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Analysis of Changes in Employee Sentiments Over Time Using Text Mining: A Case Study of Large-Scale Mergers and Acquisitions in the Japanese Petroleum Industry

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ABSTRACT

This study examines how Mergers and Acquisitions (M&A) affect employee sentiment in Japan's petroleum industry by comparing differences between managers and general employees. We analyzed 10,378 open-ended survey responses collected over two years (2019: 5,117 responses, 64.96% response rate; 2020: 5,261 responses, 47.18% response rate) using natural language processing and sentiment analysis to track changes in employee sentiment after integration. Findings show that managers experienced increased anxiety and stress due to information overload, whereas general employees generally maintained positive attitudes and appreciated better communication opportunities with management. Both groups shared concerns about human resource evaluation systems and organizational structures. However, the specific nature and intensity of these concerns varied by role. These results indicate that uniform information-sharing and support are insufficient for successful Post-Merger Integration (PMI). Instead, organizations need targeted approaches that consider the different roles and information-processing patterns of each employee group. This study contributes a theoretical framework that combines information processing theory with M&A organizational dynamics to explain how hierarchical positions shape emotional responses during integration. Findings offer practical recommendations for human resource managers by emphasizing the importance of regular sentiment monitoring, role-specific communication strategies, and a clear demonstration of integration benefits to improve PMI outcomes.

Mergers and Acquisitions (M&A) in Japan have shown consistent growth in recent decades. According to White Papers on Small and Medium Enterprises (Small and Medium Enterprise Agency, 2018, 2021), the number of M&A transactions increased more than elevenfold between 1985 and 2017. Significant surges occurred particularly during 2004–2006 and post-2012, reaching a historical peak in 2017. Despite temporary declines during the Lehman Shock and the COVID-19 pandemic, recent data confirm that M&A remains a vital corporate strategy in Japan. The Small and Medium Enterprise Agency (2024) identified primary policy objectives, including the prevention of management resource dispersion and employment retention, with additional strategic aims encompassing market share expansion, technology acquisition, and succession planning. M&A enable companies to achieve customer trust acquisition, technological advancement, labor cost optimization, and competitive differentiation, establishing themselves as crucial growth strategies across the manufacturing, non-manufacturing, and IT sectors.

However, M&A implementation faces significant challenges. Employee resistance is a critical issue during integration (Seo & Hill, 2005) because employees often perceive M&A as a highly stressful organizational event (Cartwright & Cooper, 1993). Successful organizational transformation requires comprehensive employee support to achieve anticipated outcomes (Bovey & Hede, 2001). Employee resistance may undermine morale, reduce engagement, and increase turnover rates, ultimately jeopardizing M&A success (Wickramasinghe & Karunaratne, 2009). Cartwright and Schoenberg (2006) attribute the frequent underperformance of M&A deals to employee stress, which affects motivation and productivity, emphasizing the necessity of addressing cultural integration, stress management, and leadership effectiveness.

Post-Merger Integration (PMI) critically determines M&A success by influencing the realization of anticipated synergies (Bauer & Matzler, 2014). Effective PMI requires not only operational consolidation but also the alignment of employee consciousness, emotional responses, and organizational culture. Kroon and Reif (2021) highlight the strategic role of middle managers in emotional management during the sensemaking process. Their research demonstrates how middle managers intentionally regulate emotional displays to influence subordinates, challenging the conventional M&A literature, which often considers emotions to be detrimental. This study reveals how frustration-to-optimism conversion can enhance organizational well-being and cooperation through emotional contagion, suppression, and reversal mechanisms.

The speed and depth of PMI implementation significantly affect outcomes (Bauer & Matzler, 2014). Rapid integration reduces organizational uncertainty, boosts employee morale, and accelerates the realization of synergy. However, Takahashi (2012) warns that unclear post-M&A strategies may erode corporate value through undesirable cultural transformations. Unno and Suzuki (2005) identify psychological acceptance challenges stemming from altered work philosophies and corporate loyalty. Moriguchi (2017) highlights that despite organizational awareness of these complexities, only 27% of companies report successful M&A outcomes (defined as $\geq 80\%$ target achievement).

The petroleum industry exemplifies strategic M&A utilization during structural transformations, including decarbonization and renewable energy transitions. Japan's petroleum sector has undergone significant consolidation since the 1980s deregulation,

reducing nearly 20 refiners to a handful through repeated M&A. This consolidation responds to environmental pressure, population decline, and intense competition, particularly in gasoline station optimization.

Although M&A enhance operational rationality, they impose psychological burdens on employees through workplace, compensation, and organizational changes. Bawden and Robinson (2009) identified information overload as a critical stressor during PMI that causes anxiety, depressive symptoms, and fatigue, thereby directly affecting motivation. Extant studies have predominantly focused on managerial perspectives during M&A (Cartwright & Schoenberg, 2006; Klok et al., 2022; Kroon & Reif, 2021), thus creating a gap in understanding organization-wide emotional dynamics.

Traditional methods of measuring emotion, such as surveys and interviews, have limitations, including subjective bias and cultural interpretation challenges. However, emerging techniques such as pulse surveys, voice analysis, and text mining enable the quantitative assessment of emotional trends (Higuchi, 2014). This study employs text mining to analyze employee sentiment evolution in Japan's petroleum industry M&A by comparing information processing between managers and non-managerial staff during PMI. This study identified targeted human resource strategies that address employee anxiety and expectations, ultimately contributing to successful M&A implementation.

This study addresses several important gaps in the current literature and meaningfully contributes to both theory and practice. While existing M&A studies have primarily examined financial and strategic aspects, knowledge regarding how different employee groups experience the integration process remains limited. Most studies have treated employees as a homogeneous group, missing significant differences in how managers and general employees receive information, process it, and respond emotionally to organizational changes.

This study contributes to theory by developing a novel framework that integrates information processing theory with M&A-specific organizational dynamics. This framework explains why managers and employees frequently exhibit different reactions to the same merger, not owing to personality differences, but rather because of the fundamentally different information environments and processing demands that they face during integration.

Methodologically, this study demonstrates how large-scale text mining captures longitudinal changes in employee sentiment more objectively than traditional surveys, overcoming social desirability bias while tracking emotional evolution throughout the integration process. Practically, our findings provide guidance to human resource managers by identifying the specific concerns and information needs of different employee groups, enabling the design of targeted and effective integration strategies that address role-specific challenges.

Literature Review

Employee Emotions in M&A Context

Research on M&A has evolved significantly over the past three decades across the financial, managerial, and organizational domains (Cartwright & Schoenberg, 2006). Although existing studies discuss pre-acquisition processes and PMI, challenges remain in understanding the long-term outcomes and emotional dynamics of organizational transitions.

Prouska et al. (2023) examined crisis communication patterns during M&A, revealing that top-down communication strategies significantly influence employees' solidarity behaviors. Their findings align with Wilkinson et al.'s (2020) emphasis on employee voice as a critical factor in organizational resilience during structural change. Tkalac Verčič's (2021) survey of 1,805 employees demonstrates that internal communication quality directly impacts engagement levels, particularly when supported by strong organizational branding and perceived managerial support.

Resistance to organizational change is a central theme. Oreg's (2003) Resistance to Change Scale identifies four key factors—namely, routine seeking, emotional reactivity, cognitive rigidity, and short-term focus. This aligns with Bovey and Hede's (2001) cognitive-affective model and is further substantiated by Seo and Hill's (2005) integrative framework, which demonstrates how employee anxiety and uncertainty during M&A create systematic resistance patterns, underscoring how negative evaluations of change trigger emotional distress and resistance. According to empirical evidence from Singh et al. (2012) and Wickramasinghe and Karunaratne (2009), M&A-induced uncertainties concerning career trajectories and work processes exacerbate employee anxiety. Recent studies, such as that by Makri et al. (2012), have indicated that merger integration patterns significantly influence post-merger stress levels, with hostile acquisitions precipitating particularly high anxiety among employees.

