variables and their attributes implies an underlying metric. Efforts to find such a metric have not been successful, which has led to the neglect of Guttman scaling. There are two levels on which the promised metric can be sought. First, on the basis of observing responses to a set of binarily coded items ordered by their degree of difficulty, it is possible to find statistical evidence of an underlying metric, or unidimensional latent concept. The coefficient of reproducibility - the proportion of the items that can be predicted on the bases of scale type and assumption of a perfect scale - is considered a reliability coefficient, but can be artificially high as a maximum likelihood estimator also predicts effective if the exterior scale types have a high relative frequency. An alternative statistic, the coefficient of determination (T) is presented, along with an optimum item design, which has a (residual) variance explained interpretation. Second, the scale type (the number of endorsed items) is a poor measure of the latent concept, and nonscale patterns are difficult to convert into scores. A simple solution to this problem is presented, a base conversion. It is proposed that with the proposed measurement methodology a metric can be directly extracted from the binary item-subject matrix. The scale metric is compared to an alternative measure based on on analysis of an empirical dataset.

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CULTURAL DIFFERENCES IN ORGANIZATIONAL COMMUNICATION: A SEMANTIC NETWORK ANALYSIS[1]

by

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Résumé. Différences culturelles dans la communication organisationnelle - une analyse de réseau sémantique. Ce papier examine l'influence de la culture nationale sur la culture organisationnelle en analysant des messages produits pour le public. L'équivalence structurelle des entreprises japonaises et américaines côtées en bourse aux Etats-Unis a été étudiée par l'analyse de réseau sémantique. 35 de 500 entreprises citées par *Fortune* sont jumelées par secteur. Les textes du rapport annuel de leur PDG ont été analysés pour repérer les mots les plus fréquents. Ensuite, la fréquences de ces mots pour chaque entreprise est déterminée. Une matrice entreprise X mots est créée et multipliée par sa transposition, donnant ainsi une matrice 35 X 35 basée sur la cooccurrence des mots. L'analyse a discerné deux groupes: un comprenant les entreprises japonaises et l'autres les américaines. Les japonaises étaient fortement regroupées par rapport au groupe américain faiblement centré. Les entreprises américaines communiquaient des informations sur les finances et la structure de l'entreprise pendant que les entreprises japonaises décrivaient des opérations organisationnelles. Une analyse discriminante montre que les deux groupes pouvaient être parfaitement distingués par leurs textes. Le secteur d'activité des entreprises n'étaient pas du tout reflété dans les messages, seulement leur culture nationale y trouvait place. **Culture nationale, Culture organisationnelle, Japon, U.S.A., Analyse de réseau sémantique, Cooccurrence de mots.**

Abstract. This paper examines the impact of national culture on organizational culture by analyzing messages directed to external audiences. The structural equivalence of Japanese and American corporations with stock offerings in the United States was examined through semantic network analysis. 35 Fortune 500 companies were matched by their businesses. The full texts of the chief operating officers' letters from the annual reports for 1992 were analyzed by first determining the most frequently used words in all 35 letters. Then, the frequency of each word for each company was determined. A companies by word matrix was created, which was pre-multiplied by its transpose creating a 35 X 35 companies sociomatrix based on the coocurrence of the words. The analysis revealed two distinct groups, one composed of the Japanese companies and another made up of the American. The Japanese clustered very tightly, while the American was fairly loose. The American companies discussed financial information and the structure of organization, while the Japanese describe organizational operations. A discriminant analysis revealed that the two groups could be perfectly differentiated by the texts. The companies' business were not reflected in the messages, only their national culture. **National Culture, Organizational Culture, Japan, U.S.A., Semantic Network Analysis, Coocurrence of Words.**

Despite the rapid convergence and globalization of the corporate world, many people have pointed out that the well-run corporations of the world have distinctive styles or cultures. Organizational cultures are responsible for their ability to create, implement, and maintain leadership positions in today's changing environment. The remarkable success of Japanese companies has made American companies examine the importance of the unique culture shared by Japanese management and employees as an important determinant of success. Researchers who have examined the definable characteristics of successful companies list certain aspects of culture, such as the strength and pervasiveness of core values among organization members which are common to Japanese companies (Gorman, 1987; Smith & Kleiner, 1987).

Every organization shares the characteristics of its national culture because it exists within that socio-cultural environment (Chikudate, Barnett, & McFarland, 1990). National culture affects not only the functions and structures of organizations but also makes a difference in the way members give meanings to these features (Stohl, 1993). Even if an organization is doing business in a foreign country, its own national culture still impacts organizational life. The cultural differences among nations are communicated in every organizational activity such as decision-making, bargaining and public relations. These differences help to create an organization's unique culture.

The purpose of this study is to examine the impact of national culture on organizational culture by analyzing messages directed to external audiences. While culture has been examined by qualitative and interpretive approaches, this study discusses a more precise and objective method for examining elements of organizational culture. This will be illustrated by the application of semantic network analysis to a specific organizational communication activity, the president's letter contained in the annual report. The text of president's letters from 35 American and Japanese companies operating in the U.S were content analyzed to describe the relationships among companies and their messages. This was used to determine whether cultural differences exist between Japanese and American companies operating in the same environment.

ORGANIZATIONAL CULTURE AND PRESIDENT'S LETTER

Schein (1985) described organizational culture as the total of the collective assumptions or shared learning that a group has invented, discovered or developed in coping with problems of

external adaptation and internal integration. This definition involves important aspects of organizational culture. Culture comprises a history of developing solutions to internal and external problems that have worked in the past and that are taught to new members. Organizational culture is composed of the values and assumptions which prescribe what is important and how it should be done. These values and assumptions are applied by individuals in an organization and reinforced by other members who also take them for granted (Gorman, 1987).

An organization's culture is communicated through a variety of channels, internal and external. Written memos, statements of corporate policy, and training materials are used to convey the cultural information to its members. Organizations also communicate their culture by placing advertisements or public relations in the mass media, to those outside the organization (Barnett, 1988a).

The president's letter of annual report represents a communication channel through which important cultural aspects of an organization is revealed (Danowski & Huang, 1994). Usually, the annual report includes a letter from the president or CEO of the company, which occupies the opening section. In this letter top management reports to shareholders the company's operation and financial situation of the previous year and explains general strategy for doing business in the upcoming year. Because top management expresses their thoughts and visions in this letter, they spend considerable time and efforts outlining the content of the text, proofreading and changing most of it to their taste (Bowman, 1984). In this sense, the president's letter is viewed as downward communication (Kohut & Segars, 1992). While its primary purpose is to convey financial and operational information to the public, it also communicates the personality and philosophy of the company (Anderson & Imperia, 1992). As Fiol (1989) pointed out, the president's letter communicates not only facts about the company but also implicit values and beliefs about the organization to the public and organization members.

SEMANTIC NETWORK ANALYSIS

The concept of semantic network analysis is relatively new to the field of Communication Science. Monge and Eisenberg (1987) argued that network researchers have failed to capture the content of communication messages in network by measuring interactions only in terms of broad content categories such as production/maintenance/innovation. Therefore, they could not

provide a precise description of what is communicated in the network or whether network members receive, understand, and agree upon the messages. They proposed that network analysis should examine not only contact (presence or intensity of interaction) but also the semantic domain, the overlap of interpretation of message content among network members. However, despite of the pertinence of their arguments, very few scholars have given attention to semantic network analysis (e.g., Carley & Kaufer, 1993; Danowski, 1988; Danowski & Huang, 1994; Freeman & Barnett, 1994; Stohl, 1993).

Semantic network analysis is a research method for describing the relationships among words within messages. It focuses on message content by analyzing the relationships among the words. Semantic network analysis differs from content analysis in that while the latter assigns textual units into some categories made by researchers, the former captures the relationships among words within the messages by treating each word as a node. The strength of relationship between two words is defined by the number of times two words cooccur. Every word-pair link has a coocurrence distribution used for constructing matrix data (Danowski, 1993). From this data, the structure of words network can be examined and the position of each word within the word network is identified. Some words are found as group members and others are as liaisons or bridges. By doing a complete review of all the word patterns, the content of messages can be more precisely and objectively measured and understood than by relying on traditional content analysis.

