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A METHODOLOGY FOR REDESIGNING AN ORGANIZATIONAL STRUCTURE BASED ON BUSINESS PROCESS MODELS USING SNA TECHNIQUES

Seongcheol Hong[1], Yonghyuk Lee[2], Jinwoo Kim[1] and Injun Choi[1,*]

[1]Department of Industrial and Management Engineering
Pohang University of Science and Technology
77 Cheongam-Ro, Nam-Gu, Pohang, Gyungbuk 790-784, Korea
{ sergearnt; phantazy }@postech.ac.kr; *Corresponding author: injun@postech.ac.kr

[2]Department of Information Service
Dangjin Steel Factory, Hyundai Steel
Dangjingun, Chungcheongnamdo, Korea
yhlee@hyundai-steel.com

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Abstract. *This paper proposes a methodology to derive an organizational structure that is suitable for business processes performed in an organization. The methodology uses social networks whose nodes are organizational units and whose arcs are transfers of work between two organizational units in terms of business processes. Social networks are analyzed using various SNA techniques. Redesigning guidelines are given using the analysis results. This methodology can be used to design an optimal organizational structure in terms of business processes and vice versa. A case study is presented to illustrate the validity and applicability of the methodology. This is also expected to contribute to enhancing the organizational performance.*

Keywords: Business process, Organizational structure, Social network analysis, Business process analysis, Business process reengineering

1. **Introduction.** There have been numerous efforts and research for the successful Business Process Management (BPM). However, there are limitations on getting good results because mostly research focused on the efficiency of the process itself or IT applications; they only focused on cutting time and reducing expense. However, from various references we can notice that many companies failed to improve business processes because they were not suitable for organizational structure. For the successful Business Process Improvement (BPI), the business processes are not only improved but the organizational system and the operating system are also reformed [1]. IT is not only innovated for Process Innovation (PI) but the organization and the personnel management are also changed according to business processes [2]. Also the processes of a company have to form organization with strategy, structure, reward and people [3]. Interactions between processes and organizational structure are critical to achieve the goals within a company's expectations and to succeed the activities such as BPR, PI and Six-Sigma [4]. In [5-9], the authors have led the research considering both business processes and organizational structure.

From literature above, we can understand that the potent factor which hinders companies from operating achievements is the mismatch between business processes and organization system. Thus, this paper proposes a methodology that helps to seek the organizational structure of a company to perform its business processes well. This paper extends research of [5-9] to derive organizational structure using Social Network Analysis (SNA) techniques. Existing research is built on concepts from process mining and mining

social networks. Especially, this paper is based on the concept of mining social relations from process models in [7,8], but this paper goes further more research on practical applications for redesigning organizational structure. This paper focuses at redesigning organizational structure beyond analyzing social relations simply. In existing research [8], various SNA techniques were used for building the table of taxonomy to guide applications on different circumstances. However, all contents of the table are not meaningful because of ambiguous and overlapping meanings. To avoid these points, this paper suggests the problems-oriented approach to solve business problems clearly by SNA techniques.

This paper is composed as the following. Section 2 introduces metrics which measure business processes and SNA techniques. Section 3 explains the framework and 5 problems to solve in this paper. And the redesigning guideline is provided. Section 4 shows an application case from the standard model of business processes. At last, Section 5 summarizes and states contribution, limitation and future research.

2. **The Review of Related Works.** This methodology is based on the concept of mining social networks from process models. The metrics were defined to derive relations between resources from process logs in [5,6] and from process models in [7,8]. In order to mine relations between resources from process models, two kinds of metrics were suggested in [7]: metrics based on causality and cooperation. Metrics based on causality have two metrics related to causality: transfer-of-work and subcontracting. This paper uses the concept of transfer-of-work by reason of easiness for an application. The basic idea of the transfer-of-work metrics is that organizational units are related if there is a transfer-of-work from an organizational unit to another. The transfer-of-work metrics ($\triangleright$) is defined as:

