A Text Mining Approach to Studying Matsushita's Management Thought

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Abstract— **The development of technology in text data collection and handling and the increasing use of textual knowledge applications caused a boost in text mining research of various fields like sociology, business science, and so on. In recent years, the research approach has also been applicable to the field of management philosophy and management principle. In this study, with the use of text mining approach, we analyze text data in Collected Sayings of Konosuke Matsushita, which involves more than 100 lectures and remarks delivered by Konosuke Matsushita, a distinguished and influential business executive in Japan, between 1940 and 1987. The text data were compiled and edited by PHP Research Institute, Inc. In this paper, we categorized these lectures and remarks into two groups: lectures delivered for external business people and remarks delivered for employees of the Matsushita Electric Group (Later known as Panasonic Corporation). By doing so, the study aims to condense the content of lectures and remarks delivered by Konosuke Matsushita over the past few decades, to determine the recognizable patterns of the keywords spoken on these lectures or remarks, and to understand the possible characteristics and changes in his management thought as indicated by the text data. This study is an interdisciplinary research attempt between the field of management philosophy research and the field of text mining, textual knowledge applications, and knowledge discovery. It systematically integrates elements of science, such as statistical mathematics and the ability to analyze text data, and humanities, such as management thought, perceptiveness to understand concepts, and ability to comprehend. The establishment of scientific and objective methodologies in the field of management philosophy has facilitated the effective utilization of text data and information.**

Keywords—Konosuke Matsushita; management thought; management philosophy; text mining

I. INTRODUCTION

Recent years have seen various efforts to identify the fundamentals of business management. This has directed attention to studies on management philosophy and management thought of business executives not only in Japan, but also from more global perspectives. The number of researchers and business managers interested in this study field is also increasing.

The field of management philosophy research involves various qualitative and subjective factors, such as comprehension, reasoning, and explanation. There has not been much quantitative and objective analysis on management thought and philosophy done in the past owing to the difficulty in analyzing a large amount of accumulated text data. Meanwhile, in today's era of a knowledge-based society of the new century, the progress of information digitization has facilitated the utilization of vast amounts of text data.

The technique of analyzing text data with various quantitative methods, mining the patterns from natural language rather than from structured database of facts, and discovering new and useful knowledge and information from textual document repositories is called text mining. It is a process that employs a set of algorithms for converting unstructured text data into structured data conveying the insightful information [1]. On the basis of the idea this study aim to discover useful information related to management philosophy or management thought hidden in textual records of some famous business executives.

Post World War II, Japan has experienced periods of reconstruction, high economic growth, stable growth, and the bubble economy, followed by the collapse of the bubble economy. In addition, the twenty-first century is said to be the era for creating a mechanism for the establishment of a sustainable society. In such an era, corporations are under pressure to demonstrate sustainability. It seems necessary to consider and analyze management thought backed by the experience of distinguished Japanese entrepreneurs and executives, as well as the impact of such thought in order to clarify best practices and attitudes that can be adopted by the next generation of executives and applied to their activities in the future.

The text data in Collected Sayings of Konosuke Matsushita between 1940 and 1987 are the object of this study. Konosuke Matsushita (1894–1989) was one of the most famous Japanese industrialists. He is the founder of Panasonic Corporation, a Japanese multinational electronics corporation, and a global leader in the development and manufacture of consumer, professional and industrial electronics. Since his name has never been prominently displayed, Konosuke Matsushita is not as well known as Henry Ford or Honda or any of the other business giants who used their names on their products. But his company generated more revenue during his lifetime than any of the others. For many Japanese, he is known as "the God of Management". His business books have sold more than 18 million copies in Japan alone. Konosuke Matsushita's management philosophy is widely adopted among Japanese enterprises and laid the foundation of economic growth in Japan.

The organization of this study is as follows. In the next section, we describe the research method and approach of our study for analyzing Konosuke Matsushita's management thought. The third section brings in the discussion and consideration about the results of our analysis. Finally, the fourth section closes with a midterm summary and an outlook for the next step.

II. RESEARCH METHOD AND APPROACH

Text data are data with no numeric values. In the past, such data were often analyzed using a method in which the analyst quoted parts of data and added interpretation and insights. In contrast, text mining approach involves a quantitative analysis of the text data through a numerical conversion process, which includes text preprocessing, feature generation and selection, pattern extraction, and result analyzing [2].