In communication research, network analysis is a method to describe the structure of social systems, in which relational data about communication flows are analyzed by using relationships as the units of analysis (Rogers & Kincaid, 1981). The focus of network analysis is to examine how the positions nodes occupy in the network make differences in terms of their perceptions, attitudes, and activities. Network analysis in communication research seeks to identify structures in social systems based on the frequency of communication between the system components. Semantic network analysis identifies the structure of system by what people talk about, rather than relationships such as the presence/absence or the frequency of communication between two nodes. Because the "semantic network" is the configuration of relationships among the nodes who are using same symbols and the strength of links between two nodes is the degree to which they have share meanings, we are able to classify nodes' relative positions (structural equivalence) in a shared meaning network. In this respect, semantic network analysis has an advantage over traditional network analysis in that it provides a precise description of the content of messages while at the same time allowing researchers to differentiate the

characteristics of actors based on what they communicate. The procedures for conducting semantic network analysis will be described in the method section.

Annual reports (including president's letter) have been used by many financial analysts and business communication researchers to examine several subjects including corporate strategy (Bowman, 1984), gender representation (Anderson & Imperia, 1992; Kuiper, 1988), communication strategy (Kohut & Segars, 1992), and semiotic analysis (Fiol, 1989). Most of the studies have used traditional content analysis techniques which classify the message content into a number of phrases or topics, and counts their relative frequency and proportions in order to compare the differences. As noted above, traditional content analysis has limitations in that it forces content elements into a small set of mutually exclusive categories, resulting a loss of information. In contrast, semantic network analysis represents the content of messages in the actual, natural language, there by reducing the biases of human coders, and thus increasing its validity (Danowski, 1993). Semantic network analysis grounds the research in the actual language of the population under investigation. Further, semantic network analysis is not simply a network approach to content analysis. Rather, it enables researchers to investigate the structure of social systems based on the analysis of message content communicated. The primary purpose of semantic analysis resides in the testing of various relationships between variables of interest, for example, the relationship between message change and organizational performance (Kohut & Segars, 1992), and organizational restructuring (Danowski & Huang, 1994).

This study attempts to examine the relationship between national and organizational culture by analyzing the semantic domain of corporate messages. Specifically, the following research questions are addressed:

RQ 1. Can the analysis of message content through semantic network analysis differentiate communicators?

RQ 2. Are there any differences between Japanese and American companies in terms of information present in president letter text?

RQ 3. Do the messages differentiate the companies based on the business in which they are involved?

METHOD

Data

A total of 35 companies (18 American and 17 Japanese companies)[4] which have stock offerings in the United States were selected from the list of Fortune 500 companies. 35 companies were matched by the types of their businesses according to following procedure. First, the researchers obtained business descriptions of all Japanese companies and paired them with corresponding American companies in terms of their businesses, for example, "KUBOTA" and "DEERE & CO" as farm equipment manufacturing companies. The match of SIC codes within three levels were considered for the pairing of companies.[5] Second, when more than one corresponding companies were found from the list of American companies, the companies' size and industrial ranking in their own countries were considered for the selection, for example, Ford (in U.S.A.) was matched with Honda (in Japan) because they are both the second place in their industrial rankings. Finally, for the companies that were difficult to classify according to their business types due to diversification, their core business areas were adopted as the selection criterion. For example, although SONY now has a movie production company, it was classified as an electronics manufacturing company, so GENERAL ELECTRIC was selected as a matching company.

The full texts of each company's chief operating officers' letters to shareholders for 1992 were obtained from the annual reports. The actual texts were downloaded from the Compact Disclosure database into one text file. Table 1 shows the names and SIC codes of companies in the analysis.

Table 1 **Names and SIC codes of 35 Companies**

(American)	(Japanese)
*1. 3M CO. (2672 3291 2899)	33. TDK CORP. (3695 3264 3677)**
2. BLACK & DECKER CORP. (3546 3634 3429)	26. MAKITA CORP. (3546)
3. CATERPILLAR INC. (3531 3523 3519)	23. KOMATSU LTD. (3531 3523 3541)
4. CITICORP (6712 6021 6022)	28. MITSUBISHI BANK LTD. (6029 6211)
5. DEERE & CO (3523 3531 3519)	24. KUBOTA CORP. (3523 3531 3321)
6. EMERSON ELECTRIC CO. (3621 3566 3824)	30. PIONEER ELECTRONIC (3651 3661 3663)
7. FORD MOTOR CO. (3711 3714 6159)	21. HONDA MOTOR CO. LTD. (3711 3751)
8. GENERAL ELECTRIC CO. (3724 3630 3511)	32. SONY CORP. (3651)
9. HEWLETT PACKARD CO. (3571 7372 3577)	20. HITACHI LTD. (3571 3575 3577)
10. IBM (3571 3572 3577)	36. NEC*** (3571 3577 3661)
11. EASTMAN KODAK CO. (3861 2820 2834)	31. RICOH CO. LTD. (3861 3661 3577)
12. LIZ CLAIBORNE INC. (2339 2329 2335)	35. WACOAL CORP. (2341 2330)
13. MERRILL LYNCH & CO. INC. (6211 7375 6221)	29. MITSUI & CO. LTD. (6221)
14. MOTOROLA INC. (3674 3663 3661)	25. KYOCERA CORP. (3675 3678 3670)
15. PEPSICO INC. (5812 2086 2087)	22. ITO YOKADO CO. LTD. (5411 5311 5331)
16. PIEDMONT MANAGEMENT CO. (6331 6282 6719)	34. TOKIO MARINE & FIRE INS. (6331)
17. XEROX CORP. (3861 3579 6331)	19. CANON INC. (3861 3579 3661)
18. ZENITH ELECTRONICS (3651 3671 3577)	27. MATSUSHITA ELECTRIC (3651 3630 3692)

* The two companies in the same row are matched by their business type. The ID number assigned to each company represents the name of company in all of the following Figures and Tables.

** The three primary SIC codes are reported. The first two digits of SIC code indicate a major business division, and the third digit describes the line of business within major division. The fourth digit indicates specific product type. For example, a SIC code 3546 represents a division of industrial machinery (35), a line of business (4), and power driven handtools (6).

*** The text of NEC was not available at the time of analysis, thus NEC was not included in this study.

Semantic Network

The first step in semantic network analysis is a content analysis of data text to find the most frequently used symbols or words. Although this process traditionally has been conducted by hand, word frequency programs for micro-computers have been developed, such as CATPAC (Woelfel & Holmes, 1982) or WORDLINK (Danowski, 1993). In this study, CATPAC was employed for the analysis of text. It operates as follows. CATPAC reads the text written in ASCII format.[6] The program then eliminates any of a list of articles, prepositions, and conjunctions which have proven problematic in the past (Barnett, 1988a). The list of deleted words in this study is shown in Table 2.

Table 2 **The List of Words Omitted from CATPAC Analysis**

A	ABOUT	ALSO	AM
AN	AND	ARE	AS
AT	BECAUSE	BUT	BY
CAN	COULD	ELSE	FOR
FROM	HAS	HERE	HOW
HOWEVER	IN	INTO	IS
IT	IT'S	ITS	OF
ON	ONE	ONTO	OR
OUT	SHALL	SHOULD	SINCE
THAT	THAN	THE	THEN
THERE	THIS	THESE	THOSE
TO	THUS	UNTIL	WAS
WERE	WHICH	WHILE	WILL
WHO	WHAT	WHERE	WHEN
WHY	WITH	WOULD	YET

CATPAC counts the coocurrences of the remaining words, yielding approximately the 100 (or some other user defined value) most frequently occurring words. CATPAC then creates a words by words matrix with each cell containing the frequency of the coocurrences of the words within a specified window. This matrix is cluster analyzed to determine the likelihood that the occurrence of one word will trigger the occurrence of another (Woelfel, 1993).

In this study, CATPAC was run twice, one for the combined text of the 35 companies' president's letters and another for the text

of each letter. First, CATPAC read the whole text of 35 companies and found 94 words as the most prevalent words of 35 companies' letters. Second, the researcher ran CATPAC again for each individual company's text to obtain its unique words and counted the frequency for each 94 words, resulting a company by word frequency matrix (35 companies X 94 words). The CATPAC clusters of individual company's text were not examined. Table 3 reports the number of words of each company's president letter text.