Definition 2.1. ($\triangleright$) *Let PM be process models. T is the set of all tasks, $T = \{t_1, t_2, \ldots, t_m\}$. R is the set of all resources, $R = \{r_1, r_2, \ldots, r_n\}$. The function, $\pi(T) = R$, means the unique resource of a task. For $t \in T$, $r \in R$:*

$$|r_1 \triangleright_{PM} r_2| = \sum_{\substack{t_i, t_j \in T \\ i,j = \{1,2,\ldots,m\}}} \begin{cases} 1, & \text{if } (t_i \text{ is followed by } t_j \text{ in } PM) \\ & \text{and } (\pi(t_i) = r_1 \wedge \pi(t_j) = r_2) \\ 0, & \text{otherwise} \end{cases} \quad (1)$$

$|r_1 \triangleright_{PM} r_2|$ is a function that returns the number of transfer-of-work times between r_1 and r_2 in PM. The metrics count business relations between two performers that are adjacent. A social network whose nodes are resources and whose arcs are business relations between two resources is derived by the metrics. As counting all relations between two performers are repeated, a square matrix of $(n \times n)$ is derived. The matrix represents a social network and becomes a source for SNA techniques. The network is normally called a social network in SNA because it is based on various social relations between social members. In this paper, however, it is called a process network because it is based on only business relations between resources which are performing tasks.

SNA is the theory that has focused at explanation for social members on relational properties rather than their attributes [10]. The major role of SNA is to research types and patterns from social relations. The research based on the social network started from the beginning of 1930. J. Moreno introduced SNA as the tool of sociometry [11]. Sociometry refers to methods presenting data on interpersonal relationships in graph or matrix form [12,13]. SNA techniques started from social science area but they are expanding the application areas, not only analyzing relations among people and groups, but also epidemics, disasters and various accidents [14-22].

SNA techniques are useful tools to find organization structure appropriate to business processes because they can analyze business relations among members of organization.

This paper uses degree centrality, betweenness centrality, and clique analysis on the relational aspect, and graph theoretical dimensions, structural equivalence, and block modeling analysis on the positional aspect. For more information on SNA we refer to [23].

3. **The Framework of a Methodology.** This methodology has four phases, to collect source data, to derive a process network, to diagnose 5 problems, and to suggest alternatives of redesigning organizational structure. Figure 1 shows the framework of a methodology.

