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BRIEF REPORT

Suggestions for new organizational-level item pools for the national Stress Check Program from management philosophy and mission statement: A qualitative study using unsupervised learning

Kazuhiro Watanabe[1] | **Akiomi Inoue[2]** | **Hisashi Eguchi[3]** | **Noboru Iwata[4]** | **Yuko Odagiri[5]** | **Akizumi Tsutsumi[1]**

[1]Department of Public Health, Kitasato University School of Medicine, Sagamihara, Japan

[2]Institutional Research Center, University of Occupational and Environmental Health, Japan, Kitakyushu, Japan

[3]Department of Mental Health, Institute of Industrial Ecological Sciences, University of Occupational and Environmental Health, Japan, Kitakyushu, Japan

[4]Department of Nursing, Faculty of Healthcare, Kiryu University, Midori, Japan

[5]Department of Preventive Medicine and Public Health, Tokyo Medical University, Tokyo, Japan

Correspondence
Kazuhiro Watanabe, Department of Public Health, Kitasato University School of Medicine, Sagamihara, Japan.
Email: kzwatan@kitasato-u.ac.jp

Abstract

Objective: This study aimed to obtain suggestions for new organizational-level item pools that companies could utilize to accomplish management philosophy and mission statements in the context of survey and work environment improvements for the national Stress Check Program.

Methods: A qualitative study was conducted using unsupervised learning. A large amount of text data related to management philosophy and mission statements were collected, that is, management messages described on the websites of all companies listed on the Tokyo Stock Exchange. For the main analysis, topic modeling was performed on the nouns from the management messages using Latent Dirichlet Allocation (LDA) to build a model consisting of 10 latent topics, each represented by a group of the 10 most frequently reoccurring nouns. Each group of nouns was qualitatively summarized based on the topic model.

Results: In total, 22 524 nouns were extracted from the management messages of 3575 companies. A topic model consisting of 10 latent topics was constructed using the LDA. The suggestion for new item pools included new technologies, business plans/strategies, company shareholders, health/happiness/wealth, profits/sales, development of society, a sustainable society, safety and security, customer/consumer satisfaction, corporate social responsibility, fairness, transparency, and human rights.

Conclusion: The suggestions for potential item pools were derived from management philosophy and mission statement that are not covered in the existing survey. The suggestions could be useful for motivating employers to implement work environment improvement. Future studies need to make definite items and investigate whether they correlate to job stressors and mental health among workers.

1 | INTRODUCTION

Under the current Stress Check Program in Japan, workplaces with ≥50 employees are encouraged to analyze the data from the program's survey by workgroup and implement work environment improvements based on data analysis. Work environment improvement is a primary approach to the goal of the Stress Check Program to prevent ill mental health. The effectiveness of work environment improvements has been proven to improve psychological distress and work performance among workers.[1,2]

However, many workplaces have not yet been able to improve their work environments. One reason is that the questionnaire used for the Stress Check survey cannot capture the diversity of factors potentially included in work environments. A number of workplaces have tried measuring organizational factors using the New Brief Job Stress Questionnaire,[3] which coveres job stressors (e.g., quantitative job overload), task-, workgroup-, and organizational-level resources (e.g., job control, supervisor support, procedural justice). However, additional item pools are needed to reflect diverse workplace issues. If potential item pools reflect the factors related to the work environment that motivate employers to understand the importance of work environment improvement were available in the survey, the feasibility of work environment improvement could be improved.

Management philosophy and mission statement are interesting for employers, and potentially included in survey items for work environment improvement. They are defined as the central, distinctive, and enduring concepts, beliefs, principles, and attitudes guiding business management, which are critical in the pursuit of an organizational mission.[4] In Japan, various management philosophies and mission statements were observed such as customer orientation, partner orientation, global orientation, entrepreneurship, honesty, and sales effort.[5] Interestingly, previous studies have reported that several types of management philosophy and mission statement were associated with work engagement and performance through adaptation of, identification with, and sensemaking of management philosophy and mission statement.[6-8] High levels of work engagement and performance are associated with positive mental state and well-being.[8] Thus, item pools that enable us to measure management philosophy and mission statement could motivate employers to implement work environment improvement, and could be useful for improving workers' mental health.