Emerging studies have challenged the conventional view of emotions as disruptive elements in M&A. Ager (2011) conducted an ethnographic case study in the software industry, revealing the complex emotional impact and behavioral consequences of post-M&A integration on employees, highlighting how emotional responses vary significantly across different integration phases and organizational contexts. Jha (2016) demonstrated that psychological safety is a crucial mediator between cultural differences and M&A performance, while Rao-Nicholson et al. (2016) found that leadership styles significantly influence employee psychological safety during cross-border acquisitions. Klok et al. (2022) emphasized emotion regulation's strategic role during PMI, particularly middle managers' ability to transform frustration into optimism through sense-making practices. This complements Kroon and Reif's (2021) emotional process model, which demonstrates how controlled emotional displays enhance post-merger collaboration. This perspective is reinforced by Stahl et al. (2004), who proposed that trust-building mechanisms effectively mitigate the negative impact of cultural differences on M&A outcomes.

Although these studies have significantly advanced our understanding of employees' emotional dynamics during M&A, several critical gaps remain that limit both theoretical development and practical implementation. These limitations span methodological, theoretical, and empirical dimensions, collectively hindering the development of comprehensive frameworks for understanding emotional dynamics in the M&A context.

Current research is replete with methodological constraints. The predominant reliance on cross-sectional research designs fundamentally constrains the understanding of temporal emotional evolution throughout the integration processes (Cartwright & Schoenberg, 2006; Klok et al., 2022). Further emphasizing this limitation, Popli et al. (2016) argued that cultural experience and firm-level factors significantly influence cross-border acquisition outcomes; however, most studies fail to capture these dynamic relationships over time. Additionally, Ahammad et al. (2016) highlight that knowledge transfer processes in cross-border acquisitions

are highly time-dependent and require longitudinal analytical approaches that current methodologies do not address adequately. Furthermore, systematic sample limitations owing to convenience sampling restrict cross-industry and cross-cultural generalizability.

Self-reporting methodologies introduce systematic response biases that are particularly problematic during high-uncertainty organizational transitions. Additionally, Western-centric empirical contexts do not adequately represent East Asian organizational dynamics and cultural communication patterns. This limitation is particularly critical considering the substantial evidence that cultural distance significantly impacts cross-border M&A outcomes (Dikova & Sahib, 2013). Reus (2012) provides important insights into consequences of culture for emotional attendance during cross-border acquisition implementation, demonstrating how cultural differences can both constrain and facilitate emotional processes depending on the cultural context and the acquirer's multicultural capabilities. Chung et al. (2014) reported that employees in East Asian contexts, characterized by Confucianism and collectivism, face unique challenges in adapting to Western management styles during M&A integration. Furthermore, Hajro (2015) revealed that sociocultural integration processes play a crucial mediating role between cultural influences and M&A performance, particularly in cross-border contexts.

Theoretical limitations are equally pronounced in existing literature. Insufficient theoretical integration exists between information processing frameworks and emotional formation models during organizational change. Moreover, limited theoretical development addresses hierarchical heterogeneity in change perception and subsequent emotional responses. Moreover, the literature has demonstrated the inadequate incorporation of industry-specific contextual factors influencing M&A emotional outcomes, while dynamic theoretical models explaining emotional evolution across distinct PMI phases are lacking.

Empirical shortcomings further constrain the field's advancement and limit the development of comprehensive theoretical frameworks. Studies that simultaneously examine multiple organizational levels within identical contextual settings are systematically underrepresented, which restricts our understanding of organization-wide emotional dynamics. Sentiment evolution's longitudinal tracking across extended integration periods remains rare in the literature, limiting insights into temporal emotional patterns. Moreover, the field exhibits an underutilization of natural language processing methodologies for objective emotional measurement, despite their potential to overcome traditional survey limitations. Recent advances in sentiment analysis and Natural Language Processing (NLP) applications (Pandey & Pandey, 2019) have demonstrated significant potential for capturing organizational culture and emotional dynamics in ways that traditional surveys cannot achieve. However, the application of these techniques to M&A contexts remains limited, despite evidence that they can provide more objective and comprehensive insights into employees' emotional responses during organizational transitions. Additionally, insufficient cross-cultural and cross-organizational replication limits theoretical generalizability, which is particularly relevant for understanding M&A dynamics in non-Western contexts.

Text Mining Applications

Text mining has emerged as a powerful tool for analyzing organizational dynamics and overcoming the limitations of traditional survey methods. La Bella et al. (2018) pioneered

social media text analysis using Twitter data to assess leadership perceptions and revealed discrepancies between self-reported and publicly perceived management styles. Their methodology enables the real-time analysis of large-scale employee sentiment data and provides insights previously obscured by self-reporting biases.

In Japanese scholarship, Ogi (2015) categorizes text mining applications into five domains: natural language processing, methodological development, lexicon construction, practical applications, and business analytics. This framework supports diverse implementations across corporate, educational, and governmental contexts and is particularly valuable for tracking longitudinal emotional changes during organizational transitions. Building on this foundation, Hosoo et al.'s (2020) pioneering study on conflict-solving tactics and culture in integrated organizations through interviews and text mining demonstrated how NLP techniques effectively analyze cultural dimensions and conflict-resolution patterns in the Japanese organizational context.

Furthermore, contemporary scholarship has witnessed significant methodological innovations in organizational text analysis, particularly in developing advanced sentiment-analysis techniques. Lindgren et al.'s (2023) study on sentiment analysis methodologies for organizational research indicated substantial advancements in sentiment analysis sophistication and identified persistent challenges in capturing temporal dynamics during organizational transitions. Benabou and Touhami's (2025) systematic literature review of AI-enabled human resource management revealed how machine learning frameworks enhance employee analytic capabilities in organizational communication, though their analytical focus remained predominantly on static organizational equilibria rather than dynamic transformation processes.

This field has also witnessed significant developments in empirical methodologies. Steigenberger's (2017) comprehensive review of M&A integration literature identified key methodological challenges and proposed solutions for future research, emphasizing the need for more sophisticated analytical approaches to capture the complexity of post-merger integration processes. Likewise, Schlindwein and Geppert (2021) developed a process model of emotional sense-making in post-merger integration, linking the cognitive and affective dimensions through innovative analytical frameworks.

These methodological advances demonstrate considerable promise but exhibit critical limitations pertinent to M&A research contexts. These limitations can be categorized into three primary dimensions that collectively constrain the field's ability to analyze emotional dynamics during organizational transition.

Current methodological approaches exhibit temporal analytical deficiencies. Contemporary AI-enabled sentiment analysis predominantly examines steady-state organizational configurations and offers insufficient methodological frameworks for analyzing the volatile organizational transition characteristics of M&A. The limited longitudinal analytical capabilities for tracking emotional evolution across integration phases constrain our understanding of the dynamic emotional processes that occur during organizational change.

Hierarchical analytical inadequacies represent another significant limitation of the existing research methodologies. Existing text-mining methodologies inadequately differentiate between organizational strata; however, role-specific sentiment analytical frameworks that capture information processing heterogeneity are lacking. Additionally, the insufficient

theoretical development of hierarchy-dependent emotional formation mechanisms limits the field's ability to understand differential emotional responses across organizational levels.

Contextual methodological limitations further constrain the applicability of current approaches to diverse organizational settings. Industry-specific sentiment formation dynamics remain methodologically underexplored, and the cross-cultural applicability of analytical sentiment instruments requires substantial refinement—particularly in the Japanese organizational context, which requires specialized analytical frameworks that accommodate cultural communication patterns and context-specific emotional expression norms.