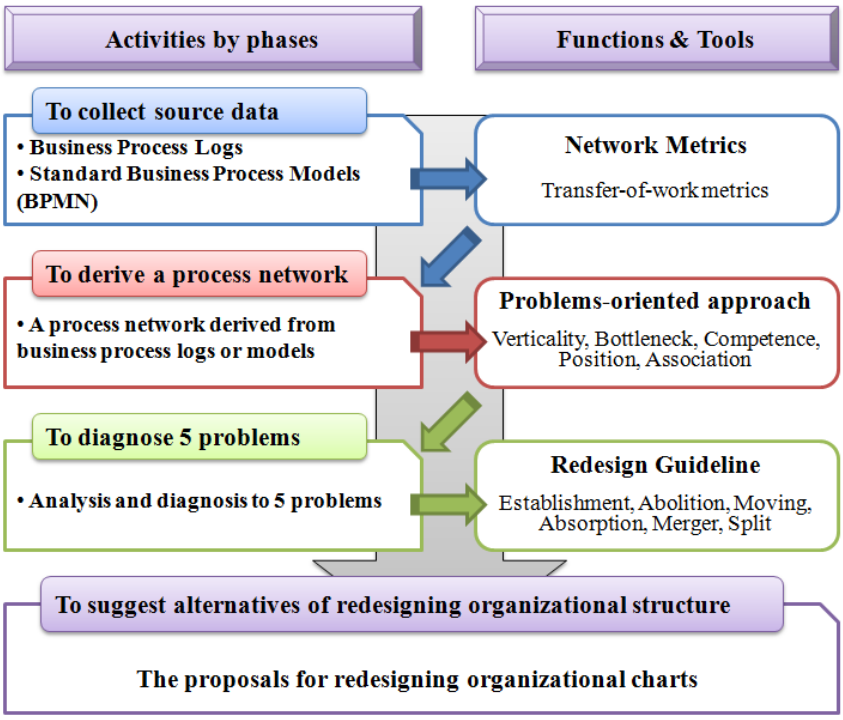

FIGURE 1. The framework of a methodology

The first phase is to collect the source data such as business process logs or models. This paper begins from business process models worth prototypes. Business process models, which are modeled by BPMN in this paper, are measured by transfer-of-work metrics which derive a matrix. The matrix is transformed into a process network in the second phase. In the third phase, the process network is diagnosed by the problems-oriented approach, i.e., five problems, using SNA techniques not methods-oriented approach in the existing research. In the last phase, it is suggested how organizational structure will become by the redesign guideline.

3.1. **Verticality of workflows.** The first problem is to understand how a workflow is made of vertical structure. In order to analyze verticality, we use the graph theoretical dimensions which are composed of connectedness, efficiency, hierarchy and LUBness (Least Upper Bound) suggested by Krackhardt [24]. This paper interprets them as terms of business processes and organizational structure, except for efficiency because of senselessness in a process network. For more details on this theory, we refer readers to [24] and the formulae therein.

The connectedness score is measured by the proportion of nodes which are reachable to other nodes. The larger links between nodes are, the higher the score is naturally. The high score means that the distance between organizational levels may be short or the number of them may be low in terms of organizational structure.

The hierarchy score quantifies how asymmetric the reachability between nodes is in a network. The asymmetric relations mean that the direction of relations between two nodes is only one-side. If a network has only ordered relations and no feedbacks, it is a complete hierarchic graph. The greater the extent of asymmetry is, the more hierarchical the structure of a network can be in terms of organization because the asymmetry inside organization means that a number of nodes flock to the specific nodes and the authority or the power is focused on the specific positions. Therefore, if the structure of a network has symmetric relations which are directed by both-sides, the score values at 0.

The LUBness is the score which measures how many each pair of nodes has a least upper bound. They each must have been under the control of third node in the organization. The third node must be someone to whom they both defer in a network. In a formal organizational structure, the LUBness of two employees is the closest boss who has formal authority over both of them. This score can be regarded to the index in terms of organization, span-of-control principle, which refers to the number of subordinates a supervisor has and controls.

3.2. **The degree of bottlenecks.** The second problem asks how the bottleneck of each node is in tasks. A bottleneck occurs if the inflow is higher than the outflow. To analyze the degree of a bottleneck, this paper uses degree centrality analysis of SNA techniques and proposes a bottleneck-index. The degree of a node means that the number of links connected to it directly. The degree centrality is defined as below in [25]:

Definition 3.1. (C_D) *Let N be the set of nodes, $N = \{n_1, n_2, \ldots, n_g\}$. $d_I(n_i)$ is the number of in-degree of n_i and $d_O(n_i)$ is the number of out-degree of n_i, $i = \{1, 2, \ldots, g\}$. $C_D(n_i)$, degree centrality is defined two separate measures; C_{ID} as in-degree and C_{OD} as out-degree.*

$$C_{ID}(n_i) = \frac{d_I(n_i)}{g-1}, \quad C_{OD}(n_i) = \frac{d_O(n_i)}{g-1} \tag{2}$$

In a process network, the degrees are regarded as the amount of tasks. The in-degree means the amount of tasks ordered by other nodes while the out-degree means the amount of tasks ordering to other nodes. In terms of a process network, the node which means organizational unit can have a large number of tasks. The degree of a bottleneck proposed in this paper is defined as below:

Definition 3.2. (B) *The bottleneck-index, $B(n_i)$ is meaning the degree of the bottleneck of n_i.*

$$B(n_i) = 1 - \frac{C_{OD}(n_i)}{C_{ID}(n_i)} = \begin{cases} \text{if } B(n_i) \le 0, & \text{then there is not a bottleneck} \\ \text{if } 0 < B(n_i) < 1, & \text{then there is a bottleneck} \\ \text{if } B(n_i) = 1, & \text{then it is meaningless because } C_{OD} = 0 \end{cases} \tag{3}$$

