A Study of Accounting Standard-Setting using Graph Theory

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Abstract: Accounting standards settings are subject to political activities by preparers or companies. Despite of strong objections from preparers of financial statements, the FASB set the conceptual and user-oriented accounting standards on business combinations. The aim of this paper is to clarify who or what kinds of groups played central roles in, using graph theory. These analyses using voice data and data produced from voting behaviors in the board meetings reveals that the centrality of preparer (group) is low, and ones of academician (group) and user (group) are high in this project. This result may indicate that what blows hole in the powers of preparers in the FASB exists.

Keywords: accounting standard-setting, graph theory, centrality, FASB, business combinations

I. INTRODUCTION

The numbers in financial statements effect the decision making of the users of financial statements, and change the distribution of wealth and the allocation of resources in a whole society. The changes or creations of accounting standards or regulations sometimes make profits of companies fall, and make positions in corporate financings worse. To avoid unfavorable results and gain favorable results, companies and other stakeholders will intervene accounting standard settings. Therefore, the standards setting processes are subject to political activities, as we have seen in cases in history (Horngren [1], Zeff [2], Kelly-Newton [3], Wolk, et al. [4]).

In setting the accounting standards, the setters such as the International Accounting Standards Board (IASB) and the Financial Accounting Standards Board (FASB) usually proceed with setting conceptual-based and user-oriented accounting standards, because they have responsibilities for protecting users and conceptual framework which they should follow in the setting standards. When the standards make unfavorable results for companies or preparers of the financial statements that are regulated by the setters, they wish to prevent setting standards. Therefore, the conflict between preparers of the financial statements and users of these statements often has occurred.

When such conflicts occurred, how have the setters set the accounting standards? Or, what kinds of group in the setters played important roles? This paper focuses on the internal structures of the setter, or the relationships of members in the setter, and aims to clarify the above second question using the centrality concept in the graph theory. To achieve this purpose, this paper covers the FASB's Business Combinations Project, Phase II. Because this project prominently occurred the conflict between preparers and users.

II. OUTLINE OF THE FASB'S BUSINESS COMBINATIONS PROJECT

The main purposes of the project were to provide for the consistent application of the purchase method or the acquisition method, and to set a single high-quality global accounting standard. For accomplishing such purposes, the FASB proposed the provisions which had three features. The first feature is to establish measuring fair values as the measurement principle. All assets and liabilities that are recognized in a business combination, including identifiable assets acquired and liabilities assumed, and noncontrolling interests, should be measured by fair values. The second feature is the application of the full goodwill method, which is derived from the above proposition. Finally, the third feature is to classify noncontrolling interests into the equity section. As a result of the classification, the transactions between controlling interests and noncontrolling interests would be viewed as equity transactions (FASB [5] [6]). These propositions are based on the economic unit concept, which was described as one of the conceptual basis for consolidated financial statements in the FASB's Discussion Memorandum (FASB [7]). Thus, it is thought that the boards set the standard which is weighted in favor of conceptual thinking.

These propositions may make companies some harmful effects. The full goodwill method needs to estimate fair value of the noncontrolling interests. Usually, as the fair values of the interests will be much higher than the carrying amounts, the amounts of goodwill will be incremental. It means that if the impairment losses of the goodwill occur, the losses are much bigger than applying the original method and exert enormous influences to profits of companies (Dennis [8]). And, because of the difficulties of estimating fair values, preparation costs of financial statements increase through rising auditing fees (IASB [9]). In fact, nearly all the preparers that responded to the board and most of participants in business roundtable meetings heavily criticized these propositions.

Throughout 2006 to 2007, the FASB redeliberated the issues, which were raised by the respondents and the participants, in the board meetings. As a result of the redeliberations, in December 2007, the FASB issued final statements, SFAS141(R) and SFAS160 (FASB [10] [11]). Despite of receiving heavy critiques, the FASB decided on almost the same provisions as originally planned.

III. THE CENTRALITY CONCEPTS IN GRAPH THEORY

Graph theory seeks to model relationships in the network to depict the network structure. The most basic feature of graph theory is quantified by considering the relations measured among the actors in a network. Methods using in network analysis provide descriptions of structural properties of actors, subgroups of actors, or groups. Another feature of graph theory is to describe the network structure using a graph. A graph is expressed for the network relationships using nodes and edges. Nodes refer to the actors or the organizations, and edges to the linkage between them (Wasserman and Faust [12]).

A main concern of graph theory is generally to make clear the centrality of the network. It is important that we know who is central, who is a leader within the network, and who influences the network most heavily. However, centrality is equivocal. Therefore, graph theory has some indicators useful for studying the centrality of the network, for example, degree centrality, closeness centrality, betweenness centrality, and so on (Wasserman and Faust [12], Scott [13], Hanneman and Riddle [14], Knoke and Yang [15]).

