Bank of Japan [5]. Shirata et al. extracted the characteristic words frequently appeared from the annual security report each of the bankruptcy corporation and the others [6]. Hirasawa made the bankruptcy prediction with the cue words [7]. Kida analyzed the financial report of Asahi Breweries and figure out that the corporate performance could be improved if the types of noun that describes increased and the change of description content was likely to appear at the time of the bad performance [8]. Peramunetilleke et al. described how money market news headlines can be used to forecast intraday currency exchange rate movements with text mining [9], respectively. As for the knowledge extraction from the news articles, Web logs, and the reports, Feng et al. captured the incidental information from news [10]. Sakai et al. made knowledge extraction of the business performances [11], [12], [13]. Taniguchi et al. also made knowledge extraction of the economic trends [14], and Sakaji made knowledge extraction of the bias expression that indicates the economic trend and the sentences including the causal relations [15], [16]. Sakai et al. discovered the latent solutions from expressions of dissatisfaction in web logs [17]. Antweiler made knowledge extraction of information content made from the financial messages on Yahoo [18], Inui made the sentiment analysis [19], Tsuji extracted stagnation symptoms from by the project progress reports [20], Fujioka made summarization of the minutes assembly [21], and Koppel et al. distinguished the good news from the bad news with Support Vector Machine (SVM) [22], respectively. As for the centrality of the communication, Yasuda et al. analyzed with the email log of the consulting company and acquired the following knowledge [23];

1. A high performer uses a positive term abundantly compared with a non-high performer.
2. A high performer has many partners connected with reliance and cooperative relations compared with a non-high performer.
3. Section achievements increase under the management with much transmission of the mail in connection with a maintenance on the staff.

As for the previous works examined the minutes with text mining method, Masuda analyzed the minutes of Takasaki city, Japanese local government with the visualization of the centrality topics [24]. However, the research which considered the contents of proceedings left behind to the minutes of the company and the relation of corporate profit with text mining method was not examined enough so far. From the intensive research of previous work of the knowledge extraction from text information, this paper focuses the relationship between the corporate performance and the context of the board meeting proceedings.

## 3. Data Summary

In this chapter, the board meeting proceedings is used gathered from a company which operates retail stores in the western part of Japan to extract the target objectives. The outline of the target company is shown in Table 1. A

Table 1. Outline of the Target Company as of June 2012

Founded	1903
Paid in Capital	40 mil. yen
Number of Directors	4
Number of Employees	45
Annual Turn over	1,560 mil. yen
Number of Shops	22

Table 2. Board Meeting Member of Each Period

Term Name	Board Meeting Member
Term of four members	president, two managing directors, outside auditor
Term of the transition	increased into nine member gradually with above original member
Term of nine members	president, two managing directors, manager, two supervisors, chiefs, outside auditors, external advisers

decision-making meeting called management council is held by making the president into the chairperson almost every week in this company.

The board meeting in this company is classified with the board meeting members at three time as it is shown in Table 3. Member of the board meeting was originally composed of four persons as follows; president, two managing directors, and outside auditor as first period called term of four members. Then, member of the board meeting was increased gradually from February 2, 2012. We call this term as term of the transition. Finally, the board meeting was composed in total of nine persons; president, two managing directors, manager, two supervisors, chiefs, outside auditors, external advisers from May 24, 2012. We call this term as term of nine members. Table 4 also indicates the term and length of days, respectively.

In this paper, we make use of the board meeting proceedings total of 43 times held from October, 2011 to January 2013 as a data set with khcoder as text mining tool [25]. Table 4 indicates the outline of the data set. There are 76,498 characters in all the proceedings and 51,020 words are extracted among them. Summary of the proceedings at each period is as follows; 10 meetings were held at term of four members, and the total number of extraction words in the proceedings is 9,283 words. 12 meetings were held at term of the transition and the total number of extraction words of the proceedings is 11,579 words. 21 meetings were held at term of nine members, and the total number of extraction words of the proceedings is 30,157 words, respectively. In addition, with the result of morphological analysis, some wrong word segmentations are extracted such as 生産/性, 粗/利率, 人件/費, 従業員, therefore, we make some correction manually with business practice. Table 5 indicate the data structure for the analysis. we put three tags of <h1>, <h2>, and <h3> respectively with the text data and divide the data by class to make layer for analysis. As for the <h1>tag, the <h2>tag, and the <h3>tag correspond to the term, the date of the meeting and the title of the board meeting, respectively.