3.3. **The core competence of business processes.** The third problem is to find competitive business processes of a company based on the concept of the value chain. The value chain suggested by Michael Porter is composed of the primary and the support activity to make a profit of a company [26]. In order to find the core competence in business processes, resources such departments are classified by value activities through the block-modeling. It is one of the SNA techniques to define coessential blocks by attributes of nodes [23]. A block represents a group of the same attributes of business activity in this paper. The block-modeling derives an image matrix indicating the presence or absence of a link among blocks. Only significant links between blocks remained by the alpha rule cutting insignificant ones. If the weight of a link between blocks is larger than the density

of a network, it is defined as 1 that means there is a relationship between them; otherwise, it is defined as 0 that means there is no relationship. The density of a network is used as the arbitrary density generally [23]. From the result, if a large number of links connected to a block, the block can be regarded as the core competence by high degree centrality.

3.4. **Authority that corresponds to the position.** The fourth problem is to understand whether a performer has adequate authority that goes with rank of position. Position accompanies responsibility and authority; for instance, if an unauthorized person performs works more and vice versa, these facts cause problems on the organizational structure. In order to solve these problems, the usages of structural equivalence and flow-betweenness centrality analysis are proposed.

The structural equivalence analysis clusters nodes who have structural similarity of roles and positions such as teacher-student and doctor-nurse-patient in the social network [10,23]. A cluster represents the group of a similar position and role in a social network [19,27]. Thus, it can represent the positions such as supervisor-manager-chief in a process network. In addition, the number of clusters can be regarded as the number of position or level of organizational structure. To measure structural equivalence, Euclidean distance measure is used. It was developed by Burt [23] and has been applied to a wide range of substantive and theoretical problems. It is defined as below in [27]:

Definition 3.3. (d_{ij}) *Let x_{ik} be the value of the link from n_i to n_k on a single relation. We define a distance measure d_{ij} of structural equivalence for n_i and n_j as the Euclidean distance between the links to and from these nodes. For n_i and n_j, this is the distance between rows i and j and columns i and j of the sociomatrix:*

$$d_{ij} = \sqrt{\sum_{k=1}^{g} [(x_{ik} - x_{jk})^2 + (x_{ki} - x_{kj})^2]}, \quad \text{for } i \neq k, j \neq k. \tag{4}$$

However, only the value of d_{ij} by itself cannot indicate whether the relative level of the position is high or not. In order to clarify the rank of position, flow-betweenness centrality analysis which measures how a node can conduct as a mediator between links is used. The flow-betweenness centrality is defined as below [28]:

Definition 3.4. (C_F) *Let m_{jk} be the maximum flow from n_j to another n_k. And let $m_{jk}(n_i)$ be the maximum flow from n_j to n_k that passes through n_i. Then the degree to which the maximum flow between all unordered pairs of nodes depends on n_i, where $j < k$ and $i \neq j \neq k$ is*

$$C_F(n_i) = \sum_{j<k}^{g} \sum_{j \neq k}^{g} m_{jk}(n_i) \tag{5}$$

A high $C_F(n_i)$ says that n_i exerts his influence on other pairs of n_j and n_k. The node has the authority on information control. Thus, in a process network, a performer with high flow-betweenness centrality can have the control power on business processes.

3.5. **The degree of business cooperation.** The last problem is to discover how well the shape of organizational structure is built as considering cooperation among performers. If cooperation among departments on business processes is close, i.e., there are a number of associations among tasks of them, the procedure of tasks can be more effective by making their distance close on organizational structure. To analyze this problem, clique analysis method of SNA techniques and the association-rule in data-mining techniques are used.