The application of advanced machine learning techniques to corporate culture measurement has gained significant attention. Li et al. (2021) developed a comprehensive framework for measuring corporate culture using machine learning algorithms, demonstrating how textual analysis can capture cultural dimensions that traditional surveys cannot detect. Their findings reveal that culture-performance relationships are more pronounced during organizational transitions, including M&A events. Recent developments in natural language processing have enabled sophisticated sentiment analysis approaches. Chinta (2023) demonstrated how machine learning techniques can be leveraged for predictive analysis in M&A contexts, whereas Jiang (2021) showed how text mining and NLP can effectively analyze merger activity patterns. In sum, NLP methodologies offer significant potential to overcome the limitations of traditional surveys in M&A research.

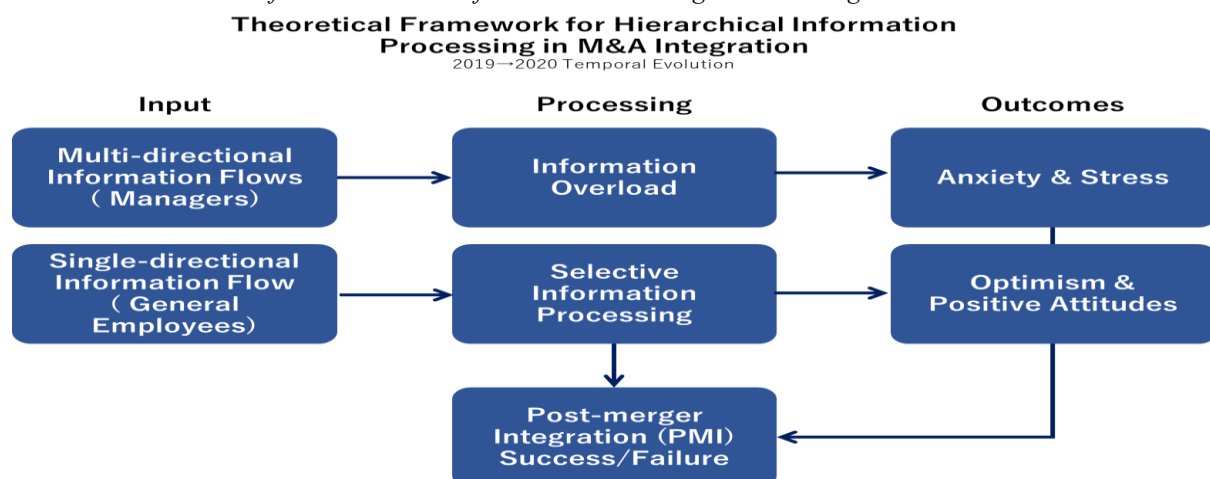
Theoretical Framework

Recent comprehensive reviews of information overload research (Arnold et al., 2023) provide a robust theoretical foundation for elucidating the hierarchical differences in information processing during M&A. Arnold et al.'s (2023) five-level framework identifies organizational hierarchy as a fundamental determinant of information processing patterns, with empirical evidence indicating that “managers primarily hold information and select necessary information to communicate with general employees.”

Building on this foundation, this study proposes an integrated theoretical framework (Figure 1) that combines information processing theory with M&A-specific organizational dynamics during post-merger integration.

Figure 1

Theoretical Framework for Hierarchical Information Processing in M&A Integration



The framework posits that a hierarchical position fundamentally determines information-processing patterns during PMI through three interconnected mechanisms. First, information input differentiation creates distinct communication pathways across different organizational levels. Managers receive multidirectional information flows from superiors, peers, and subordinates, creating high information volume and complexity. By contrast, general employees predominantly receive single-directional information from immediate supervisors, enabling selective information processing and reducing cognitive burden.

Second, processing mechanism variance emerges from these differential information flows. Multidirectional information creates cognitive overload, precipitating stress and anxiety among managers (Arnold et al., 2023; Bawden & Robinson, 2009). Conversely, single-directional information enables selective processing among general employees, thereby contributing to the maintenance of optimistic attitudes and positive integration perceptions through reduced information complexity.

Third, temporal evolution demonstrates the persistence of these patterns across the integration phases. These processing differences persisted across the integration phases (2019–2020), with emotional outcomes influencing the overall PMI success through differential engagement patterns. This framework suggests that information processing heterogeneity between hierarchical levels creates divergent emotional trajectories that significantly impact integration outcomes.

This framework addresses the theoretical gap identified in the literature by providing a dynamic model elucidating how a hierarchical position influences emotional formation during organizational change, particularly in the M&A context.

Research Hypotheses

Based on the theoretical framework integrating information processing theory (Arnold et al., 2023) with M&A-specific organizational dynamics, this study tested the following hypotheses:

Hypothesis 1. Managers experience greater anxiety and stress than general employees during PMI owing to information overload from multidirectional information flows, while general employees maintain more positive attitudes through selective information processing from single-directional channels.

Hypothesis 2. The differential emotional patterns between managers and general employees persist and intensify across PMI's temporal evolution, with managers transitioning from mixed expectations and anxiety to persistent management concerns, while general employees maintain consistent optimism, enhanced by increased dialogue opportunities.

Hypothesis 3. Managers demonstrate predominantly negative emotional responses (anxiety, stress, and organizational structure concerns) throughout the integration process, whereas general employees exhibit consistently positive emotional responses (optimism, reform appreciation, and enhanced management communication).

Hypothesis 4. Managers express unique concerns regarding organizational structure and the evaluation of management responsibilities, while general employees focus on fairness concerns and operational improvements, with both groups sharing Human Resource (HR) system anxieties but differing in their specific focus areas.

Method

Data

This study employed responses from the open-ended section of an online questionnaire administered at a company formed through a merger based on the principle of equality between the two organizations (Table 1). We analyzed 10,378 open-ended survey responses collected over two years (2019: 5,117 responses, 64.96% response rate; 2020: 5,261 responses, 47.18% response rate).

Table 1

Survey Participants

Survey Period	July 2019	July 2020
Number of Respondents	5,117	5,261
Survey Method	Online	
Survey Content	Open-ended responses	
Survey Question	Please describe your expectations and concerns for the future.	
Response Rate	64.96%	47.18%

The survey targeted all employees except executive officers and directors. Temporary staff and individuals without direct employment contracts were excluded. Due to contractual agreements with the data-providing company, the company names were anonymized as Company A and Company B.

The dataset includes information on the survey year, respondent attributes (managers or general employees), and open-ended responses. It does not include information that can identify the respondent's original company or any other personal identifiers. Additionally, references to the COVID-19 pandemic, which became widespread after the 2019 and 2020 surveys, were excluded from the analysis.

Analytical Method

The data analyzed in this study were collected during fiscal years 2019 and 2020. This period coincided with the COVID-19 pandemic, which led to significant changes in lifestyle and work styles. To extract the essential longitudinal changes in employee sentiments, terms related to the coronavirus were excluded from the analysis.

This study employed quantitative text analysis as described by Higuchi (2014). For quantitative text analysis, open-ended responses were first collected and converted into a format compatible with KH Coder. The preprocessing steps included morphological analysis for word segmentation and removal of stop words. Subsequently, the frequencies of the extracted words were aggregated to clarify the distribution of the major terms, and the co-occurrence relationships between the words were analyzed to generate co-occurrence network diagrams. These visualizations enable the identification of structural features and relationships between groups of words. Additionally, a correspondence analysis was used to visualize the distribution of words and responses in a multidimensional space to allow the interpretation of characteristic terms and response patterns. Thereafter, a comprehensive interpretation of the features and trends contained in the free-text responses was conducted based on the analytical results.

The rationale for employing quantitative text analysis is to enhance the objectivity of the data analysis. Furthermore, this approach improves the exploratory capability of qualitative data (Higuchi, 2014). By analyzing the trends and relationships of frequently appearing words in open-ended responses regarding expectations and concerns during periods of organizational transformation, such as M&A, this method enables the objective and efficient summarization of qualitative data. Consequently, it can support the timely development of organizational measures in response to various environmental changes, not limited to M&A.