#### 4. Data Analysis

At first, we count the term frequency of each period. Table 6 indicates the table of the term frequency in top 20 words for each period. Table 7 also indicates the summary of the term frequency, respectively. and then, both Principal Component Analysis and Correspondence Analysis are conducted to figure out the relation of the

Table 3. Terms of Each Period

Name of the Term	Duration	Period
Term of four members	2011/10/6-2012/1/26	112 days
Term of the transition	2012/2/2-2012/5/10	98 days
Term of nine members	2012/5/24-2013/1/10	231 days

Table 4. Outline of Proceedings Data

Number of the board meetings	43
Number of the total characters	76,498 words
Number of the extracted words	51,020 words

Table 5. Data Layers

<h1> 4 人期<h1>
<h2>20111006<h2>
<h3> 1 . A 店オープン関連 <h3>
新業態の A 店の出だしは苦戦しているが、時間と競争せずに、じっくりと改善に着手すること。

extracted word and the term. We exclude from the analysis part of speech including frequent words that have no analytical meaning such as 「する」, 「ある」, 「ない」. and make the analytical configurations for the extraction word are narrowed down as follows;

1. Only 84 words which appear 30 times or more in the whole data were used for analysis.
2. Change of the frequency of appearance for every time was calculated with the value the Khai square, and only 60 words were displayed on the output result at large order.

Fig 1 indicates the result of the corresponding analysis. from the figure, 「弁当」, 「店長」, 「店」, 「実施」, 「対応」, 「対策」, 「分析」 means "Lunch", "Store Manager", "Store", "Enforcement", "Correspondence", "Measure", and "Analysis" are frequently appeared in the term of four members. On the other hand, at the term of nine members, there are frequently appeared such as 「情報」, 「システム」, 「計画」, 「開発」, 「粗利率」, 「強み」 means "Information", "System", "Plan", "Development", "Ratio of Gross Income", and "Strong Point." From the result of the plot analysis of the extraction word for each term, the member who participates in a meeting follows on increasing, and it is imagined from the measure against a store unit that the contents of proceedings changed to the contents in connection with the management of the whole company.

Fig 2 and Fig 3 indicate the coincidence network graph of each frequent appearance word at the term of four members and the term of nine members term, respectively. In this analysis, we count the frequency of co-occurrence in a sentence separated by punctuation, word frequent in each period, is by drawing a line between words a lot of co-occurrence count. Furthermore, The fact that the words are border less close to each other simply, it does not mean that there is a strong co-occurrence relation between these words. It should be noted that it is important to ensure that it is connected by a line. I show that the co-occurrence frequency, the higher the line frequency of the word the higher the larger circle, has signed a word and the word thick. The color of the circle shows each word or plays a central role in how the network structure. Centrality is higher in the order of light blue, white and pink. As in the correspondence analysis indicate in Figure 1, we exclude from the analysis part of speech containing the 「する」, 「ある」, 「ない」 in "Do", "Yes" and "No", frequent words that have no meaning analytically. I go refine co-occurrence relationship extraction and language setting as follows;

1. Only 10 times or more frequency of occurrence is used in term of four members (37 words).
2. Only 20 times or more frequency of occurrence is used in term of nine members (72 words).
3. The number of the co-occurrence relation to draw was limited to 60 order with a high Jaccard coefficient in Fig 2 and Fig 3 to draw .

It turns out that the words which have taken the lead in co-occurrence relation from Fig 2 at the term of four members are 「実施」, 「店長」 in "Enforcement" and "Store manager." Some examples of these words are analyzed. At first, 「実施」 in "Enforcement" is analyzed. In the proceedings on October 6, 2011, titled "Reinforcement of Store B", "Store B is reinforced based on the president visit report. However, since it is not necessary to hurry, it prepares with careful plan and carries out on a large scale like store C renewals. Since D block manager is busy with store H's operation for several month, he carries out under E managing director initiative. "An improvement store priority is enforcement in the turn of store G, store H, store I, store J, and store K" is described on October 13, 2011 and "It is pointing to the prior plan about the measure against store F, so that it can carry out early in November" on October 20, 2011.