A clique in a social network is a subgroup that people who have the same doctrine or claim and interest gathered. In other words, it is a subordinate network within the

network [10,23]. Thus, a clique on a process network is regarded as a subordinate group that cooperative departments gather by relevant their tasks.

The association-rule makes us explore all cooperation among departments. The result of clique analysis is regarded as a transaction list for applying the association-rule in this paper. If the association-rule proves that certain relations among departments are significant statistically, it says that they have strong business relations with one another.

3.6. **The alternatives of redesigning organizational structure.** Figure 2 shows the cases of the alternatives to guide redesigning organizational structure in the viewpoint of departments. The cases are comprised of all possible solutions, which are divided into total 6 types; there are department establishment, abolition, and movement for only one department and absorption, merger, and split for multiple departments. According as the scope of redesign, the alternatives are divided into the entire and the partial level. For example, for a department, the establishment means establishing a new department on the entire level, but extending a unit into a larger unit on the partial level. In another case, for multiple departments, the absorption means that a whole unit is absorbed into the other department on the entire level, but the partial unit of a department is absorbed into the other department on the partial level. In other words, the entire level indicates that the starting point is a whole department, but the point is the part of a department on the partial level. Through this table, the results of SNA can be mapped to the alternatives for the reorganization of departments.

	For a department			For multiple departments		
	Establishment	Abolition	Moving	Integration		Split
				Absorption	Merger	
Entire						
	Establishing a new unit	Abolition or Outsourcing	Transferring the whole of a unit	Absorbing a unit	Merger between multiple units	Split into multiple units
Partial						
	Extending a unit	Reduction or partial outsourcing	Transferring a unit partially	Absorbing a part of unit	Merger between parts of them	Split a unit

FIGURE 2. The guideline for redesigning alternatives

4. **Application of a Methodology and Interpretation of Results.** This paper uses a standard model of business processes designed and distributed by TIPA (Korea Technology and Information Promotion Agency for SME) as the source of analysis [29]. The industry of the model is the communication and broadcast equipments. The model is comprised of total 99 standardized business processes. The organizational system is represented temporarily as shown in Figure 3. The arbitrary organizational structure has the functional structure.