The open-source software KH Coder 3 (<http://khcoder.net/>) was used to analyze the text data. This study aims to capture employee sentiments following business integration by applying text mining to open-ended responses to a questionnaire. The analysis procedure involved segregating the collected open-ended data into “managers” and “general employees” based on respondent attributes. Responses related to coronavirus were excluded from the analysis to eliminate the influence of the COVID-19 pandemic. Thereafter, the processed text data were imported into a new project in KH Coder as separate files for managers and general employees.

Morphological analysis was conducted using the built-in ChaSen tool in the KH Coder to segment the Japanese text and assign part-of-speech information. To improve analytical precision, company names (both official and abbreviated), “new company,” “former company,” and “telework” were designated as forced extraction terms for automatic extraction. In the co-occurrence network analysis, the minimum frequency threshold was set to 60 to extract target terms and generate network structures. Based on the resulting co-occurrence network diagrams, semantically related groups of words were labeled, and the areas of employee interest and emotional trends were interpreted, specifically focusing on the differences in network structures between managers and general employees, which were then compared and discussed (Table 2).

Table 2

Analytical Process

Step	Description
1	Collection of open-ended response data
2	Organization of text data - Segmentation into managers and general employees - Removal of sentences containing terms related to coronavirus (e.g., telework, corona, remote work, tools, online, TEAMS, remote, work, virus, novel)
3	Import into KH Coder - Creation of a new project - Loading analysis files (managers and general employees)
4	Morphological analysis (automatic) - Japanese language / ChaSen settings
5	Preprocessing - Selection of target words - Setting forced extraction terms such as the official and common names of Company A and Company B, “new company,” “former company,” and “telework”
6	Execution of co-occurrence network analysis - Minimum frequency set to 60
7	Interpretation of results - Interpretation of results (longitudinal changes, comparison between managers and general employees), labeling

Quantitative text analysis is a method for organizing and analyzing textual data (Higuchi, 2014). Co-occurrence networks, which visualize the relationships between words as graphs,

were primarily used in the KH Coder 3. A co-occurrence network diagram connects words with similar occurrence patterns using lines and displays both frequency and subgraph information. The frequency is represented by the size of each circle according to word occurrence, whereas the subgraphs indicate co-occurrence relationships. In this study, a co-occurrence network analysis was conducted to examine the longitudinal changes.

Results

Overview of Key Findings

Table 3 presents a comprehensive summary of employee sentiment across different roles and periods. The analysis revealed distinct patterns between managers and general employees, with managers experiencing information overload-induced stress, whereas general employees maintained consistently optimistic attitudes throughout the integration process.

Table 3

Summary of Employee Sentiments by Role and Time Period

Aspect	Managers 2019	Managers 2020	General 2019	Employees 2020
Emotional Tone	Mixed anxiety/expectations	Persistent concern	Consistent optimism	Positive progress
Primary Focus	Organizational structure	Management uncertainty	Work method changes	System fairness
Information Processing	Overload/stress	Continued overload	Selective/positive	Maintained balance
Communication	Multi-directional pressure	Information burden	Single-direction clarity	Increased dialogue
Integration Perception	Lack of tangible progress	Concrete effects focus	Desire for improvement	Operational benefits
HR System Concerns	Evaluation management	New system dissatisfaction	Fairness anxiety	Persistent concerns
Organizational Structure	Rapid establishment needs	Reduced comments	Minimal concerns	No major issues
Synergy Expectations	Pressure for early results	Management implications	Positive anticipation	Continued optimism
Work Environment	Efficiency demands	IT improvement benefits	Adaptation challenges	Reform satisfaction

The following sections provide a detailed analysis of these patterns, using co-occurrence network diagrams.

Longitudinal Changes: Overall Trends (2019-2020)

Figures 2 to 7 present the co-occurrence network diagrams generated using KH Coder 3. Figure 2 presents the results for 2019; Figure 3 for 2020; Figure 4 for managers in 2019; Figure 5 for managers in 2020; Figure 6 for general employees in 2019; and Figure 7 for general employees in 2020.

In 2019, ten subgraphs were generated (Figure 2). Subgraph 1 includes terms such as “integration,” “operations,” “expectations,” and “anxiety,” reflecting both expectations and concerns regarding the newly integrated company. Subgraph 2 includes “opportunity” and “interaction,” which are connected to “realization” and “none.” This suggests that due to the survey being conducted one month after integration, the organizations with the same functions were established by each legacy company, and opportunities for interaction were lacking, and

a sense that integration was not yet tangible remained. Subgraph 3 includes “organization” and “structure,” indicating opinions regarding a need to promptly review the organizational structure, as the pre-integration organizations were largely retained and multiple organizations with similar functions coexisted.

Subgraph 5 includes “workplace,” “environment,” and “change.” As organizations with the same functions were established by each legacy company, a certain number of comments stated that no change had occurred in the workplace or working environment. Opinions expressing expectations of changes in the workplace or company are also found in this subgraph. Subgraph 6 includes “both companies,” “good,” and “each other,” expressing the desire to leverage the strengths of both companies in the new organization.

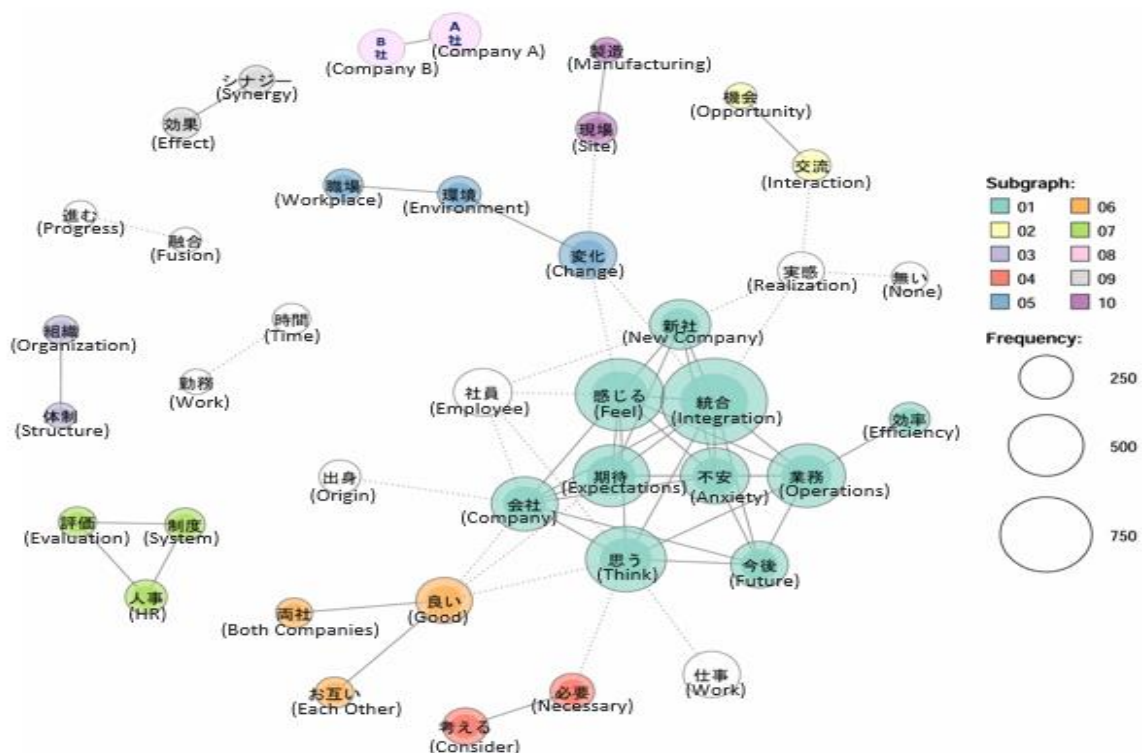
Subgraph 7 features “evaluation,” “system,” and “HR.” Immediately after integration, the HR evaluation system continued for both pre-integration companies. Consequently, evaluators were concerned about whether they could conduct appropriate evaluations, and those being evaluated were concerned about whether they would be evaluated fairly. Subgraph 9 includes “effect” and “synergy,” reflecting the determination to rapidly realize synergy effects, as well as anxiety and a sense of crisis regarding whether such synergies could actually be achieved, considering strong internal and external pressure to do so immediately after the integration.