Table 3 **Number of Words of Each Company's President Letter Text**

(American)	*(N)	(Japanese)	(N)
1. 3M **	864	33. TDK	891
2. BLACK & DECKER	1388	26. MAKITA	826
3. CATERPILLAR	285	23. KOMATSU	635
4. CITICORP	644	28. MITSUBISHI BANK	1678
5. DEERE & CO	1637	24. KUBOTA	537
6. EMERSON ELECTRIC	1677	30. PIONEER ELECTRONIC	889
7. FORD MOTOR	1340	21. HONDA MOTOR	827
8. GENERAL ELECTRIC	2903	32. SONY	1393
9. HEWLETT PACKARD	746	20. HITACHI	1303
10. IBM	1246	36. NEC***	
11. EASTMAN KODAK	2162	31. RICOH	937
12. LIZ CLAIBORNE	967	35. WACOAL	594
13. MERRILL LYNCH	450	29. MITSUI & CO	534
14. MOTOROLA	771	25. KYOCERA	1029
15. PEPSICO	1849	22. ITO YOKADO	843
16. PIEDMONT MANAGEMENT	1374	34. TOKIO MARINE & FIRE INS.	1020
17. XEROX	1399	19. CANON	583
18. ZENITH ELECTRONICS	623	27. MATSUSHITA ELECTRIC	1154
Total	22325	Total	15673
Mean	1240	Mean	921
S.D	658.08	S.D	320.52

t = 1.82 (p = 0.08)**

* N denotes the number of words of each company's president's letter.

** The results of t-test analysis were reported, which indicate no significant difference in mean number of words between American and Japanese group.

The company by word matrix was pre-multiplied by its transpose to create a 35 X 35 sociomatrix of companies based on the coocurrence of words in their messages. Since the main purpose of this study is to examine the structure of companies in U.S.A, rather than a close examination of message content, this 35 X 35 company matrix was used as data for identifying the groups of companies according to their nationality and types of business.

Galileo Analysis

Galileo (Woelfel & Fink, 1980) is a multidimensional scaling (MDS) method that can be used to determine the relations among the nodes of a network (Barnett & Rice, 1985). The Galileo analysis of network data starts with the transformation of matrix S (shared words among 35 companies) to a matrix of social distance, S*. This transformation can be accomplished by assigning the smallest value to the cell with the greatest number of shared words, such that the stronger the relationship between two companies, the closer they are in a network space (Barnett, 1988b). Then, matrix S* may be pre-multiplied by its transpose after being centered about the matrix's grand mean to create a scalar product matrix which is orthogonally decomposed. This results in a matrix of coordinates with each node (company) located on a series of reference axes or dimensions (Barnett, 1988a). A graphic representation of all nodes such as a map can be drawn from the coordinates matrix. From the scalar product matrix, a measure of centrality defined as the average distance of a node to all others in the network can be obtained (Barnett & Rice, 1985).

Cluster Analysis

To perform the group identification, Johnson's hierarchical cluster analysis from UCINET-IV was used (Borgotti, Everett, & Freeman, 1992). Cluster analysis is a method to find groups of similar entities in data (Aldenderfer & Blashfield, 1984). From a similarity matrix of n nodes (in this case, 35 companies), the pair of nodes with the highest similarity (shared words) is combined to form an initial cluster, C_1. Then a new matrix including the pair of nodes of C_1 as a single node is produced. A third company is added to C_1 or a new pair of companies are combined to form C_2. This process is repeated until all companies are included to form cluster C_n (Barnett & Danowski, 1992). The result of cluster analysis is typically described by a dendrogram in which the groupings among all nodes are represented by their relative closeness and height.

Correspondence Analysis

Correspondence analysis is a multivariate descriptive statistical method that graphically displays the rows and columns of a categorical data matrix (Hoffman & Franke, 1986). It is a discrete principal component analysis or a singular value decomposition of a matrix of chi-square distances. The decomposition generates a set of matrices (coordinates) which can be applied to the production of interpoint distances for mapping (Barnett, 1993; Barnett & Danowski, 1992). When applied to social network data, it allows for the simultaneous presentation of both nodes or sources (rows) and variables or receivers (columns) in the same space. This advantage improves the researcher's ability to interpret the network structure (Barnett, 1993). In this case, it will allow for the simultaneous presentation of the 94 most frequent words and the 35 companies. This study used the correspondence analysis program from BMDP.

Discriminant Analysis

Discriminant analysis is a technique to study the multivariate differences between two or more groups of objects by using several variables to predict group membership of individual cases (Klecka, 1980). Because discriminant analysis simultaneously examines the relationship between classifying variables and objects, it allows researchers to identify which variables (words) are important for distinguishing among the groups of objects (companies). In this study, word frequencies will be used to differentiate the 35 companies. A dummy variable for the group name (Japan and U.S.A) was used. The Discriminant Procedure from SPSS/PC+ was employed.

RESULTS

CATPAC resulted in a total of 4,698 unique words from the 35 companies' 1992 text. The 94 most frequent words each occurred more than 26 times. The frequency of each word for each company was determined to create a company by word matrix (35 companies X 94 words), which was pre-multiplied by its transpose creating a 35 X 35 companies sociomatrix based on the coocurrence of the words. The results of CATPAC analysis with the companies' frequencies for the 94 words are presented in Table 4.