The objective of this study was to obtain suggestions for new organizational-level item pools that companies could utilize to management philosophy and mission statements in the context of survey and work environment improvements of the national Stress Check Program, by a qualitative study using a technique of machine learning (unsupervised learning).

2 | METHODS

2.1 | Study design and data collection

This qualitative study used unsupervised learning. To identify suggestions for the item pools, a large amount of text data related to management philosophy and mission statements was collected. Text data were collected from management messages described on the websites of each of the companies listed in the First, Second, and Mothers sections of the Tokyo Stock Exchange (TSE), and in the Standard and Growth Sections of the Japan Association of Securities Dealers Automatic Quotations (JASDAQ) as of August 8, 2019. Specifically, the data for the analysis consisted of either the "message from top management" posted on the company's home page or the complete text of the page corresponding to the company's management philosophy and mission statement. The Tokyo Stock Exchange Listed Company Information Service[9] was used to search for information on the listed companies. Management messages as management philosophy and mission statements were collected from the websites of 3575 companies

listed on the TSE and JASDAQ. This included 2124 TSE 1st Section, 469 2nd Section and 292 Mothers Section companies, and 657 JASDAQ Standard Section and 33 Growth Section companies. The companies were categorized into 11 industry types based on the Japan Standard Industrial Classification: agriculture, forestry, and fisheries (11); mining (5); construction (157); manufacturing (1431); electricity/gas (24); information and communication (436); transport (111); wholesale/retail trade (661); finance/insurance (166); real estate (130); and service industries (443). Extraction of the text from the company web pages was outsourced to Tokyo Soteria Employment, from August 8 to December 12, 2019.[10] Ethical approval was not obtained because this study did not involve humans, but the text data.

2.2 | Analysis

First, a morphological analysis was conducted to divide the management messages into morphemes. Second, among the morphemes, only the top 1000 nouns used in at least 30% of management philosophy and mission statements were used in the main analysis. For the main analysis, topic modeling using LDA, an unsupervised machine-learning technique, was conducted. LDA can indicate latent topics represented by a series of words that appear frequently in a set of sentences.[11] When a sentence is given, LDA can also calculate the posterior probabilities for what topic a given sentence was about, using Bayesian estimation. In this study, the number of extracted latent topics was set to 10, which is a hyperparameter that should be tuned in LDA. Janome version v0.3,[12] for the morphological analysis, and Scikit-learn version 0.21.3[13] for morphological analysis and topic modeling was used, respectively. The extracted 10 topics were qualitatively summarized to make presumed company goals and suggestions for new organizational-level item pools.

3 | RESULTS

From the management messages of 3575 companies, a total of 22 524 nouns were extracted. Among the nouns, the top 1000 words that were used in at least 30% of the management philosophy and mission statements were used in topic modeling. Table 1 shows the word series of the ten latent topics, presumed company goals, and suggestions for new item pools.

The top 10 reoccurring words for latent Topic 1 included *katsuyō* (utilization), *kadai* (issue), *kaiketsu* (resolution), *kanō* (potential), *ryōiki* (domain), *bunya* (field), and *gyōkai* (industry). The management messages

included in the topic referred to the goals of utilizing new technologies as they became available, and to analyze and resolve current issues in the company's industry.

The words related to latent topic 2 included *nengetsu* (years and months), *chūki* (medium-term), *senryaku* (strategy), *kiban* (fundamentals), *kyōka* (strengthening), *kakudai* (expansion), *taisei* (system), and *kabunushi* (shareholder). The management messages included in the topic refer to business plans, medium- and long-term strategies, and gratitude to company shareholders.

The words related to latent topic 3 included *hitobito* (people), *jibun* (oneself), *shiawase* (happiness), *kandō* (excitement), and *sonzai* (presence). Management messages included in the topic refer to the pursuit of happiness, making people's lives wealthier, and finding meaning in their lives.

The words related to latent topic 4 included *rieki* (profit), *uriage* (sales), *tōshi* (investment), *keizai* (economy), and *eigyō* (operations). The management messages included in the topic referred to the profits and sales of the company, and contributed to the development of society through economic activities.

The words related to latent topic 5 included *chikyū* (earth), *jizoku* (sustainability), *kanō* (potential), *enerugī* (energy), *anzen* (safety), *kihon* (fundament), *sutēku* (stake), and *horudā* (holder). The management messages included in the topic referred to trying to preserve the global environment and its resources, contributing to a sustainable society, making people feel safe and secure, and winning the trust of stakeholders.