Subgraph 10 includes “manufacturing” and “site,” which suggests that, as the manufacturing sites were not integrated immediately after the merger, comments indicated that employees at manufacturing sites did not perceive any change due to the integration.

Another subgraph included “time” and “work,” reflecting calls for improvement owing to increased working hours, which resulted from an increase in integration-related tasks in addition to regular duties and resignations attributable to the integration.

Figure 2

Fiscal Year 2019



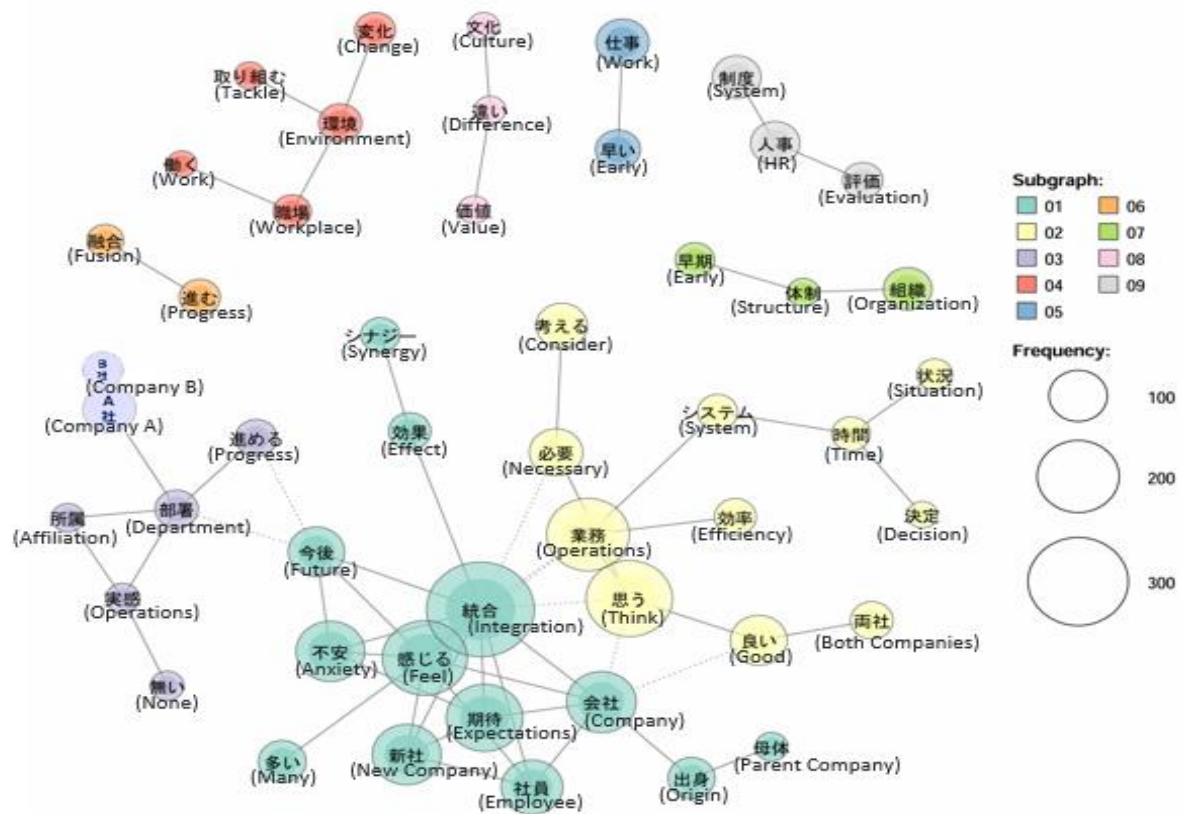
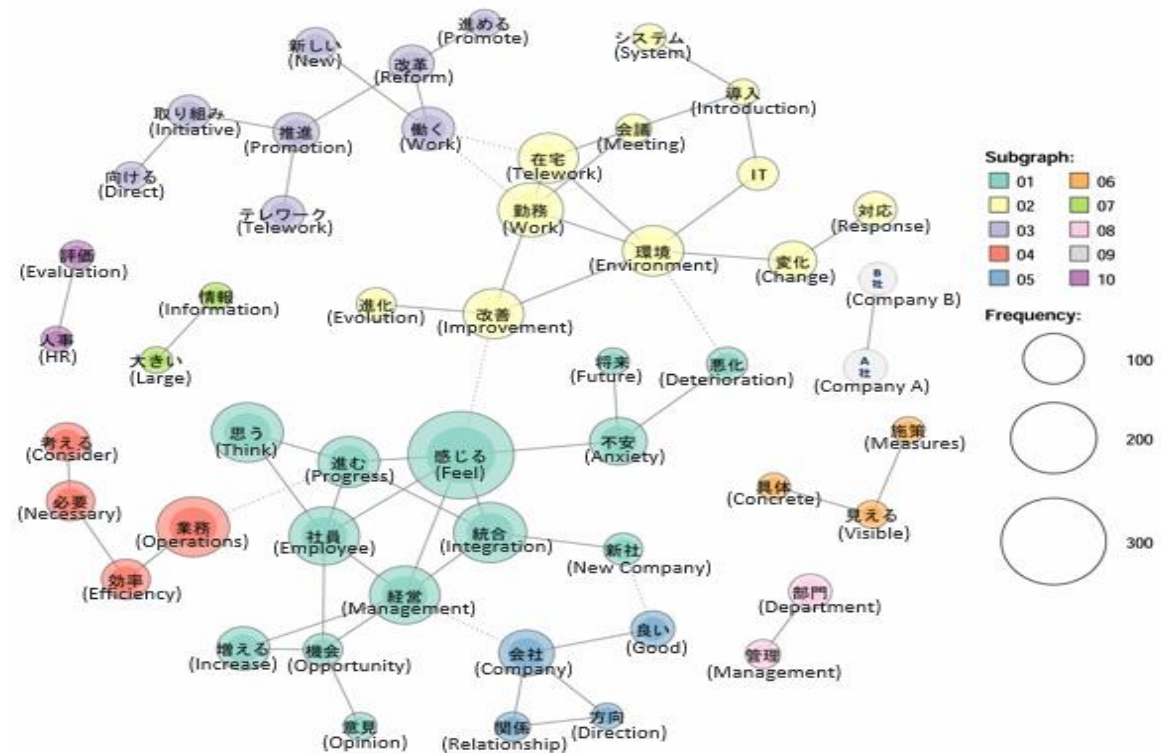
In fiscal year 2019, nine subgraphs were generated for managers (Figure 4). Subgraph 1 includes “integration,” “expectation,” “feel,” “company,” “anxiety,” “new company,” “synergy,” “effect,” “origin,” and “parent company.” This reflects both expectations and concerns regarding integration, unbiased business execution toward one’s original company, whether synergistic effects can be realized, and the perceived necessity to generate synergistic effects promptly.

Subgraph 2 includes “operations,” “necessary,” “consider,” “think,” “good,” “both companies,” “efficiency,” “system,” “time,” “situation,” and “decision,” indicating the need to leverage the strengths of both companies and consider operational efficiency and system integration. Subgraph 3 includes “realization,” “affiliation,” “department,” “promote,” “none,” “Company A,” and “Company B,” expressing that they do not yet experience a sense of integration, likely because some departments had been integrated, whereas others had not at the time of integration in 2019.

Subgraph 4 includes “work,” “workplace,” “environment,” “tackle,” and “culture,” reflecting anxiety about adapting to changes in the new workplace and working environment. Subgraph 5 includes “work” and “early,” indicating a desire for prompt optimization and integration of operations. Subgraph 6 includes “fusion” and “progress,” reflecting expectations for further integration in the future. Subgraph 7 includes “early,” “structure,” and “organization,” indicating opinions that the organizational structure should be established as soon as possible.