Table 4 **Word by Company Matrix (94 words X 35 companies)**

(Company)	1	5	10	15	20	25	30	35
BEST	0 0 0 0 0 7 3 0 0 0 3 0 0 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 2 0 0 0 0
BIG	0 0 0 0 0 0 0 17 0 0 0 0 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
BOARD	2 7 0 0 0 0 9 0 2 4 0 4 0 4 4 0 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0
CAPITAL	2 3 0 4 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 0 0 5 0 14 0 0 0 5 0 0 0
CHANGE	0 0 0 0 0 0 0 0 5 0 0 4 0 0 2 3 0 0 0 0 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 5 0
CHIEF	0 0 0 0 0 0 3 3 0 3 0 3 2 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
COMPANY	0 0 0 3 6 8 8 25 5 5 11 3 0 0 3 10 0 0 0 4 2 2 0 0 6 2 5 0 0 0 0 0 2 2 0
COMPANY'S	0 0 0 0 8 5 4 0 0 0 0 0 0 0 0 0 0 0 2 0 5 0 0 0 0 0 0 3 0 0 0 0 0 0 4 2 0
COMPETITIVE	2 4 2 0 0 0 0 0 2 6 0 0 0 0 0 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 0 0 0
CONDITIONS	0 0 0 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 3 0 0 0 0 0 0 0 0 0 0 0 0 3 0 0 0
CONSUMER	0 5 0 4 0 0 0 0 0 0 3 5 0 0 9 0 0 0 0 0 7 0 0 0 0 0 0 0 3 5 0 0 0 0 0 0 0
CONTINUE	0 0 0 6 4 0 0 0 0 0 0 5 5 3 0 0 0 2 2 3 0 2 2 0 0 0 0 3 2 0 3 0 0 0 0
CORPORATE	0 0 0 4 0 0 0 0 0 0 0 0 0 0 0 5 0 0 0 4 3 2 2 0 0 0 0 0 3 0 0 4 0 0 0 0
CORPORATION	0 3 0 0 0 4 0 0 0 0 0 2 0 0 8 0 0 0 2 0 0 0 0 0 0 0 2 0 0 2 0 0 0 3 0 0
COST	0 6 0 3 5 9 0 0 0 0 4 0 0 0 0 0 0 3 0 0 0 0 0 0 0 0 0 3 0 0 0 0 0 0 0 0
CUSTOMER	3 0 0 0 0 0 0 5 0 0 0 0 0 3 4 0 8 0 0 0 0 0 3 0 0 0 0 3 0 0 0 3 0 4 6 0
DEVELOPMENT	2 0 0 0 0 4 0 0 0 3 5 0 0 2 0 0 0 0 0 5 3 0 2 0 5 6 7 3 3 0 3 3 0 0 0
EARNINGS	4 0 0 0 0 5 0 5 6 0 7 0 0 4 3 0 0 0 0 0 2 0 0 0 0 0 0 7 0 0 0 0 0 0 0
ECONOMIC	3 6 0 0 0 4 3 0 2 0 0 0 0 0 0 0 0 0 6 5 0 0 0 0 0 3 3 0 3 0 0 3 0 3 0
ECONOMY	2 0 2 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 0 0 3 2 4 3 0 3 0 0 0 3 0 2 0
EFFORTS	3 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 0 0 2 2 0 0 0 0 0 0 5 2 4 0 0 6 2 0 0 2 2
EMPLOYEES	2 0 0 0 4 0 0 0 0 0 0 3 2 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 0 0 0
ENVIRONMENT	0 0 0 2 0 0 0 0 3 0 0 0 0 0 0 3 0 0 0 0 0 4 2 3 0 3 0 0 0 0 0 6 0 6 0
EQUIPMENT	0 0 0 0 16 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 8 0 0 7 2 0 0 4 0 0 0 310 0 0 0
EUROPE	0 4 0 0 0 0 7 0 0 0 0 0 0 0 0 0 0 0 0 4 8 0 0 0 0 2 0 0 0 3 0 3 0 0 0
EXECUTIVE	0 0 0 0 0 4 0 0 3 0 3 3 0 2 0 0 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0
FINANCIAL	0 0 0 0 0 4 5 0 0 7 4 0 0 10 0 8 8 2 0 0 0 2 0 0 0 0 0 0 6 0 0 0 0 2 0 0
FOCUS	0 0 0 0 0 0 0 0 5 0 0 0 0 0 2 0 0 3 0 0 0 0 0 0 0 3 0 0 0 0 0 0 0 0 0 0
FURTHER	0 0 0 0 0 0 0 0 0 0 3 0 0 0 0 0 0 0 0 0 0 5 0 0 0 6 0 0 3 0 3 0 0 0 0 0
FUTURE	0 0 0 0 0 0 0 5 0 0 0 0 0 0 3 3 3 0 0 0 0 0 0 3 0 0 0 0 0 0 0 3 0 0 0 0 3 0
GLOBAL	0 5 4 2 0 10 0 6 0 0 3 2 2 0 0 3 0 0 2 3 4 2 0 0 0 0 4 4 0 0 0 0 0 0 0
GOOD	3 0 0 0 0 4 0 0 3 0 0 0 0 0 0 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
GROUP	0 0 0 0 0 0 3 0 6 0 5 0 0 0 0 0 0 0 0 0 0 2 3 0 0 0 0 0 0 0 0 0 0 0 0
GROWTH	5 4 0 0 0 3 0 8 3 4 6 6 2 8 6 4 9 0 2 5 0 2 4 2 0 4 7 7 0 0 0 0 2 5 2
HEALTH	0 0 0 0 8 0 0 0 0 0 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
HIGH	4 0 0 0 3 4 0 0 0 0 3 0 0 0 0 0 0 3 0 4 3 3 0 0 0 211 3 0 5 0 3 0 0 0
I	0 0 0 0 0 0 0 0 18 0 0 3 0 0 0 5 0 3 0 0 0 0 0 0 0 3 0 0 0 0 4 0 7 0 0 0 0
IMPORTANT	0 0 0 0 6 5 0 0 0 0 3 2 0 0 4 0 0 0 0 0 0 0 0 0 0 0 2 0 0 0 0 0 0 0 2 0 0
IMPROVE	0 4 0 0 7 0 3 0 2 3 3 0 0 6 3 0 7 6 0 0 4 0 0 0 0 0 0 3 0 0 2 0 0 2 0
INCOME	0 3 0 0 6 0 0 0 0 0 0 0 0 0 0 0 0 3 0 5 0 4 2 0 4 3 2 3 0 0 0 2 4 0 3 0
INCREASE	3 0 0 0 0 4 0 0 0 4 0 0 0 2 0 0 0 0 5 4 0 0 0 2 3 3 0 7 0 0 0 4 0 0 2
INDUSTRY	2 0 3 0 6 5 0 0 0 5 3 0 0 0 0 9 3 3 0 4 0 0 3 4 0 2 3 0 0 3 0 0 0 4 0
INTERNATIONAL	2 0 0 0 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 0 0 0 0 0 0 0 3 4 2 0 0 0 0 2 0
INVESTMENT	0 0 0 0 0 3 0 0 0 3 0 0 0 3 0 0 0 0 0 6 0 0 2 0 0 2 0 3 0 0 0 5 4 4 0
JAPAN	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 2 7 2 2 3 5 5 5 5 6 0 7 5 4 5
LEADERSHIP	0 0 2 0 0 4 0 0 0 3 4 0 4 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2
LONG	0 0 0 2 0 0 0 0 0 0 3 0 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
MAJOR	2 3 0 0 3 3 4 0 0 0 3 0 0 2 0 3 4 0 0 0 2 0 0 0 0 0 0 3 0 0 0 0 0 0 2 0 0
MANAGEMENT	0 0 0 3 0 3 0 0 2 0 0 0 0 0 510 0 0 0 0 0 0 3 3 0 0 014 0 0 0 2 0 0 2 0
MANUFACTURING	2 4 0 0 5 0 0 4 0 7 0 2 0 0 0 0 0 2 0 0 3 0 0 0 0 5 0 0 0 0 3 0 0 0 0
MARKET	0 9 0 0 6 3 8 5 0 0 4 5 3 3 0 010 0 0 4 0 0 5 0 6 0 8 6 2 4 0 6 0 0 6

	1	5	10	15	20	25	30	35
MARKETPLACE	0 0 0 0 4 0 0 9 0 6 0 0 0 0 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
NEW	3 1 2 0 0 1 8 9 1 2 1 1 4 0 1 5 4 0 0 9 9 1 0 5 5 8 2 0 8 0 4 7 0 7 5 0 0 3 0 4 3
OFFICER	0 0 0 0 0 0 0 0 0 3 0 3 2 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
OPERATING	0 4 0 0 5 4 0 0 3 0 0 0 0 4 9 5 0 3 0 0 3 0 0 0 0 0 3 0 0 0 2 4 0 3 0
OPERATIONS	0 6 0 0 1 3 3 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 4 2 3 0 4 0 3 2 3 4 3 2 0 0
ORGANIZATION	0 0 2 0 0 0 0 0 5 2 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
PAST	0 0 0 0 0 0 6 0 0 0 0 0 0 0 0 0 0 3 0 0 0 0 2 0 0 0 0 0 0 5 0 0 0 0 0 0 3
PEOPLE	0 0 0 0 0 0 0 3 8 0 4 0 0 0 2 5 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
PERCENT	1 4 0 0 0 0 1 0 0 0 7 5 3 0 0 0 0 0 0 5 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 2 2 0
PERFORMANCE	0 0 0 0 0 0 4 0 0 2 3 0 0 0 4 3 3 6 3 0 0 0 2 2 0 0 2 0 0 0 0 3 0 0 0 0
POSITION	0 0 2 0 4 4 0 0 0 0 0 0 4 0 0 0 0 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
PRESIDENT	0 0 0 0 0 0 0 6 0 4 0 0 3 0 4 3 0 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0
PRODUCTION	3 0 0 0 7 0 0 0 0 0 0 0 0 0 0 0 0 3 3 0 0 6 0 0 0 4 5 5 0 0 0 0 3 7 0 0
PRODUCTS	3 1 2 2 0 1 0 1 6 5 5 6 3 1 5 9 0 5 7 3 1 1 5 3 1 3 2 2 2 6 3 6 4 1 4 0 0 1 1 8 5 7 2 5
PROFITABILITY	0 0 0 0 0 3 0 0 3 3 0 0 0 0 0 3 0 0 0 0 0 2 0 2 0 0 0 0 0 0 2 0 0 0 0
QUALITY	0 5 0 0 6 0 0 0 0 0 1 1 3 0 2 3 0 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 0
RECORD	0 0 0 0 3 6 5 0 0 0 4 2 0 0 0 3 0 0 3 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0
REDUCED	2 3 0 0 4 0 0 0 2 6 6 0 0 0 0 0 0 2 2 2 0 0 0 0 4 0 0 7 0 0 0 0 0 3 0
RESOURCES	0 0 0 0 0 0 0 0 0 0 4 4 0 0 2 0 3 4 0 0 3 0 0 0 0 0 0 0 0 0 0 2 0 2 0 0
RESULTS	0 0 0 0 0 3 4 0 2 3 4 0 0 2 5 3 0 4 0 3 3 5 3 2 3 0 0 5 0 0 3 0 0 0 3
SALES	9 4 0 0 3 1 2 0 0 0 0 3 6 0 6 5 0 0 6 1 2 1 1 3 3 4 1 0 0 5 1 1 0 0 8 3 1 7 6 0 6
SERVICES	2 0 0 0 0 0 7 0 0 8 0 0 0 0 7 6 9 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0
SHARE	5 0 0 0 3 7 4 4 5 0 4 3 0 6 3 0 5 0 2 0 3 2 2 0 0 0 0 0 0 0 0 9 0 0 3
SMALL	0 0 0 0 0 0 0 1 7 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
STRATEGIC	0 0 0 0 0 0 3 0 0 0 0 5 0 0 0 0 0 3 0 0 0 0 0 0 0 3 0 0 0 2 0 0 0 2 0 0
STRATEGY	0 0 0 0 0 0 6 0 0 0 0 0 0 0 0 0 5 4 3 0 0 0 2 0 0 0 3 0 0 0 2 0 3 0 0 0 0
STRONG	2 4 0 0 0 0 0 3 0 2 0 0 2 0 0 4 0 3 0 0 0 0 4 0 2 0 5 0 0 0 0 0 3 0 0 2
SUCCESS	0 0 0 0 0 0 5 4 0 0 0 0 2 0 0 3 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 0
SUPPORT	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 0 0 2 2 0 0 0 2 0 0 2 0 0 0 0 0 0
SYSTEMS	0 0 0 0 0 0 0 0 7 3 7 0 0 0 0 0 0 0 3 0 7 0 2 0 0 0 0 0 5 0 5 2 4 2 0 0
TECHNOLOGY	0 0 0 0 0 5 0 4 0 3 8 0 0 5 0 0 0 0 0 4 0 0 2 3 4 0 0 0 0 3 0 0 0 0 0
TERM	0 0 0 2 0 0 0 0 0 5 3 3 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 6 3 0 0 0
TIME	0 0 0 0 0 0 0 3 0 2 4 0 0 0 2 6 0 0 0 0 0 0 0 0 0 0 0 0 4 3 0 0 2 0 2 0 0
TOTAL	2 0 0 2 0 5 0 0 0 0 0 0 0 0 2 0 0 0 0 0 4 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0
US	3 8 0 3 9 0 3 1 8 0 0 0 5 0 3 8 0 4 0 0 0 0 0 2 4 0 0 0 5 4 0 0 0 0 0 0 0
VALUE	0 0 0 2 0 6 0 0 0 5 0 3 0 0 0 4 4 0 0 0 0 0 0 0 0 3 1 2 5 0 0 3 0 0 0 0
WE'RE	6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 0 0 0 0
WE'VE	0 0 2 0 0 0 0 0 7 0 0 0 0 0 0 0 0 4 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 0 0 0 0
WORK	0 0 0 0 0 0 0 0 8 0 4 0 0 0 0 0 0 5 0 0 7 0 0 0 0 0 0 0 0 0 0 0 2 0 0 0 0
WORLD	3 0 3 5 0 0 0 0 0 4 1 1 0 0 0 0 0 1 0 0 0 4 0 0 0 0 0 0 0 0 0 5 0 0 0 0 0 0
WORLDWIDE	2 0 0 0 0 5 0 0 2 6 6 0 0 0 0 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 5 2 0 0 0 0
YEAR	6 9 2 4 8 7 1 1 4 8 8 0 2 3 4 5 9 1 1 4 4 1 4 6 4 4 6 3 6 6 0 9 2 0 8 1 5 1 1 5 7
UNITED STATES	5 3 0 0 4 3 9 0 0 0 0 3 4 4 0 3 0 0 0 3 4 4 4 2 3 0 4 7 0 0 0 0 0 7 0 0 2