Table 6. Frequency Matrix of Period and Words

	Total		four members		Transition		nine members	
	term	Frequency	term	Frequency	term	Frequency	term	Frequency
1	商品	218	商品	52	月	47	商品	134
2	月	161	月	39	管理	43	月	75
3	管理	130	店長	31	商品	32	管理	69
4	惣菜	120	惣菜	26	経営	25	惣菜	69
5	社長	112	実施	22	社員	25	社長	67
6	データ	102	データ	21	社長	25	データ	65
7	店舗	95	社長	20	惣菜	25	経営	60
8	店長	93	分析	20	店長	25	販売	59
9	経営	91	管理	18	店舗	25	店舗	53
10	販売	80	常務	18	利益	22	計画	52
11	計画	78	店舗	17	木	21	システム	49
12	検討	78	本部	17	目標	21	開発	45
13	システム	74	検討	16	部長	19	検討	44
14	必要	74	販売	15	検討	18	必要	44
15	実施	68	対応	14	必要	18	売上	41
16	売上	67	ブロック	13	計画	17	活用	39
17	開発	60	売上	13	実施	17	店長	37
18	社員	59	課題	12	分析	17	アイテム	36
19	常務	59	会議	12	役員	17	情報	36
20	本部	59	活用	12	データ	16	決算	35

Table 7. Summarized Frequency Matrix of Period and Words

Words in Japanese	商品	惣菜	社長	データ	店舗
Words in English	Item	Side Dish	President	Data	Store
Term of four members	52	26	20	21	17
Term of the transition	32	25	25	16	25
Term of nine members	134	69	67	65	53

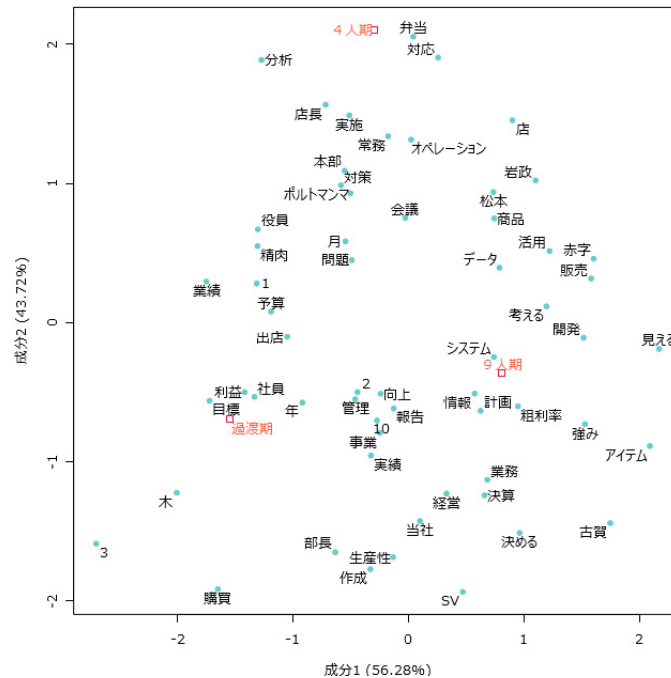


Fig. 1. Correspondence Analysis

Next, the example of 「店長」 in "Store Manager" is analyzed. There is a proceeding titled of "Side Dish Department Store Manager Issue" on October 6, 2011. "Mr. M will be sounded about store L in November, and if useless, Mr. O under store N training is transferred. If Mr. M receives a store manager, it will argue as that Mr. O transfers to store P manager", and "the direction which will fully promote Mr. Q to the store manager of S or T store after training in store R in the future", mentioning a personal name about store manager personnel affairs. In the proceedings on October 27, 2011, "Store U, current condition, Organization reinforcement is completed and management is possible focusing on part timer V. Since store manager is required in the mid-term, Mr. M of former store W manager is requested to be appointed.", "Store X, No operational problem, promote the current condition for the time being. Store manager is required to make more sales in the mid-term.", "While carrying out the store manager education of Mr. O from N store, a full delicatessen store, he will be appointed to be a Z store manager in the future with supporting store Z operation." are described. From the above description, many measures against a performance improvement of a store unit and arguments about store manager personnel affairs are made at the term of four members.

Fig 3 indicates the relation of the co-occurrence at the term of nine members. From the figure, 「経営」 in "Management" is in the center in the graph. Moreover, the co-occurrence relations which are not appeared in the term of four members, such as 「販売－製造－計画－経営」, 「データ－活用－情報－システム－開発－商品」, 「教育－店長－マニュアル－作成」, 「生産性－向上」 in "sales - manufacture - plan - management", "data - practical use - information - system - development - items", "education - store manager - manual - production", and "productivity - improvement", are shown. It turns out that it is argued about the management strategies which affect the whole company, such as management plans, information system, product development, manual preparation for store manager education, and productivity drive.