Subgraph 8 includes “culture,” “difference,” and “value,” indicating a renewed awareness of differences in culture and values between the two companies, immediately after integration. Finally, Subgraph 9 includes “system,” “HR,” and “evaluation.” This reflects concerns regarding HR evaluation system management, as the pre-integration of HR systems, including evaluation, continues. There was anxiety regarding appropriate evaluations as different systems were applied to supervisors and subordinates.

Furthermore, when the co-occurrence network edges were redrawn, relationships were observed between Subgraphs 1, 5, and 8, and between Subgraphs 8 and 9. Subgraphs 1, 5, and 8 suggest that optimizing and integrating operations, accepting differences in corporate culture, and promptly integrating operations are necessary to realize synergistic effects. However, expectations for newly integrated companies and anxieties regarding integrating companies with different backgrounds exist simultaneously. The relationship between Subgraphs 8 and 9 indicates concerns regarding fair evaluations, where the evaluators and those being evaluated originally belonged to different companies, each with its own culture and values.

Figure 4*Fiscal Year 2019: Managers***Figure 5***Fiscal Year 2020: Managers*

In the fiscal year 2019, 11 subgraphs were generated for general employees (Figure 6). Subgraph 1 includes “integration,” “feel,” “expectation,” “future,” “operations,” “efficiency,” and “change,” reflecting opinions that business integration led to changes in the workplace environment and an increase in integration-related tasks sometimes caused delays in daily operations, indicating a need for further operational efficiency.

Subgraph 2 includes “realization,” “none,” “interaction,” “opportunity,” “site,” “level,” and “manufacturing,” expressing a lack of tangible sense of integration immediately after the merger, particularly in manufacturing, which offered few opportunities for interaction.

Subgraph 3 features “visible,” “concrete,” and “business,” reflecting requests for a more concrete direction for business activities immediately after the integration. Subgraph 4 includes “work,” “company,” “origin,” “employee,” and “think,” indicating differences in work styles depending on the original company, and that employees were conscious of their company of origin in their daily work.

Subgraph 5 includes “necessary” and “consider,” reflecting the necessity to consider various issues, such as how to proceed with daily tasks and how to collaborate effectively with supervisors and colleagues from different original companies.

Subgraph 6 includes “both companies,” “good,” and “each other,” expressing the desire to create a better company by adopting the strengths of both legacy companies in the new integrated company.

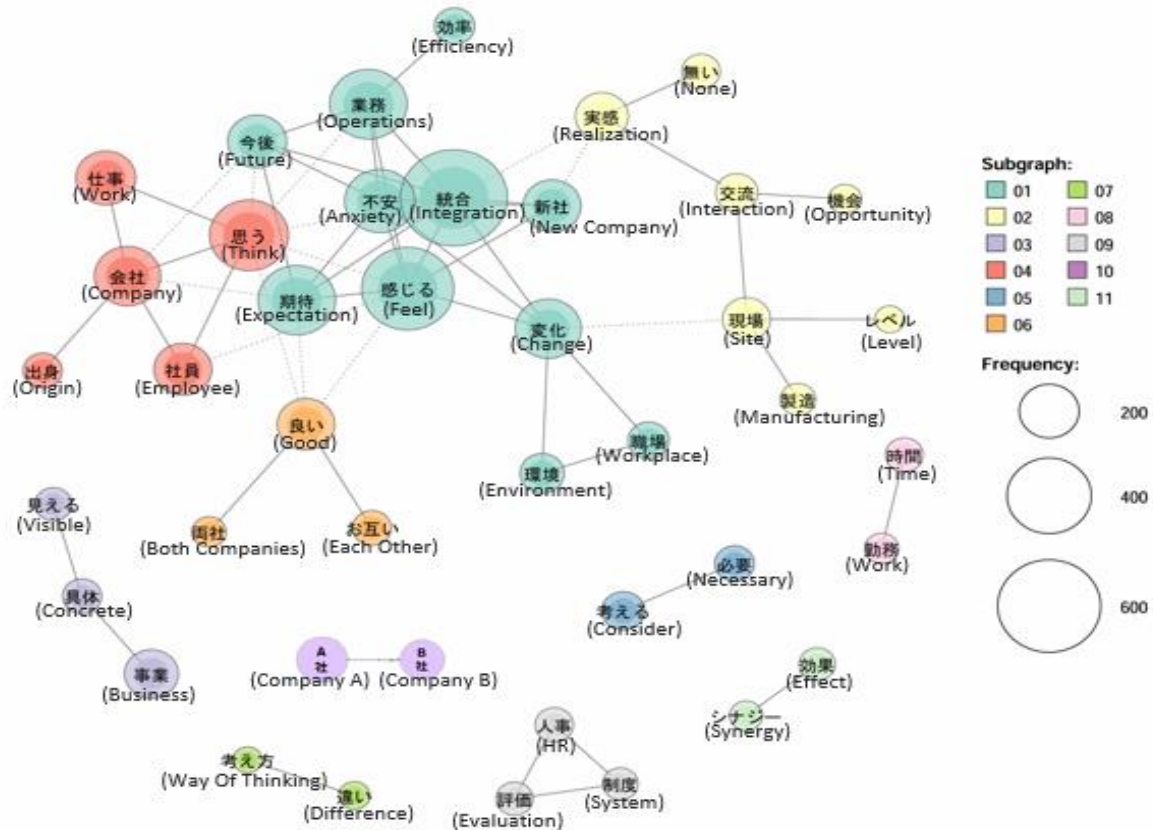
Subgraph 7 features “way of thinking” and “difference,” indicating difficulty in proceeding smoothly with daily work owing to differences in perspectives based on company of origin.

Subgraph 8 includes “time” and “work,” reflecting a need to unify and optimize working hours, as at the time of integration, multiple HR systems existed, resulting in different working hours depending on the original company.

Subgraph 9 includes “HR,” “evaluation,” and “system,” reflecting concerns regarding management of the HR system and that the differences in evaluation systems between the two companies were unfair.

Subgraph 10 features the former company names, “Company A” and “Company B.” Subgraph 11 includes “effect” and “synergy,” reflecting anxiety and pressure regarding the need to promptly realize synergy effects, owing to strong expectations both within and outside the company for early realization of such effects.

Furthermore, when the co-occurrence network edges were redrawn, relationships were observed between Subgraphs 3 and 11 and between Subgraphs 6 and 10. Subgraphs 3 and 11 indicate that concrete synergistic effects, such as those from the consolidation of business offices and refineries, are not yet visible. Subgraphs 6 and 10 reflect the expectations of creating a better integrated company by leveraging the strengths of Companies A and B.

Figure 6*Fiscal Year 2019: General Employees*

In fiscal year 2020, 11 subgraphs were generated for general employees (Figure 7). Subgraph 1 includes “feel,” “improvement,” “evolution,” “think,” “operations,” “work,” “efficiency,” “necessary,” “site,” “time,” “many,” and “people,” reflecting opinions that operational efficiency and improvements had progressed one year after the integration.

Subgraph 2 includes “workplace,” “environment,” “work,” “telework,” “meeting,” and “online,” indicating that work style reforms promoted since the integration had become more established. Subgraph 3 includes “TEAMS,” “utilization,” “IT,” “tool,” “progress,” “introduction,” and “system,” demonstrating that new systems had been introduced (advancing IT adoption) one year after the integration.

Subgraph 4 features “work,” “new,” and “reform,” further illustrating the progress of work style reforms, similar to Subgraph 2. Subgraph 5 includes “business” and “visible,” reflecting anxiety regarding the lack of clear direction for future business activities, even one year after integration.