* COMPANY NAME

1. 3M	10. IBM	19. CANON	28. MITSUBISHI BANK
2. BLACK & DECKER	11. EASTMAN KODAK	20. HITACHI	29. MITSUI & CO
3. CATERPILLAR	12. LIZ CLAIBORNE	21. HONDA MOTOR	30. PIONEER ELEC.
4. CITICORP	13. MERRILL LYNCH	22. ITO YOKADO	31. RICOH
5. DEERE & CO	14. MOTOROLA	23. KOMATSU	32. SONY
6. EMERSON ELEC	15. PEPSICO	24. KUBOTA	33. TDK
7. FORD MOTOR	16. PIEDMONT MANAG.	25. KYOCERA	34. TOKIO FIRE & MARINE
8. GENERAL ELECTRIC	17. XEROX	26. MAKITA	35. WACOAL
9. HEWLETT PACKARD	18. ZENITH ELEC.	27. MATSUSHITA ELECTRIC	

Galileo revealed two distinct groups, the one composed of Japanese companies, and another of American companies. Groups based on business types were not found. A two-dimensional plot which accounted for 37.6% variance revealed that 15 Japanese companies formed a tight cluster on the lower part, and 11 American companies located on the upper area, shaping a large but loosely connected cluster. Two Japanese companies (HITACHI and SONY) were relatively isolated from the Japanese cluster. Three American companies (3M, EMERSON and ZENITH) were found to be a part of Japanese cluster.

Japanese companies are more central in the shared words' network. While the most central companies were American companies (CATERPILLAR (C = 1.34) and MERRILL LYNCH (C = 1.44), the mean centrality score for Japanese company group (C_m = 3.09) was smaller than the one of American company group (C_m = 4.87), indicating that overall Japanese companies were more central in the network. The least central companies were GENERAL ELECTRIC (C = 15.86) and DEERE & CO (C = 9.03). The coordinates and centrality scores for all companies are reported in Table 5.

Table 5 **Galileo Coordinates for First Two Dimensions and Centrality**

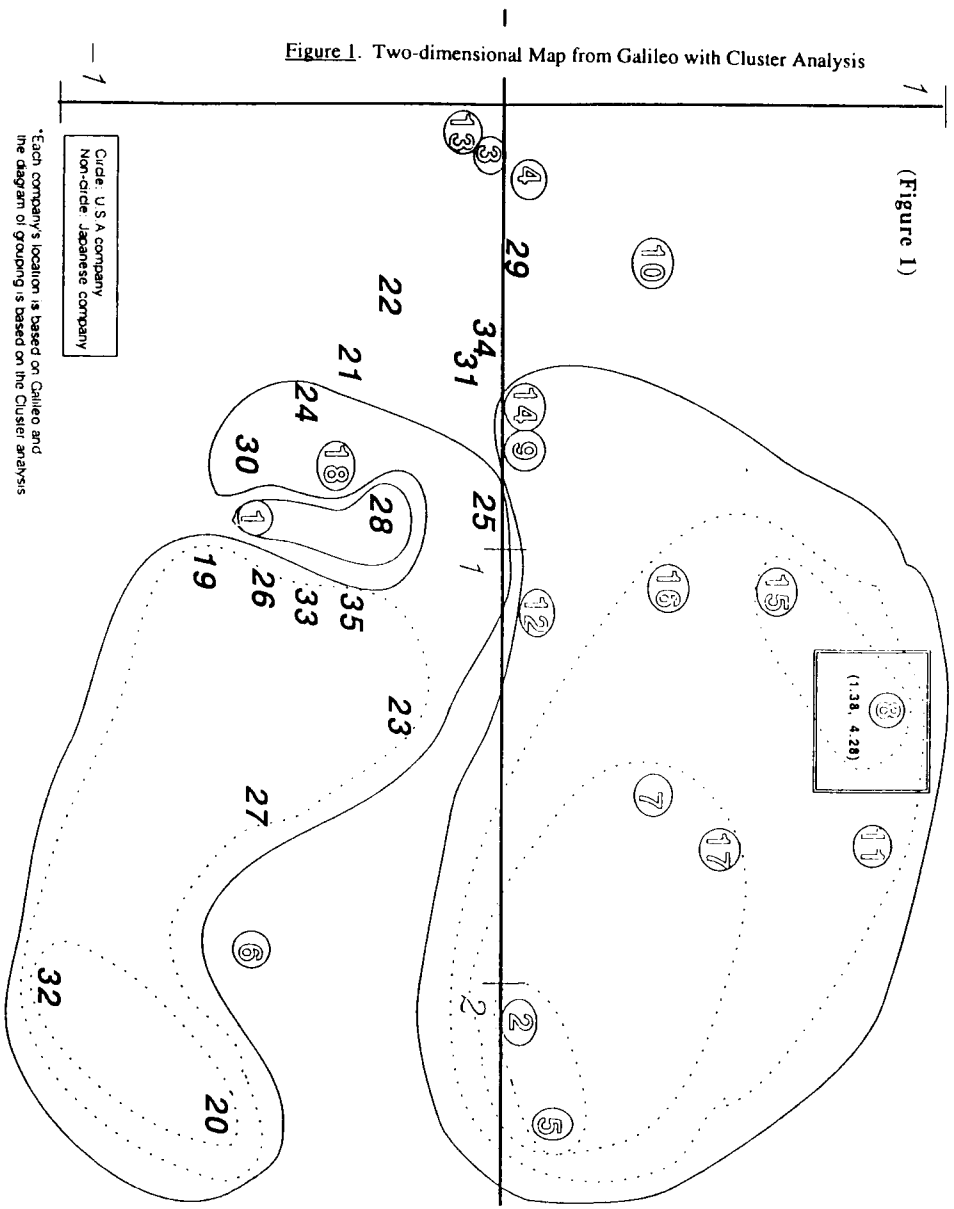
	1st	2nd	Centrality
3M	.925	-.524	3.41*
BLACK & DECKER CORP	2.021	.014	5.00
CATERPILLAR INC	.137	-.002	1.34
CITICORP	.169	.049	1.70
DEERE & CO	2.240	.133	9.03
EMERSON ELECTRIC CO	1.935	-.585	7.10
FORD MOTOR CO	1.548	.342	5.32
GENERAL ELECTRIC CO	1.385	4.280	15.86
HEWLETT PACKARD	.746	.096	2.62
IBM	.361	.342	3.99
EASTMAN KODAK CO	1.643	.775	7.62
LIZ CLAIBORNE INC	1.139	.085	2.25
MERRILL LYNCH & CO	.154	-.090	1.44
MOTOROLA INC	.654	.024	3.15
PEPSICO INC	1.121	.659	4.76
PIEDMONT MANAGEMENT CO	1.134	.407	4.37
XEROX CORP	1.646	.494	7.08
ZENITH ELECTRONIC CORP	.818	-.306	1.72
CANON INC	.913	-.583	2.28
HITACHI LTD	2.221	-.611	5.84
HONDA MOTOR CO	.560	-.343	2.20
ITO YOKADO CO	.447	-.249	1.77
KOMATSU LTD	1.317	-.211	1.96
KUBOTA CORP	.633	-.442	1.68
KYOCERA CORP	.892	-.022	2.42
MAKITA CORP	1.062	-.535	2.49
MATSUSHITA ELECTRIC CO	1.586	-.523	6.96
MITSUBISHI BANK	.936	-.321	5.47
MITSUI & CO	.287	.032	1.56
PIONEER ELECTRIC	.860	-.533	2.63
RICOH CO	.640	-.135	2.49
SONY CORP	1.867	1.405	6.33
TDK CORP	1.055	-.442	2.41
TOKIO MARINE & FIRE INS.	.526	-.009	2.67
WACOAL CORP	1.040	-.379	1.49
Eigenvalues	50.048	25.175	
Percentage of variance			Mean 4.01
accounted for by eigenvalue	25.019	12.585	
Sum of roots	200.036		