The words related to latent topic 6 included *kokyaku* (customer), *manzoku* (satisfaction), and *doryoku* (effort). The management messages included in the topic referred to the importance of business customer satisfaction and the constant effort required to develop the company.

The words related to latent Topic 7 included "*okyaku*" "*sama*" (together these are the honorary form of 'customer', *minasama* (an honorary form of 'everyone'), *kenkō* (health), *iyakuhin* (drugs), *kanja* (patient), and *chiryō* (treatment). The management messages included in the topic referred to consumer satisfaction, contributing to society through the treatment of disease, and the promotion of better health maintenance.

The words related to latent topic 8 included *kenshō* (charter), *mondai* (problem), *tettei* (thorough), *sekinin* (responsibility), and *kōsei* (fairness). The management messages included in the topic referred to corporate social responsibility, quickly resolving problems when the company violates the charter, and the importance of fair competition in company management practices.

The words related to latent topic 9 included *mēkā* (manufacturer), *mono* (goods), and *seisan* (production). The management messages included in the topic referred

TABLE 1 Latent topic, presumed company goals, and suggestions for new item pools

No	10 most frequently occurring nouns for each latent topic (word count)	Presumed company goals	Suggestions for new item pools
1	utilization (1141), issue (1509), resolution (1025), potential (1562), domain (998), field (1810), industry (1430), variety (1024), necessity (1479), human resources (991)	- Utilization of new technologies - Resolution of domain- or industry-related issues	- The organization utilizes new technologies - Resolving issues faced by the industry is a priority for the organization
2	years and months (1482), strengthening (1538), expansion (1765), corporation (1179), fundamentals (1180), system (1133), shareholder (1705), strategy (966), medium-term (825), promotion (1404)	- Medium and long-term company growth - Stability of business operations & earnings - Maximization of shareholder value	- Medium and long-term growth are a priority for the organization - Stability of operations is a priority for the organization - Shareholder value is a priority for the organization (organizational level)
3	people (1731), that (1533), importance (1471), work (1184), many (1335), oneself (737), happiness (722), excitement (705), all (1262), presence (1259)	- People being happy and having meaningful lives	- People's happiness is a priority for the organization - People having meaningful lives is a priority for the organization
4	profit (1434), fiscal year (859), sales (598), investment (1111), housing (459), economy (1202), business operations (840), years and months (1482), consolidation (327), store (715)	- Maximize sales and profits - Maximize the company's contribution to the economy	- Company profits are a priority for the organization - Contributing to society through economic activity is a priority for the organization (organizational level)
5	earth (1213), sustainability (1316), safety (2216), fundament (1686), energy (681), holder (1101), stake (1094), potential (1562), policy (1194), making (2171)	- Preservation of the global environment and its resources - Contributing to a sustainable society - People's safety and security - Stakeholder trust	- Trying to preserve the global environment and its resources is a priority for the organization - Contributing to the sustainability of society is a priority for the organization - People's safety and security are a priority for the organization - Stakeholder trust is a priority for the organization
6	production (1381), customer (1803), satisfaction (1688), logistics (527), industry (1430), field (1810), effort (1099), making (2171), necessity (1479), manufacturer (917)	- Business customer satisfaction - Constant effort	- Business customer satisfaction is a priority for the organization - Always making an effort is a priority for the organization
7	customer (2206), health (1169), everyone (851), drugs (281), patient (261), issue (1509), finance (801), treatment (186), maintenance (1316)	- Consumer satisfaction - Contributing to the health maintenance and treatment of patients with illnesses	- Consumer satisfaction is a priority for the organization - People's health is a priority for the organization
8	safety (2216), proactivity (1587), problem (896), thorough (746), charter (276), personally (989), fairness (821), construction (266), security (1264), responsibility (1294)	- Social accountability - Fair company management practices in regard to competition - How problems that have occurred with the company are addressed	- Socially accountable behavior is a priority for the organization - Fair management practices in regard to competition are a priority for the organization - The organization is able to quickly address internal problems when they occur
9	making (2171), manufacturer (917), field (1810), car (578), parts (361), expectations (1466), goods (604), production (1381), equipment (257), domestic (913)	- Contributing to society by producing new products	- Contributing to society through making things is a priority for the organization

TABLE 1 (Continued)

No	10 most frequently occurring nouns for each latent topic (word count)	Presumed company goals	Suggestions for new item pools
10	relationship (1508), compliance (911), laws (777), respect (1158), appropriateness (507), norms (604), fairness (821), employment (1205), workplace (666), disclosure (470)	- Fairness, transparency - Compliance with laws and norms - Respect for human rights	- Fairness and transparency are a priority for the organization - Compliance with laws and norms are a priority for the organization - Respect for human rights is a priority for the organization

to the goals of making society greater comfortable by producing new products.