Degree centrality supposes that actors who have more ties to other actors have advantaged positions. Degree centrality measures the extent to which a node (actor) connects to all other nodes in the network.

$$C_D(n_i) = \frac{\sum_j n_{ij}}{g-1} \tag{1}$$

where n_{ij} means the node in the network, normalized actor degree centrality measure, $C_D(n_i)$, divides an actor i's degree centrality score by the maximum number of possible connections with the $g-1$ other actors.

Closeness centrality supposes that the closer an actor reaches to all others within the organization, the more important the actor becomes. Closeness centrality measures how near a node is to the other nodes in the network.

$$C_C(n_i) = \frac{g-1}{\sum_{j=1}^{g} d(n_i, n_j)} (i \neq j) \tag{2}$$

where $d(n_i, n_j)$ means the distance between node i and node j that is the another in the network. The closeness centrality measure is computed as the inverse of the sum of the geodesic distances of the both and multiplying by $g-1$ in order to normalize.

Betweenness centrality supposes that an actor who becomes a mediator among actors becomes the source of power. Betweenness centrality measures the extent to which other actors lie on the geodesic path between pairs of nodes in the network.

$$C_B(n_i) = \frac{\sum_{j<k} [g_{jk}(n_i)/g_{jk}]}{(g-1)(g-2)/2} \tag{3}$$

where g_{jk} means the number of geodesic paths between the two nodes j and k, and $g_{jk}(n_i)$ is the number of geodesics between the j and k that contain node i. Then, dividing $g_{jk}(n_i)$ by g_{jk} measures the proportion of geodesic paths connecting j and k in which node i is involved. The betweenness centrality measure is computed by summing the portions and then dividing the sums by the theoretical value, $\frac{(g-1)(g-2)}{2}$, in order to normalize.

IV. RESEARCH QUESTIONS AND RESEARCH DATA

Research Questions

The accounting standard setters usually are comprised of the members who have various backgrounds such as preparers, users, auditors, and academicians, in order to acquire the legitimacy of the organizations from the constituents. In those days when the FASB addressed the business combination project, the board was composed with seven members; three CPAs, two preparers, one user, and one academician (Miller and Redding [16]).

In considering facts described in section II, it is anticipated that, in setting the standards, the power in the FASB lay not on the preparer's side, but on the user's and academician's side. Thus, research questions in this paper are that:

(1) Are the centralities of the preparer's side relative low? And,

(2) Are the centralities of the user's and academician's side relative high?

Using Data

To testify the above questions, this paper uses two data sets. Both sets are extracted from the 28 minute records which have been released on the FASB's website (from October 30, 2002 to April 27, 2005), before issuing the propositions on June 30, 2005. One data set is data extracted from the voices among members in the board meetings. The aim of using this data set is to specify what kinds of group have influential powers in the network. Table 1 shows the counts of voices on the basis of member to member in matrix style.

Table 1 Voice Data

	Herz	Batavick	Crooch	Foster	Schieneman	Schipper	Seidman	Trott	Wulff	Young
Herz	–	10	10	3	15	16	15	36	12	0
Batavick	10	–	8	0	6	10	9	28	0	1
Crooch	10	8	–	3	8	13	10	31	6	3
Foster	3	0	3	–	3	4	0	7	10	0
Schieneman	15	6	8	3	–	12	13	30	9	0
Schipper	16	10	13	4	12	–	19	45	9	0
Seidman	15	9	10	0	13	19	–	28	0	1
Trott	36	28	31	7	30	45	28	–	16	2
Wulff	12	0	6	10	9	9	0	16	–	0
Young	0	1	3	0	0	0	1	2	0	–

Another set is data extracted from voting behaviors in the meetings. The FASB voted 113 times during the term. The aim of using this data set is to confirm the similarities among the members and to specify what kinds of group dominant in the decision making in the network. This data set is made from the data on each actor's voting behaviors using an affiliate analysis in UCINET VI (Borgatti, et al. [17]). Table 2 shows the analytical result, that is, the homogeneities of voting behaviors on the basis of member to member in

matrix style.