* The smaller the value, the more central the company in the network.

The cluster analysis revealed two distinct groups, one for Japanese companies and another for the American. The American group was composed of 13 companies and it clustered fairly loosely. The Japanese group clustered more tightly and included all but two companies, MITSUBISHI BANK and MITSUI & CO. Although the overall results of cluster analysis were similar to the one from the Galileo analysis, the shapes of the clusters were different. Five Japanese companies (HONDA, ITO YOKADO, RICOH, MITSUI, and TOKIO MARINE) were not included in the Japanese cluster, compared to two companies (HITACHI and SONY) in the Galileo analysis. Also, these two companies which were isolates in the Galileo Analysis, were tightly clustered and became a part of Japanese cluster. Two American companies (3M and ZENITH) were in the Japanese group in the Galileo analysis. They formed an isolated cluster. For the American cluster, EMERSON and GENERAL ELECTRIC were added into the American group resulting in the cluster of 13 companies instead of 11 from Galileo.

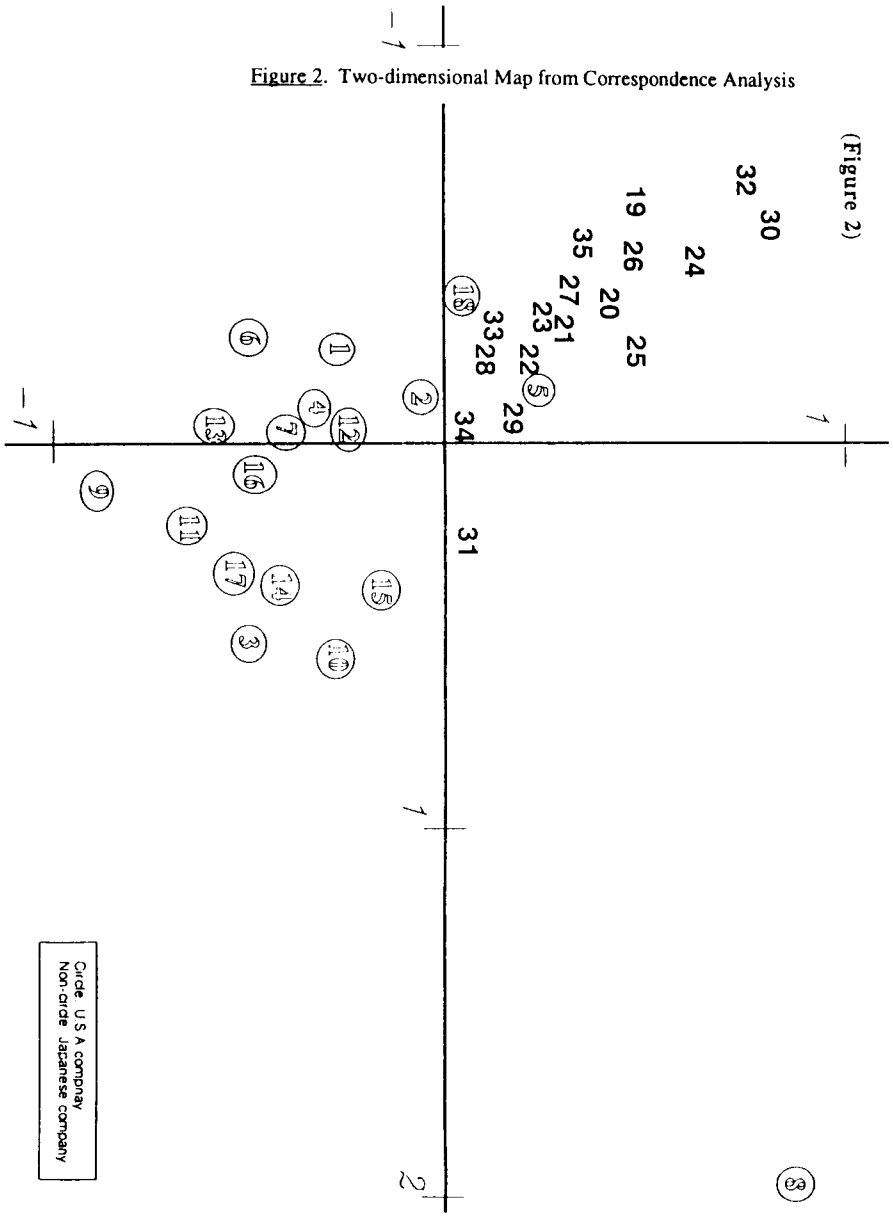
While the companies were clustered into two groups according to their nationalities, there was no differentiation in terms of business type. For example, FORD was not grouped with HONDA in cluster analysis and they were not close in the multidimensional space. These results indicate that business type was not reflected in the messages. Figure 1 shows a two-dimensional map of the companies from Galileo, with the results of the cluster analysis.

Figure 1. Two-dimensional Map from Galileo with Cluster Analysis



The coordinates of the two largest dimensions from the correspondence analysis accounted for 11.7% and 7.6% variance respectively. They are presented in Figure 2. Because these two dimensions accounted for only 19.3% of total variance, any interpretation from Figure 2 should be viewed with caution.

Figure 2. Two-dimensional Map from Correspondence Analysis



Two groups were identified according to companies' nationalities. Business type was not reflected in the group identification. On the lower part of Figure 2, 14 out of 18 American companies were clustered as a group, and all Japanese companies were grouped together as a cluster on the upper part. Four American companies (DEERE & CO, BLACK & DECKER, GENERAL ELECTRIC, and ZENITH) did not belong to American cluster. DEERE & CO was a member of the Japanese group. GENERAL ELECTRIC did not belong to either cluster.

Although the results of the correspondence analysis were similar to those from the Galileo and cluster analyses, GENERAL ELECTRIC was a member of the American group in the cluster analysis, but in the correspondence analysis, it was found to be an isolate, i.e., not a member of any cluster, Japanese or American. Also, worth noting are the differences in the locations of four American companies (CATERPILLER, CITICORP, IBM, and MERRILL LYNCH). In the cluster analysis, they did not belong to American cluster but existed as isolates. However, in the correspondence analysis, all of them were members of the American cluster. The differences in results may be due to the differences in methods used. Galileo uses frequency as a distance between the nodes and employs a least-square of distances for the group detection. Cluster analysis uses rank-order of distances between pairs of cells, while correspondence analysis is based upon chi-square distances between the nodes.

The above results clearly showed that despite the particular method used, the companies were differentiated into two groups based on the texts. This raises a question: which words were important in distinguishing the groups, and what are their relationships to the two groups? Discriminant analysis was performed to answer this question.