Subgraph 6 includes “integration,” “employee,” “management,” “opportunity,” and “explanation.” This indicates that general employees, who previously had fewer interactions with management than managers, positively perceived increased opportunities for direct communication with executives owing to frequent company-wide information sharing by management during integration.

Subgraph 7 includes “digital” and “promotion,” indicating progress in digital transformation initiatives one year post-integration. Subgraph 8 features “anxiety,” “future,” and

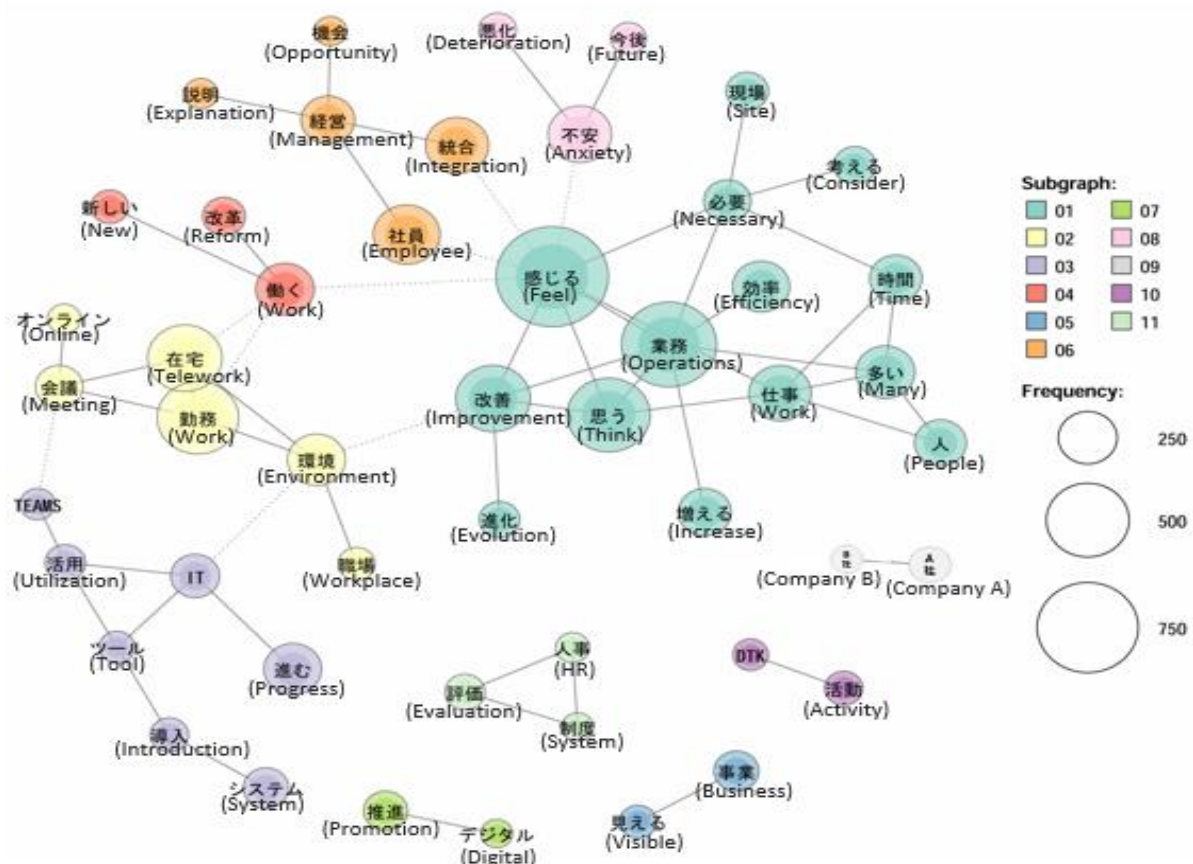
“deterioration,” reflecting concerns regarding potential management and performance declines owing to the inability to demonstrate clear synergy effects.

Subgraph 9 lists the former company names “Company A” and “Company B.” Subgraph 10 includes “DTK” and “activity,” referring to a project (PJ) activity name for promoting various optimizations in the new integrated company. Subgraph 11 contains “HR,” “evaluation,” and “system,” indicating persistent anxiety and dissatisfaction with the HR system. Although the new HR system (including evaluation) was fully introduced after one year, insufficient communication regarding its rationale and expectations, as well as inadequate employee support, remained evident.

Furthermore, when the co-occurrence network edges were redrawn, relationships were observed between Subgraphs 2 and 7 and between Subgraphs 2 and 3. Subgraphs 2 and 7 indicate that digital promotions have enabled online meetings and improved the teleworking environment. Subgraphs 2 and 3 indicate that the introduction of IT tools such as TEAMS facilitates telework-friendly conditions.

Figure 7

Fiscal Year 2020: General Employees



Discussion

This study examined the impact of business integration in the petroleum industry on employee sentiment by conducting a quantitative text analysis of open-ended responses from employee surveys using the text mining software KH Coder 3. Higuchi (2014) stated that quantitative

text analysis is a method for organizing and analyzing textual data to facilitate content analysis. This study employed quantitative text analysis because it enhances the discovery of new qualitative aspects of data and improves exploratory capacity (Higuchi, 2014). Additionally, this study is expected to increase the objectivity of analysis. Furthermore, a co-occurrence network analysis was conducted to extract meanings from the relationships between the extracted words, which enabled us to understand the trends among the respondents. Fiscal years 2019 and 2020 were compared, followed by a comparison between managers and general employees within the same year.

Comparing the overall results from fiscal years 2019 and 2020, many opinions were related to “work environment,” “business integration,” “HR system,” and “organizational structure.” In fiscal year 2019, comments regarding the work environment reflected that increased integration-related tasks led to busier schedules and longer working hours owing to attrition following integration. However, by fiscal year 2020, more comments indicated that the work environment had improved as a result of new work-style reforms, one of the new companies’ initiatives, and the introduction of new IT systems. Examining business integration one month after integration, many respondents expressed a lack of a tangible sense of integration, as well as expectations and anxieties. However, after one year, in the results for fiscal year 2020, concerns shifted from integration to the specific effects or changes that integration could bring. Regarding the HR system, at the time of integration, the systems from the pre-integration companies were continued, and a new HR system was introduced during the following year. Consequently, regarding the evaluation system, the evaluators and those being evaluated often belonged to different original companies, meaning that supervisors (managers) and subordinates (general employees) were evaluated based on different criteria. Consequently, the evaluators were concerned about whether they could properly evaluate their subordinates, and those evaluated were concerned about being assessed by evaluators who did not fully understand the evaluation criteria. These anxieties about evaluation were not resolved even after the introduction of the new HR system, and similar reactions were observed by both evaluators and those being evaluated in the fiscal year 2020, as in the previous year. Finally, at the time of integration in 2019, the organizational structures of the pre-integration companies were largely maintained. This approach was intended to help maintain the motivation of organizational leaders and reduce employment anxiety. However, it resulted in multiple organizations with overlapping functions. Consequently, employees requested clarification of their organizational functions and roles. After one year and a review of the organizational structure, such comments disappeared in fiscal year 2020.

Next, an analysis comparing managers and general employees reveals different perceptions and reactions. Examining managers, many comments were related to the work environment, business integration, HR systems, organizational structures, and “management.” Regarding the work environment, in fiscal year 2019, immediately after integration, managers were extremely busy with integration-related tasks and strongly desired early optimization and efficiency improvements. Although the desire for efficiency remained in fiscal year 2020, the effects of work-style reforms led to a notable decrease in such comments compared to the previous year. Regarding business integration, in fiscal year 2019, many managers expressed a lack of a tangible sense of integration, as well as expectations and anxieties; however, by fiscal year 2020, such comments disappeared and shifted to remarks about the concrete effects of

integration. Regarding the HR system, in fiscal year 2019, the HR systems from the original organizations continued; however, a new system was introduced in 2020. Despite multiple explanations and training sessions for evaluators, many managers continued to express unalleviated anxiety. Regarding organizational structure, at the time of integration in fiscal year 2019, pre-integration organizations were largely maintained, leading to many comments calling for the rapid establishment of a new organizational structure. However, after the new structure was implemented in fiscal year 2020, such comments almost disappeared. Finally, several comments regarding management focused on creating synergistic effects. This was a major objective of the integration and was strongly recognized by both managers and general employees, as internal and external stakeholders demanded the early realization of synergy. However, many concerns have been expressed regarding the future of management owing to the lack of a clear business strategy, increased integration-related costs, and the adoption of favorable conditions by both companies in the new HR system, which has led to a significant increase in expenses.