Table 2 Data on Homogeneities of Voting Behaviors

	Herz	Batavick	Crooch	Foster	Schieneman	Schipper	Seidman	Trott	Wulff	Young
Herz	113	74	87	12	92	99	84	92	16	7
Batavick	74	80	62	0	63	68	73	67	0	7
Crooch	87	62	103	18	76	89	69	84	14	9
Foster	12	0	18	24	10	16	0	16	8	0
Schieneman	92	63	76	10	104	82	69	79	18	0
Schipper	99	68	89	16	82	113	78	100	16	7
Seidman	84	73	69	0	69	78	88	73	0	7
Trott	92	67	84	16	79	100	73	108	12	7
Wulff	16	0	14	8	18	16	0	12	24	0
Young	7	7	9	0	0	7	7	7	0	9

In addition, Table 3 shows the list of FASB members from the beginning of the project (June, 2001) to issuance of the propositions. In this table, Time 1 is the beginning of the project. Time 2 is the starting point for disclosing minutes on the FASB's website. Time 3 is when Seidman succeeded Wulff. Time 4 is when Batavick succeeded Foster, and Time 5 is the point when Young succeeded Schieneman.

Table 3 List of FASB members in the Business Combinations Project

Time 1 (Jun-01)	Time2 (Oct-02)	Time 3 (Jul-03)	Time 4 (Aug-03)	Time5 (Jan-05)
Jenkins (CPA), chairman	Herz (CPA), chairman	Herz (CPA), chairman	Herz (CPA), chairman	Herz (CPA), chairman
Crooch (CPA)	Crooch (CPA)	Crooch (CPA)	Crooch (CPA)	Crooch (CPA)
Trott (CPA)	Trott (CPA)	Trott (CPA)	Trott (CPA)	Trott (CPA)
Foster (Non-Financial)	Foster (Non-Financial)	Foster (Non-Financial)	Batavick (Non-Financial)	Batavick (Non-Financial)
Larson (Financial)	Wulff (Non-Financial)	Seidman (Consultant)	Seidman (Consultant)	Seidman (Consultant)
Cope (Analyst)	Schieneman (Analyst)	Schieneman (Analyst)	Schieneman (Analyst)	Young (Analyst)
Mueller (Academic)	Schipper (Academic)	Schipper (Academic)	Schipper (Academic)	Schipper (Academic)

(shaded parts means the succeeding member)

V. RESULTS AND DISCUSSIONS

Results of Centralities Based on the Voice Data

This paper analyses two data sets from the perspective of above three centralities using UCINET VI. Table 4 presents the results of multiple centrality analysis based on the data of Table 1. Table 4 reveals that the centralities of Trott (CPA) and Crooch (CPA) are very high, and those of Herz (CPA), Schieneman (user), and Schipper (academician) are relatively high. And, Figure 1 shows the graph based on the result of centralities using NetDraw (Borgatti [18]). Thus, in terms of the centrality based on the voices in the network, it is clearly seen that CPAs might be at the centre of the board meetings with support from academician and user.

Table 4 Results of Multiple Centrality Analysis based on Voice Data

Normalized Centrality Measures

	Degree	Closeness	Betweenness
Herz	88.889	90.000	2.222
Batavick	77.778	81.818	2.083
Crooch	100.000	100.000	7.083
Foster	66.667	75.000	0.000
Schieneman	88.889	90.000	2.222
Schipper	88.889	90.000	2.222
Seidman	77.778	81.818	2.083
Trott	100.000	100.000	7.083
Wulff	66.667	75.000	0.000
Young	44.444	64.286	0.000

Descriptive Statistics for Each Measure

	Degree	Closeness	Betweenness
Mean	80.000	84.792	2.500
Std Dev	16.330	10.835	2.477
Sum	800.000	847.922	25.000
Variance	266.667	117.390	6.134
SSQ	66666.664	73071.086	123.843
MCSSQ	2666.667	1173.898	61.343
Euc Norm	258.199	270.317	11.128
Minimum	44.444	64.286	0.000
Maximum	100.000	100.000	7.083

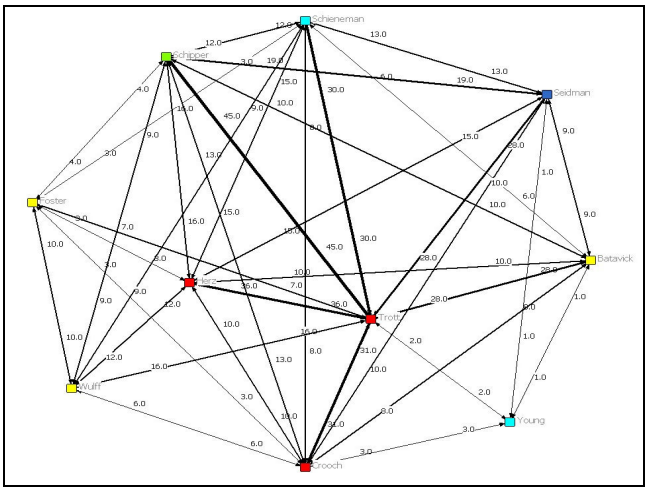

Figure 1 The Graph Based on the Centrality Analysis (prepared with NetDraw)

Results of Centralities Based on Data of Voting Behaviors

Table 5 presents the results of multiple centrality analyses based on the data in Table 2. These analyses include three centralities, like above analysis. Table 5 reveals that, for all three indicators of centralities, the centralities of Herz, Crooch, Schipper, and Trott are very high, and those of Schieneman are relatively high. In terms of the centrality based on the homogeneity of voting behaviors, it is clearly seen that CPAs and academician might be at the centre of the board meetings with support from user.