The stepwise method of discriminant analysis was conducted twice. First, all 94 words were used as predicting variables. Of the 94 words, 24 words were found to have significant effects in discriminating the groups. Among these words, the F value of word *Japan* (F = 58.95) was much greater than those of other words (Mean of F = 4.69), suggesting that this word might distort the overall discriminating function. An examination of data revealed that the word *Japan* was not used by any American company. Thus the discriminant analysis was conducted a second time without the word *Japan*.

The second discriminant analysis revealed that the two groups could be perfectly discriminated by the texts. All 18 American companies were correctly classified into the American group and all

17 Japanese companies were identified as the Japanese group. Of the 93 words, 23 words were found to have a significant impact on the differentiation of the companies. The results of the second discriminant analysis are presented in Table 6.

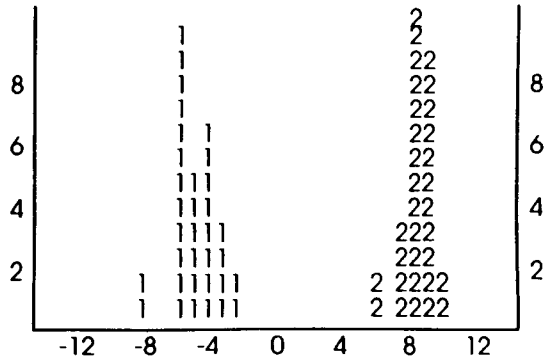
Table 6 **Results of Discriminant Analysis**

List of Significant Words

(Word)	(F)	(Word)	(F)
BOARD	7.64**	LEADERSHIP	5.60*
CHIEF	7.81**	MAJOR	5.83*
COMPANY	4.49*	MARKETPLACE	4.07*
COMPETITIVE	4.62*	NEW	4.85*
CUSTOMER	4.77*	PEOPLE	6.24*
DEVELOPMENT	4.63*	OFFICER	4.44*
ECONOMY	4.75*	POSITION	5.73*
EFFORTS	4.53*	PRESIDENT	4.22*
FINANCIAL	5.02*	QUALITY	5.95*
GOOD	5.47*	SUCCESS	4.05*
IMPROVE	6.46*	US	4.79*
INCOME	4.36*		

* $p < .05$
** $p < .01$

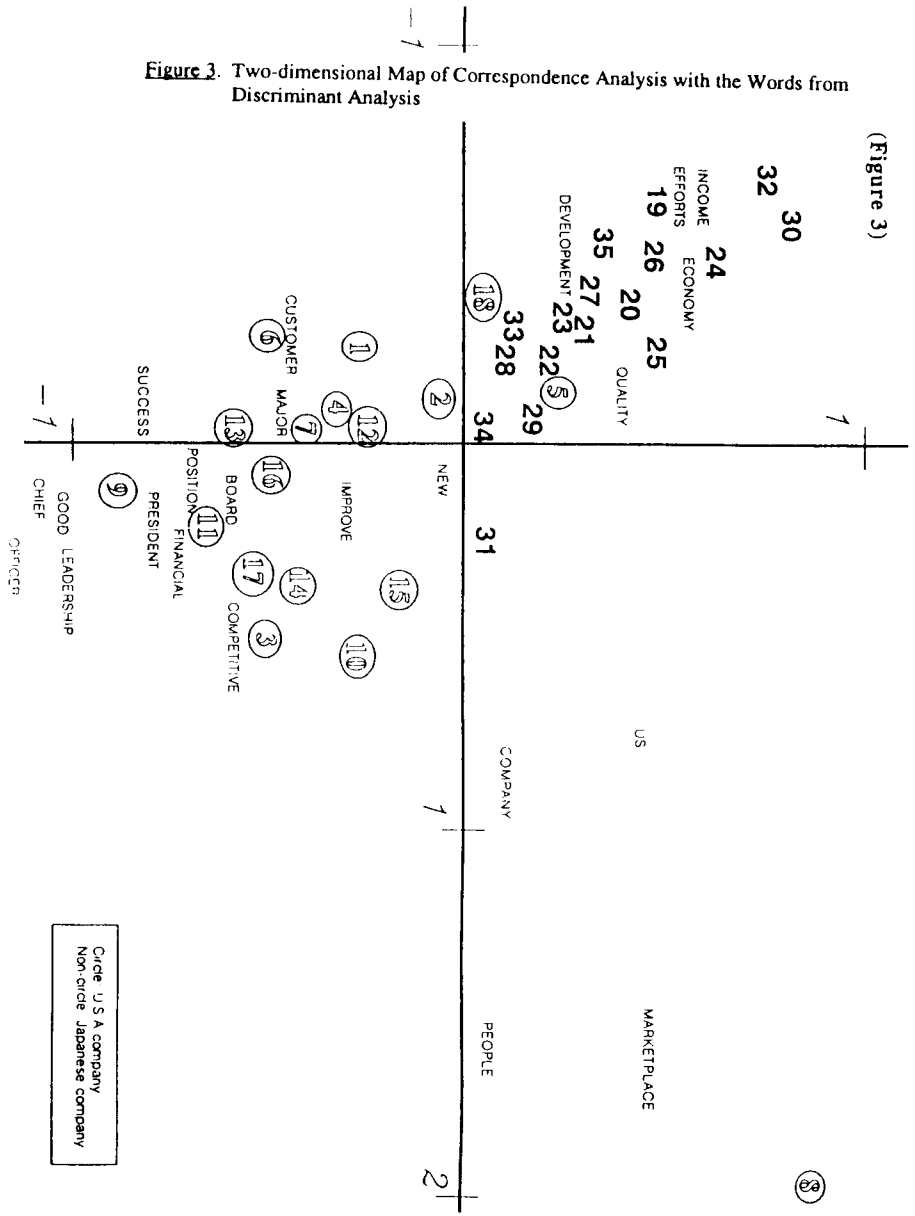
Histogram of Japanese and U.S.A Company Group



1: JAPAN (n = 17)
2: U.S.A (n = 18)

Finally, the positions of these 23 words were plotted in the map of correspondence analysis in order to examine the relationship between the two groups and the discriminating words. Thirteen words were close to the American group and were tightly clustered together: *board*, *chief*, *leadership*, *president*, *officer*, *major*, *position*, *financial*, *improve*, *good*, *success*, *competitive*, and *customer*. These words indicated that the American companies were discussing two subjects in their president's letters: **financial information** and **organizational structure**. On the other hand, the Japanese companies described **organizational operations**. Six words were closer to Japanese cluster: *income*, *effort*, *economy*, *new*, *development*, and *quality*. These words reflect the concern of Japanese companies for the development of new quality product in order to survive in the American business environment. The remaining four words (*company*, *marketplace*, *people*, and *us*) were "neutral" in the sense that they were not closer to either the Japanese or American clusters. Figure 3 presented the words and companies in the same space.

Figure 3. Two-dimensional Map of Correspondence Analysis with the Words from Discriminant Analysis



DISCUSSION AND CONCLUSION

This study demonstrated the use of semantic network analysis differentiating communicators based on the meaning of their messages. The results suggest that the text of president's letters from annual reports are able to effectively differentiate Fortune 500 companies in terms of their national cultures. Both cluster and correspondence analysis revealed that the companies were classified in to two distinct national groups, Japanese and American, based on their messages. Among the most frequently shared words of the text, discriminant analysis showed that 23 words had a significant effect on discriminating these two groups. While the analysis differentiated the companies according to national culture, classification of companies in terms of business type was not found. All pairs of companies matched by business type were not grouped together in the cluster analysis, the MDS or correspondence analysis, suggesting that business type was not reflected in the messages of president's letters.

These results may be attributed to the following reasons. First, the contents of president's letter were different between American and Japanese groups. American companies discussed financial information (*financial*, *improve*, *good*) and structure of the organization (*board*, *chief*, *leadership*, *president*, *officer*), while the Japanese companies discuss mainly organizational operations (*income*, *effort*, *economy*, *new*, *development*, *quality*).

Besides the differences in the content of messages between Japanese and American groups, another reason may be found in the characteristics of multinational corporations (MNC) including the Japanese companies in this study. Although multinational corporations are doing business in foreign countries and hiring many native employees, the position of president or CEO of subsidiary company is usually filled by individuals dispatched from their home offices. For the Japanese companies in this study, the presidents of all 17 companies were Japanese. Sims and Guice (1992) proposed that "fluency in a language is not enough to prepare a writer to communicate successfully with readers of other cultures. Instead, cultural factors beyond language greatly affect communication, factors including the knowledge of the business communication practices and of the cultural expectations of the countries (p. 23)." In their study comparing U.S. and Japanese business letters, they found that the letters written by non-native speakers of English differed significantly from those written by native speakers in tone, closing, and information, and the letters of non-native speakers deviated more from the accepted business communication practices in U.S. In this respect, we might assume

that the cultural differences in business writing practices were reflected in the text of president's letters, and as a result, classification of companies into two cultural groups.