The main purpose of performing a quantitative text analysis is twofold: to explore the data and to improve objectivity. For instance, one can read the content of presentations and remarks in order to grasp the overall impression of the message, but how can this impression be objectively conveyed to a third party? What if the sheer amount of text data poses a difficulty? Furthermore, how can one examine possible changes in lecture content that are influenced by a variety of factors, including different years, different durations of lectures, and different audiences? By taking advantage of the quantitative analysis of text mining, you can deal with these issues.

There are three very important components in actually utilizing text mining: the first is extraction of information, the second is analysis of the extracted information, and the third is visualization of the results. In other words, three points must be considered: the first is how do you collect only the necessary information by minimizing the noise? The second is what analytic technique do you use in order to correctly examine and understand the information collected? The third is what visualization do you use in order to facilitate examination and understanding of the analysis results?

In order to accomplish the research objective of scientifically and objectively analyzing the overall management thought of Konosuke Matsushita and examining the characteristics and their changes over different time periods, this study goes through the procedure in the following key steps: data preparation, data analysis, and result discussion.

- Data preparation. A research platform is constructed. More specifically, records of lectures delivered by Konosuke Matsushita to external business managers as well as his talks within the Matsushita Electric Group between 1940 and 1987 were used to compile a database [3]. Besides, the text data were categorized into two groups: 52 lectures delivered for external business people between 1953 and 1983 and 54 talks or remarks delivered for employees of the Matsushita Electric Group between 1940 and 1987. With the help of KH Coder, which is a text mining software package for quantitative content

analysis or text mining [4], a library of relevant keywords was created from the database.

- Data analysis. On the basis of the research platform, a variety of analyses are performed from both an overall view of the keywords and the perspective of characteristic keywords.
- Result discussion. The discussion and consideration about the results are summarized, furthermore, scope for further research is also considered.

III. DATA ANALYSIS AND DISCUSSION

Analysis of the text data can be carried out from various angles. In this section we make some analysis mainly from both an overall view of the keywords (such as frequently-appearing-keyword analysis, network analysis, etc.) and the perspective of characteristic keywords (such as trend analysis of characteristic keywords, analysis of related keywords, etc.).

A. An Overall View of the Keywords

1) Morphological analysis and frequently-appearing keywords: Text mining is an approach that assigns numeric values to text data for analysis. It does not refer to a specific analytic method or process flow. Therefore, there are various types of analytic methods, such as extraction of frequently-appearing keywords from the text data, categorization of observed data, and analysis of the emerging tendency of specific keywords in the text data, and so on. These are all based on morphological analysis. A morpheme is the smallest semantically meaningful unit of language; breaking it down further will make the unit meaningless. By using morphological analysis, we can divide a sentence into morphemes and obtain basic statistics as to what type of words, or more accurately, morphemes, are being used.

In this study, we first conducted morphological analysis on all lectures and remarks selected for the study, and performed noise reduction (eliminating irrelevant and less frequently appearing words). We then extracted the most frequently appearing keywords; summarized aspects such as the number of involved lectures that means the number of lectures and remarks in which those keywords appeared, and the total appearance frequency of the keywords. We also conducted analyses such as comparison between the lectures for external business managers and the remarks within the Matsushita Electric Group as well.

The differences and similarities were summarized as follows. Firstly, the results show that there is relativity between the total appearance frequency of the keywords and the number of involved lectures. In addition, frequently appearing keywords were diverse, including "management", "politics", "region", "business", "labor and employment", and so on. However, it is observed that the characteristic keywords used by Konosuke Matsushita do not appear frequently. Meanwhile, the results of the frequently appearing keywords indicate that external lectures are largely based on macro perspectives, while internal remarks are often based on micro perspectives such as employees, staff, and individuals.

2) Trend analysis of keyword groups by year: The extracted keywords were categorized into several different categories, such as "business", "manufacturing", "religion", "moral and value", "management", and "labor and employment". Then the trends and changes in each keyword category by year were summarized separately for internal remarks and external lectures.

The results show that the appearance frequencies of keywords falling under the categories of "business", "manufacturing", "moral and value", and "management" are not a function of year and time period, while the appearance frequencies of keywords falling under the "religion" and "labor and employment" categories varied depending on the time period. The trends and changes in the "religion" and "labor and employment" categories are considered to be related to Konosuke Matsushita's religious background and the history of the labor movement in Japan.

3) Analysis of co-occurrence networks for keywords in different time periods: Co-occurrence relations of keywords can be described by a network graph, where the lines link the keywords with a high degree of co-occurrence together. In addition, co-occurrence relations between the keywords and time periods can be connected as well. In other words, it is possible to examine how much attention is being paid to an extracted keyword in different time periods and how these keywords are linked each other.