Table 5 Results of Multiple Centrality Analysis based on Voting Behavior Data

Normalized Centrality Measures

	Degree	Closeness	Betweenness
Herz	100.000	100.000	4.074
Batavick	77.778	81.818	0.463
Crooch	100.000	100.000	4.074
Foster	66.667	75.000	0.000
Schieneman	88.889	90.000	2.222
Schipper	100.000	100.000	4.074
Seidman	77.778	81.818	0.463
Trott	100.000	100.000	4.074
Wulff	66.667	75.000	0.000
Young	66.667	75.000	0.000

Descriptive Statistics for Each Measure

	Degree	Closeness	Betweenness
Mean	84.444	87.864	1.944
Std Dev	14.229	10.785	1.843
Sum	844.444	878.636	19.444
Variance	202.469	116.324	3.395
SSQ	73333.328	78363.430	71.759
MCSSQ	2024.692	1163.244	33.951
Euc Norm	270.801	279.935	8.471
Minimum	66.667	75.000	0.000
Maximum	100.000	100.000	4.074

An Additional Test

Above analyses are performed on the basis of the individual-level data. Members of the FASB are different from the points of starting career as a member. As there are some variances on numbers of participating in the board meetings, of voices, and of votes among members in certain project, the centrality analyses based on the individual-level have limits to some extent.

Thus, this paper performs the core/periphery analysis based on the data of group-level as an additional test to verify the above results. This analysis seeks to

identify a set of actors who have a high-density of ties among themselves (the core) by sharing many events in common, and another set of actors who have a very low-density of ties among themselves (the periphery) by having few events in common (Hanneman and Riddle [14]). This analysis divides both the rows and the columns into two classes. One of the blocks on the main diagonal is a high-density block; the other block on the main diagonal is a low-density block.

Data using in this analysis is the group-level data on homogeneity of voting behaviors to which transforms data shown in Table 2 from the individual-level. This analysis divided the FASB's members by seven groups according as backgrounds of the members. Table 6 shows the result of this analysis. It is clearly seen that one CPA group (Herz), Academician group (Schipper), and User group (Schieneman/Young) lie on the core, in contrast, two CPAs (Crooch, Trott) and two Preparer groups (Foster/Batavick, Wulff/Seidman) lie on the periphery. Similar to other indicators, this result also shows that Academician group and User group play important roles at the FASB's decision-making processes.

Table 6 Result of Core/Periphery Analysis based on Group-Level Data

Blocked Adjacency Matrix

	CPA(Her)	Academician(Sch)	User(Sch/You)	Preparer(Fos/Bat)	CPA(Cro)	Preparer(Wul/Sei)	CPA(Tro)
CPA(Her)	113	99	99	86	87	100	92
Academician(Sch)	99	113	89	84	89	94	100
User(Sch/You)	99	89	113	80	85	94	86
Preparer(Fos/Bat)	86	84	80	104	80	81	83
CPA(Cro)	87	89	85	80	103	83	84
Preparer(Wul/Sei)	100	94	94	81	83	112	85
CPA(Tro)	92	100	86	83	84	85	108

Density Matrix

	1	2
1	95.667	89.750
2	89.750	82.667

Discussions

From what has been discussed above, it seems that an accounting standard on business combinations might be developed under the network structure, in which CPAs, academician, and user are central and core positions, in contrast, preparers are periphery positions. The results are consistent with facts surrounding the standard, which might be proposed a conceptual and user-oriented standard and might be criticized heavily from preparers. Therefore, it seems that the standard was needed, not for the preparers, but for the users.

VI. CONCLUSION

Above discussions may indicate that what blows hole in the powers of preparers or companies in the FASB exists. That is, in the circumstances where the board faces the accounting standard-setting competition with the IASB, the FASB may strengthen links with user's group in order to acquire a competitive advantage. To clarify this point, it is necessary to broaden research subjects and to perform cross-sectional and time-series analyses.

Significances of this research using graph theory are to testify the accounting standard-settings from the perspective of network structure with quantified data analyses. Especially, this paper may test the validity of intuitional results with these analyses. Although it is necessary to elaborate research methods, in this regard, it is thought that this paper made a kind of contribution.

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