Examining general employees, many comments were related to “work environment,” “business integration,” “HR system,” and “management.” Regarding the work environment, in fiscal year 2019, immediately after the integration, there was confusion owing to differences in work styles and approaches between the two companies. However, by fiscal year 2020, not only did such confusion disappear, but many comments also indicated improvements due to the progress of work-style reforms and the introduction of new IT systems. Regarding business integration, in fiscal year 2019, many general employees expressed a lack of a tangible sense of integration immediately after the merger. However, many expressed wanting to adopt the best aspects of both companies and create a better company. This positive attitude continued into fiscal year 2020. Moreover, general employees positively viewed the increased opportunities to interact with management as a result of integration. Regarding the HR system, similar to managers, general employees expressed anxiety about being evaluated by evaluators from different companies and using the new evaluation system. Finally, both managers and general employees expressed a strong desire for the early realization of synergistic effects. However, for general employees, increased interaction with management contributes to positive attitudes, a characteristic that has not been identified in earlier studies.

Thus, these findings indicate that both managers and general employees share anxieties regarding the HR system, a desire for the early realization of synergistic effects, and expectations of concrete outcomes from business integration. Regarding the work environment, managers focused more on efficiency and optimization, whereas general employees demonstrated stronger anxiety about the possibility of changes in work methods owing to integration. Regarding business integration, managers’ attitudes shifted from a combination of expectations and anxieties to more positive views over the course of one year. General employees expressed fewer negative opinions and responded positively in the first year, wanting to improve their new companies. General employees were particularly positive about the increase in opportunities to interact with management. Finally, regarding organizational structure, only managers raised such issues, whereas general employees made almost no comments about organizational structure. These differences are likely owing to the positions and roles of managers and general employees. The results of the separate analysis of managers and general employees indicate that although both groups shared anxieties regarding the HR

system and the creation of synergy effects, there were differences in specific content and perspectives. Regarding the work environment, managers strongly desired efficiency and optimization, whereas general employees were more anxious about changes in work methods. Managers shifted from a combination of expectations and anxieties to more positive attitudes towards business integration, whereas general employees were more positive from the outset. Furthermore, only managers commented on the organizational structure, whereas almost no such comments were made by general employees.

These empirical findings supported this study's four hypotheses. Hypothesis 1, which predicted that managers would experience greater anxiety and stress owing to information overload, while general employees would maintain more positive attitudes, is strongly supported. This is evident from the observed patterns of managerial concerns regarding organizational structure, evaluation management, and efficiency optimization, in contrast to general employees' consistent optimism concerning integration outcomes. Hypothesis 2, which pertained to the persistence and intensification of differential emotional patterns across time, is supported by the temporal analysis demonstrating managers' progression from mixed expectations and anxieties to persistent management concerns and general employees' consistent optimism, enhanced by increased dialogue opportunities. Hypothesis 3, which predicted predominantly negative emotional responses from managers and positive responses from general employees, is supported by the clear distinction observed between managerial stress and anxiety and general employee optimism and appreciation for reforms. Finally, Hypothesis 4, which pertained to different focus areas between hierarchical levels, is supported by managers' unique concerns regarding organizational structure and their evaluation of management responsibilities, whereas general employees focus on fairness concerns and operational improvements, with both groups sharing HR system anxieties but differing in their specific focus areas.

The comprehensive validation of these hypotheses demonstrates that the theoretical framework integrating information processing theory with M&A-specific organizational dynamics effectively explains the differential emotional patterns observed between hierarchical levels during post-merger integration. These findings deepen the understanding of how information processing capabilities and organizational roles influence employee emotional responses during major organizational transitions.

Conclusion

This study indicates that the cognitive gap between managers and general employees encompasses issues that transcend simple differences in organizational roles. Differences in information transmission routes (managers receiving information from multiple directions; general employees receiving information from a single direction) influence the emotional formation process and contribute to PMI research.

This survey revealed that general employees have a more positive perception of business integration than managers. Immediately after integration, managers expressed almost no positive opinions, whereas many general employees expressed a desire to learn more about and improve the newly integrated companies. Furthermore, even one year after integration, general employees maintained positive perceptions of integration. However, some managers expressed expectations immediately after integration, whereas others expressed concerns. Bawden and

Robinson (2009) highlighted that information overload can have negative effects such as stress, information anxiety, depressive symptoms, fatigue, and other aspects of psychological well-being. Before integration, information was generally controlled, and only some executives and employees involved in integration-related tasks had access to it. After integration, managers primarily hold and select the necessary information to communicate with general employees. Consequently, managers' anxiety can be attributed to information overload, leading them to perceive matters negatively. Additionally, only managers expressed opinions regarding the organizational structure immediately after integration. As this integration was horizontal and organizations with overlapping functions merged, concerns about the new organizational structure arose, particularly among managers. Although various measures have been implemented over the years following integration, limited effects have been observed.

Although the importance of information sharing and communication after business integration has been highlighted in many previous studies, the results of this study suggest that it does not necessarily lead directly to increased employee motivation or engagement. In particular, it became clear that information overload among managers can cause anxiety and stress, potentially having a negative impact. This indicates the importance and necessity of appropriately selecting and effectively transmitting information rather than simply increasing the amount of information shared. Furthermore, the observed differences in perceptions of business integration between general employees and managers suggest the need for information provision and support tailored to hierarchical levels and roles. This highlights the limitations of conventional uniform communication strategies and suggests the need for new approaches to PMI.

Additionally, the results suggest the following: (1) considering differences in information-processing mechanisms by organizational role (managers and general employees); (2) understanding cognitive bias by organizational role; and (3) understanding emotional changes through long-term monitoring. Based on these points, an approach tailored to organizational roles can provide practical implications for management issues beyond simply measuring the effectiveness of various measures.

Therefore, in future PMI, developing measures for the entire organization, as well as those targeting managers and general employees separately, is considered effective. First, organization-wide measures: (1) regularly survey employee sentiment and awareness and continuously monitor changes and, based on the results, flexibly and promptly implement various HR measures; and (2) visualize specific synergy effects and share them with all employees (e.g., by introducing employee sentiment monitoring systems). Second, managers should (1) provide training on appropriate information organization and transmission methods, (2) build support systems to alleviate anxiety about organizational changes, and (3) continuously provide explanations and training to promote understanding of the new HR system (e.g., training in information organization). Third, general employees (1) provide continuous opportunities for dialogue with management to promote information sharing, (2) visualize the strengths of both companies and the good practices of each department, and (3) implement explanations and individual follow-ups to alleviate anxiety about the new HR system (e.g., providing continuous opportunities for dialogue). In particular, "training on appropriate information organization and transmission methods" for managers is an important measure to reduce the negative effects of information overload and achieve effective

information transmission. Furthermore, the development of measures at the hierarchical level aims not only to increase the quantity of information shared but also to build a qualitative communication strategy that considers the needs and psychological impacts of each level, thereby contributing to a more effective PMI.

This study collected data one year and three months after business integration. During this period, employees' perceptions of integration changed significantly. Ideally, data should be collected and analyzed over a longer period. It is important to continue the cycle of regularly confirming employee sentiment and perceptions of M&A and developing various measures accordingly. This will help implement optimal measures for the entire organization, which in turn will help create an integrated company where employees find their work meaningful and ultimately contribute to the success of the M&A.

Declarations

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