Next, the example of 「経営」 in "Management" is analyzed. In proceedings titled "Message from the president" on August 16, 2012, "Midterm management plan; Supposed to start making business plan conjunction with A Tax Accountant firm and B Small and Medium Enterprise Management Consultant. besides, proceed to obtain the approval of the management innovation from the government." This indicates start formulation of the management plan cooperate with the external specialists In proceeding on September 20, 2012, titled "Message from the

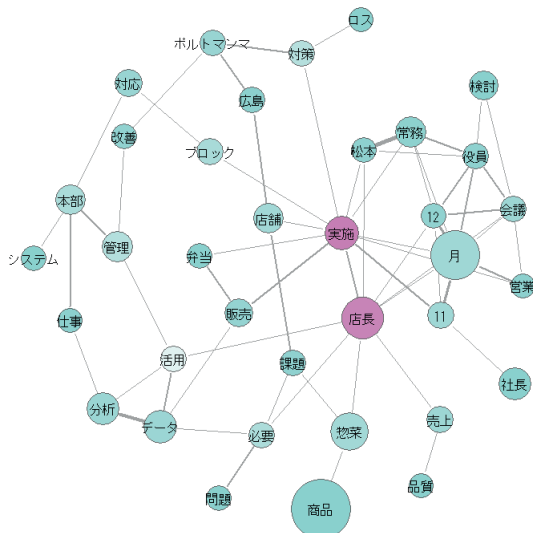


Fig. 2. Collocation Network Graph in four members

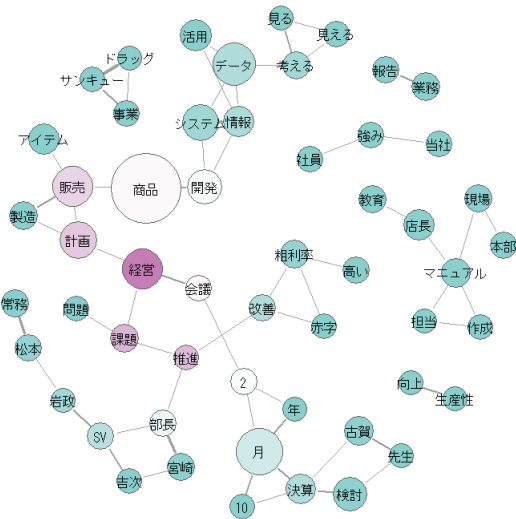


Fig. 3. Collocation Network Graph in nine members

Table 8. Profit Margin on Sales

Name	Profit Margin on Sales
Term of four members	-1.1%
Term of the transition	-1.1%
Term of nine members	0.6%

president” , There are some descriptions with following issues; “Value Chain (Michael Porter) ,Support Service, Infrastructure (Management Plan, Finance, Information System), Personnel Management, Product Development (technology Development), Supply, Main Activity, Purchase Distribution, Manufacture, Shipment, and Marketing Service” and president is introducing the theory of Michael Porter’s Value Chain to the meeting members [26]. There is description on September 20, 2012 about “Systematization of Product Development function” Strengthening of product development is an important issue for the management to support operational field. This means product development become management issue. Moreover, there is description on January 10, 2013 about “Scientific management based on data is advocated” this means the president announces and focuses on data oriented management. From the above description, It turns out that the reference to the subject about the management of the whole company is increasing at the term of nine members. In summary, the results of analysis based on the word co-occurrence with the board meeting proceedings contents, we figure out that the contexts of the broad meetings are changed the store unit measure or the store manager personnel affairs into the examinations of the management plans that affect the whole company from the term of four members to the term of nine members.

Table 8 indicates the transitions of the profit margin on sales for each term. As for the profit margin on sales from October, 2011 to January, 2012 corresponding to four members term is -1.1%. And the profit margin on sales from February, 2012 to May, 2012 corresponding to the transition term is also -1.1%. From June, 2012 to December, 2013 corresponding to nine members term indicates 0.6% of the profit margin on sales corresponding to nine members term. A possibility that changes of the contents of proceedings are influenced improvement in achievements can be considered.

## 5. Concluding Remarks

This paper presented investigating for analyzing the characteristics from the broad meeting proceedings from a corporation which aims to understand the characteristics of the centrality of the context with the correspondence analysis and the coincidence network diagrams. The results of analysis based on the word co-occurrence with the



board meeting proceedings contents, we figure out that the contexts of the board meetings are changed the store unit measure or the store manager personnel affairs into the examinations of the management plans that affect the whole company from the term of four members to the term of nine members. Furthermore, a possibility that changes of the contents of proceedings are influenced improvement in achievements can be considered.

Our future work includes; 1) Identify causal relationships between changes in the content and improvement of corporate performance from the analysis of the proceedings. 2) Prediction of speakers that affect the corporate performances. These works will require algorithm investigations and pay attention to hear the views of not only the board members but the rank-and-file employees for prediction and our further survey studies.

We wish to express our great gratitude of the cooperation from the retail company to our analysis.

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