Among the companies in this study, the location of GENERAL ELECTRIC is intriguing. It does not belong to either cluster, rather it is located far away from the center. What makes this company extremely isolated? The examination of word by company matrix (Table 3) revealed that GENERAL ELECTRIC has a unique meaning structure. For GENERAL ELECTRIC, five words (*big*, *company*, *I*, *small*, *us*) were predominant in terms of their frequency. When they are compared to the mean for these words (*big* (f = 17, m = 0.6), *company* (f = 25, m = 3.2), *I* (f = 18, m = 1.22), *small* (f = 17, m = 0.6), *us* (f = 18, m = 2.25), they may be regarded as GENERAL ELECTRIC's "own" words. Overall, the semantic structure of GENERAL ELECTRIC is extremely different from the other companies.

Finally, this study showed that the analysis of messages allowed us to identify the companies in terms of their national culture. Two reasons for these results were discussed in light of the differences in the content of president's letters, and business writing styles. However, there may be many other possible reasons for these results, for example number of interlocking directorates, the degree of resource exchange among these companies, or common demographic characteristics among the C.E.Os. By examining these variables in the future study, we may get more precise picture of the determinants of the semantic network structure in corporate messages.

By analyzing the content of president's letter, this study examined only one aspect of organizational culture. As noted above, the president's letter may be an expression of an individual's idea about their company, though it may be considered important and valuable to study because of president or CEO' hierarchical power in the company. As Deal and Kennedy (1982) generally defines organizational culture as "the way we do things around here," organizational culture includes everything that happens in organization. Therefore, future studies need to include other materials that reflect the other aspects of organizational life such as internal employee newsletters, training materials, policy statements, and product advertisements (e.g., Freeman & Barnett, 1994) in order to obtain more comprehensive picture of organizational culture.

REFERENCES

Aldenderfer, M. S. & Blashfield, R. K (1984). *Cluster analysis*. Beverly Hills, CA: Sage.

Anderson, C. J. & Imperia, G. (1992). The corporate annual report: A photo analysis of male and female portrayals. *The Journal of Business Communication*, 29, 113-128.

Barnett, G. A. (1988a). Communication and organizational culture. In G. Goldhaber & G. A. Barnett (Eds.) *Handbook of organizational communication* (pp. 101-130). Norwood, NJ: Ablex.

Barnett, G. A. (1988b). Precise procedure for longitudinal network analysis. In G. A. Barnett & J. Woelfel (Eds.) *Readings in the Galileo system: Theory, methods and applications*. Dubuque, IA: Kendall/Hunt.

Barnett, G. A. (1993). Correspondence analysis: A method for the description of communication networks. In W. D. Richards, Jr. & G. A. Barnett (Eds.) *Progress in communication sciences, XII* (pp. 135-164). Norwood, NJ: Ablex.

Barnett, G. A. & Danowski, J. A. (1992). The structure of communication: A network analysis of the International Communication Association. *Human Communication Research*, 19, 164-285.

Barnett, G.A. & Rice, R. E. (1985). Network analysis in Riemann space: Application of the Galileo system to social networks. *Social Networks*, 7, 287-322.

Borgotti, S., Everett, M., & Freeman, L. (1992). *UCINET IV: A microcomputer package for network analysis*. Columbia, SC: Analytic Technologies.

Bowman, E. H. (1984). Content analysis of annual reports for corporate strategy and risk. *Interfaces*, 14, 61-71.

Carley, K. M. & Kaufer, D. S. (1993). Semantic connectivity: An approach for analyzing symbols in semantic networks. *Communication Theory*, 3, 183-213.

Chikudate, N., Barnett, G. A., & McFarland, S. D. (1990). A cross-cultural examination of organizational culture: A comparison between Japan and United States. Paper presented to International Communication Association, Dublin.

Danowski, J. A. (1988). Organizational infographics and automated auditing: Using computers to unobtrusively gather and analyze communication. In G. Goldhaber & G. A. Barnett (Eds.) *Handbook of organizational communication* (pp. 335- 384). Norwood, NJ: Ablex.

Danowski, J. A. (1993). Network analysis of message content. In W. D. Richards & G. A. Barnett (Eds.) *Progress in communication science, XII* (pp.197-221).Norwood, NJ: Ablex.

Danowski, J. A. & Huang, H. (1994). Organizational restructuring and changes in semantic networks in messages directed to external audiences. Paper presented to International Communication Association, Sydney.

Deal, T. E. & Kennedy, A. A. (1982). *Corporate cultures: The rites and rituals of corporate life*. Reading, MA: Addison-Wesley.

Fiol, C. M. (1989). A semiotic analysis of corporate language: Organizational boundaries and joint venturing. *Administrative Science Quarterly*, 34, 277-303.

Freeman, C. A. & Barnett, G. A. (1994). An alternative approach to using interpretative theory to examine corporate messages and organizational culture. In L. Thayer, & G. A. Barnett (Eds.) *Organizational communication: Emerging perspectives IV* (pp. 60-73). Norwood, NJ: Ablex.

Gorman, L. (1987). Corporate culture: Why managers should be interested. *Leadership and Organization Development Journal*, 8, 3-9.

Hoffman, D. L. & Franke, G. R. (1986). Correspondence analysis: Graphical representation of categorical data in market research. *Journal of Marketing Research*, 23, 213-127.

Johnson, S. C. (1967). Hierarchical clustering schemes. *Psychometrica*, 32, 241-254.

Klecka, W. R. (1980). *Discriminant analysis*. Beverly Hills, CA: Sage.

Kohut, G. A. & Segars, A. H. (1992). The president's letter to stockholders: An examination of corporate communication strategy. *The Journal of Business Communication*, 29, 7- 21.

Kulper, S. (1988). Gender representation in corporate annual reports and perceptions of corporate climate. *The Journal of Business Communication*, 25, 87-94.

Monge, P. R. & Eisenberg, E. M. (1987). Emergent communication networks. In F. M. Jablin, L. L. Putnam, K. H. Roberts, & L. W. Porter (Eds.) *Handbook of organizational communication: An interdisciplinary perspective* (pp. 304-342). Newbury Park, CA: Sage.

Rogers, E. M. & Kincaid, D. L. (1981). *Communication networks: Toward a new paradigm for research*. New York: The Free Press.

Schein, E. A. (1985). *Organizational culture and leadership: A dynamic view*. San Francisco: Jossey-Bass.

Sims, B. R. & Guice, S. (1992). Differences between business letters from native and non-native speakers of English. *The Journal of Business Communication*, 29, 23-39.

Smith, G. R. & Kleiner, B. H. (1987). Differences in corporate cultures and their leadership to organizational effectiveness. *Leadership and Organization Development Journal*, 8, 10-12.

Stohl, C. (1993). European managers' interpretations of participation: A semantic network analysis. *Human Communication Research*, 20, 97-117.

Woelfel, J. (1993). Artificial neural networks in policy research: A current assessment. *Journal of Communication*, 43, 62-80.

Woelfel, J. & Holmes, R. (1982). CATPAC demonstration. Paper presented to International Communication Association, Boston.

Woelfel, J. & Fink, E. L. (1980). *The measurement of communication processes: Galileo theory and method*. New York: Academic Press.

NOTES

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2. Ha-Yong Jang is a doctoral student in the Department of Communication, State University of New York at Buffalo.

3. George A. Barnett is Professor of Communication at the State University of New York at Buffalo.

4. Initially, 18 Japanese companies were chosen but the text of NEC was not available from the database. Therefore, only 17 companies were included in the actual analysis.

5. Two companies are matched as a pair if they have same two digits (a major business division) within their first three SIC codes. PEPSICO and ITO YOKADO is an exception. Although they are not matched by the SIC codes, authors selected them considering their public images; Pizza Hut and K.F.C from PEPSICO, and Denny's and Seven-Eleven from ITO YOKADO. However, due to the subjective nature of this selection, it would be one of limitations of this study.

6. Every sentence of text is separated from every other by a delimiter in order to insure its analysis as phrases rather than single words, or a window of specified length (usually 5 to 7 words long) is passed over the text, such that two words are considered to co-occur if they are copresent in the same window.

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