On the basis of the next two different perspectives, the perspective of the career of Konosuke Matsushita and the perspective of the economic fluctuation in Japan, the lectures and remarks that were delivered over a period of more than 40 years were divided into the different time periods for analysis as follows:

- The perspective of the career of Konosuke Matsushita. First, the 1940s to the 1950s, when Konosuke Matsushita was the President of Panasonic Corporation. Second, the 1960s to the early 1970s, when he was the Chairman of Panasonic Corporation. Third, the late 1970s to the 1980s, when he was the executive adviser of Panasonic Corporation.
- The perspective of the economic fluctuation in Japan. Economic fluctuation includes the period marking an increase in the activities of economic society (expansion) and the period marking the stagnation of the economic society (recession). Because economic fluctuation occurs as repeated cycles over several years alternating expansion and recession, it is also called the economic cycle. First, the economic boom of the mid-1950s. Second, the Inventory recession of 1957-1958. Third, the economic boom of 1958-1961. Fourth, the recession of 1961-1962. Fifth, the economic boom of 1962-1964 created by the Tokyo Olympic Games. Sixth, the Securities depression of 1964-1965. Seventh, the economic boom of 1965-1973. Last, the recession of 1973-1986.

The analysis results indicated that although there were some common words across time periods, Konosuke Matsushita focused on different keyword groups during the lectures and remarks in different time periods. In particular, the text mining analysis made it clear that the economic fluctuation in Japan strongly influenced changes in the keywords used.

B. The Perspective of Characteristic Keywords

1) Trend analysis of characteristic keywords by year: The popularity of Konosuke Matsushita's management philosophy stems from his practical thoughts and ideas on real-life management practices, assuming a form of aphorism in his lectures and writing. In this section, we mainly focus on the following characteristic keywords of Konosuke Matsushita's management philosophy [5] and verify in detail the change in usage of these keywords in internal remarks and external lectures.

- Management through collective wisdom. A management approach that takes advantage of collective wisdom obtained from as many employees and persons as possible.
- Coexistence and mutual prosperity.
- The right person in the right place.
- Appropriate management. Accurately understanding the company's comprehensive abilities, such as technical capabilities, financial strength, and management skills, and striving to manage the business realistically within one's own capability.
- Autonomous responsible management.

The time periods when the characteristic keyword attracted attention and the relevant background information are analyzed and made into a line graph.

2) Analysis of related keywords: Some specific topic-related keywords (i.e., related keywords of some intriguing topics) are the focus in this section. This relation is determined on basis of calculating conditional probability, that is to say, the keywords that are highly likely to appear in lecture texts involving a specific topic are so-called the topic-related keywords. For example, the results showed that in the case of the analysis of keywords related to the topic "business manager", the "business manager"-related keywords turned out to be "productivity", "industry", "business world", "business people", "social conditions", "employees", "labor union", "politician", and so on. Examining such results from various perspectives based on concept of business manager, roles of business manager in economic society, etc., it became clear that for Konosuke Matsushita, important matters strongly associated with business managers, or leaders in business, are pluralistic and multilayered, including factors such as industry, production, economy, society, employees, politics, etc..

In addition to creating a list of keywords highly associated with a particular topic, the analysis of topic-related keywords can help draw a co-occurrence network diagram of a specific topic. Such a diagram places the specific topic selected for discussion in a double-border square and links the topic-related keywords with lines.

Furthermore, in order to better illustrate the characteristics, we can use a thicker line to indicate a stronger co-occurrence relationship, or place keywords that appear more often in larger circles, and so on.

IV. SUMMARY AND FUTURE DIRECTION

This study aims to show that text mining is a new and effective research approach to the field of management philosophy and management principle. The present results confirmed that the keywords in Konosuke Matsushita's lectures or remarks changed over the course of time and also depending on the person he was talking about. By analyzing the accumulated text data using text mining, some existing interpretation can be verified in a more objective manner.

For the next step, there are a lot of open problems and research directions for further developing this study. First, we plan to focus on adding discussions about other keyword categories and notable characteristic keywords. Moreover, we hope to concentrate on some factors such as the depth of keywords, inter-area analysis, etc. as well. In the future, we will attempt to make analysis from the macro-level and global perspectives. In addition, we are going to work on a comparative study of Konosuke Matsushita's management philosophy and management philosophy of other influential business leaders, such as Kazuo Inamori, who ranks alongside Sony's co-founder, and Soichiro Honda as one of the great Japanese postwar entrepreneurs.

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