The words related to latent topic 10 included *kōsei* (fairness) and *kaiji* (disclosure). *Junshu* (compliance), *hōrei* (laws), *kihan* (norms), and *sonchō* (respect). The management messages included in the topic referred to ensuring fairness and transparency of information within a company, fulfilling corporate responsibility to comply with laws and regulations, and respecting human rights.

In summary, the suggestion for new item pools included new technologies, business plans/strategies, company shareholders, health/happiness/wealth, profits/sales, development of society, a sustainable society, safety and security, customer/consumer satisfaction, corporate social responsibility, fairness, transparency, and human rights.

4 | DISCUSSION

The topic models developed in this study provide suggestions for new organizational-level item pools that could potentially be used in national stress check programs. Most of these factors are consistent with the previous report of management philosophies,[5] and not currently measured in existing scales.[3] The suggested factors could be included in the item pool from which companies could select items to use when implementing their stress check survey and work environment improvements. For example, the items would be useful whether the workplace emphasizes employees' happiness and meaningful lives, whether it contributes to a sustainable society, and whether workplace keeping emphasizes people's health. Some of these philosophies and missions may reflect social expectancies, while others may be universal. Not all suggestions can directly relate to employees' health and performance, however, some of them could be effective to improve work environments and workers' health through adaptation of the philosophies.[6-8] Further studies are needed to examine the relationship between the scores of potential item pools and mental health of workers.

The topic model developed from the management messages showed what the company considered important, thereby providing suggestions on what company goals may be. Therefore, in the job stress model, they may be treated as organizational stress-related factors. For example, the presumed goals of Topic 3 can be "people being happy and having meaningful lives," and suggestions for the Stress Check survey might include whether the workplace emphasizes employees' happiness and meaningful lives. The presumed goals from Topic 5 can be "preservation of the global environment and its resources," "contributing to a sustainable society," and "people's safety and security." Subsequently, suggestions might be made for organizational-level survey items to ask whether the workplace contributes to preserving the global environment and its resources, sustainable society, and people's safety. The presumed goals from Topic 7 can be "consumer satisfaction" and "contributing to society through the treatment of disease and the promotion of better health maintenance." Subsequently, suggestions may be made for organizational-level survey items to ask whether workplace keeping emphasizes people's health. Mental health and well-being would improve in the workplaces where these goals were important. Including item pool items for these topics could allow companies to assess factors related to their goals.

This study has several limitations. First, only one source (i.e., management messages) was used for the text data of the management philosophy and mission statements. However, a few goals may have been missed. In addition, the judgment of whether the sentences are considered management messages might be biased by people performing the data input from the company website. Finally, the setting of the hyperparameters for topic modeling (number of words to use and number of latent topics to identify), presumed company goals, and suggestions for potential item pools were also biased by the first author.

In conclusion, suggestions for potential item pools were derived from management philosophy and mission statement that are not covered in the existing survey. The suggestions could be useful for making items to measure the work environment that motivates employers to

implement work environment improvement. Future studies need to make definite items and investigate whether they correlate to job stressors and mental health among workers.

AUTHOR CONTRIBUTIONS
KW has contributed to the research design, analysis, and writing the draft. AI, HE, NI, YO, and AT had significant contributions to the revision of the draft and all of them approved the current manuscript.

DATA AVAILABILITY STATEMENT
Data are available upon reasonable request.

ORCID
Kazuhiro Watanabe https://orcid.org/0000-0002-3342-6142
Akiomi Inoue https://orcid.org/0000-0002-4079-0719
Yuko Odagiri https://orcid.org/0000-0002-7603-4800
Akizumi Tsutsumi https://orcid.org/0000-0003-0966-4869

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