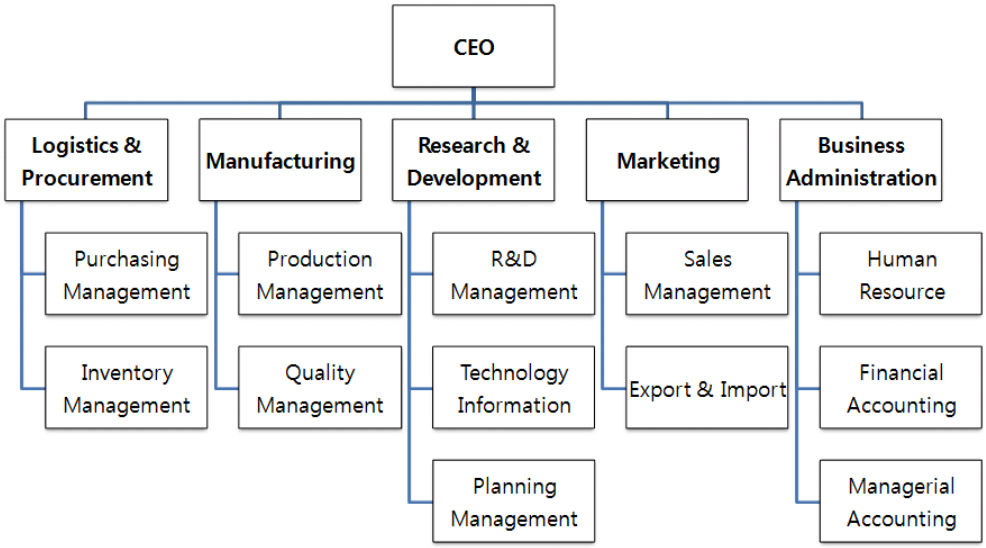

FIGURE 3. The organizational chart of a company

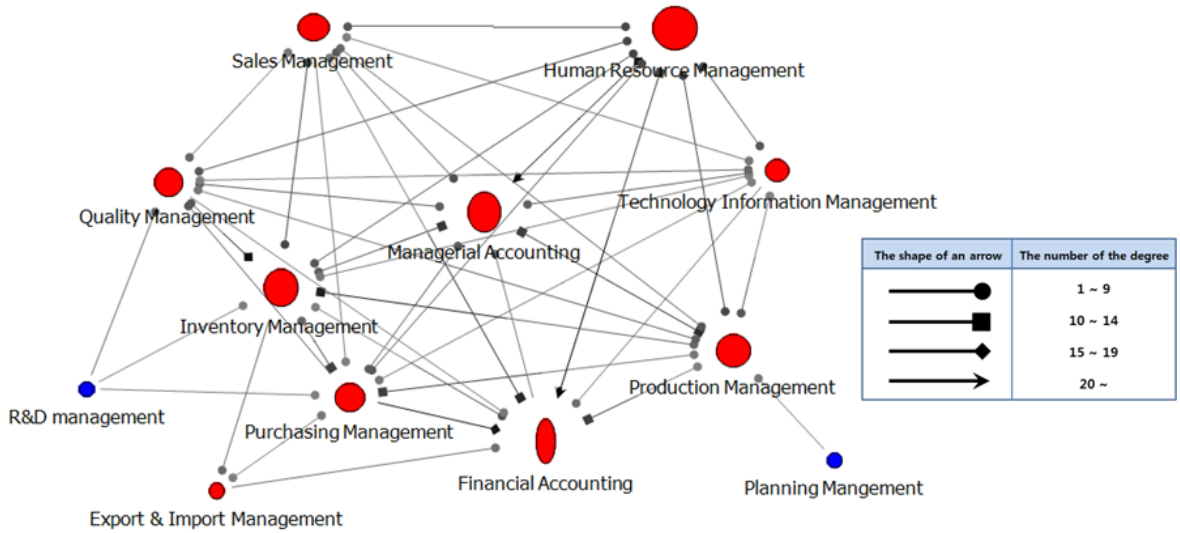

FIGURE 4. The process network of a company

4.1. **The application of a methodology.** The process network is mined by transfer-of-work metrics from the standard model of business processes as shown in Figure 4.

The result of test for Krackhardt's theory is as follows; connectedness is 0.682, hierarchy is 0.308, and LUBness is 0.982. Two points are remarkable examples: hierarchy and LUBness. 0.308 of hierarchy score means that the organizational structure is not long-distance so that the distance from bottom level to the authority level is relatively short. 0.982 of LUBness means the degree of span-of-control is wide so that there are some pressure of management. The LUBness says each division manages subordinate departments more than needed; it is necessary for the company to disperse departments to curtail span-of-control. The following analyses are progressed in consideration of low hierarchy and high span-of-control.

Table 1 shows that bottleneck-indexes are measured. It is shown that the department of financial accounting has the greatest bottleneck-index; the following department is managerial accounting. Moreover, the two departments belong to the division of business

TABLE 1. The result of centrality analysis about departments

Department	*In-Degree Centrality(%)*	*Out-Degree Centrality(%)*	*Bottleneck Index*
Managerial Accounting	*0.1492*	*0.1218*	*0.1831*
Purchasing Management	*0.0819*	*0.0987*	*–0.2051*
Tech & Info Management	*0.0462*	*0.0651*	*–0.4091*
Planning Management	–	*0.0042*	–
Production Management	*0.105*	*0.1261*	*–0.2*
Export & Import Management	*0.0105*	*0.0105*	0
R&D Management	–	*0.0126*	–
Sales Management	*0.0672*	*0.1113*	*–0.6563*
Human Resource Management	*0.166*	*0.1891*	*–0.1392*
Inventory Management	*0.1261*	*0.1324*	*–0.05*
Financial Accounting	*0.1681*	*0.0336*	*0.8*
Quality Management	*0.0798*	*0.0945*	*–0.1842*

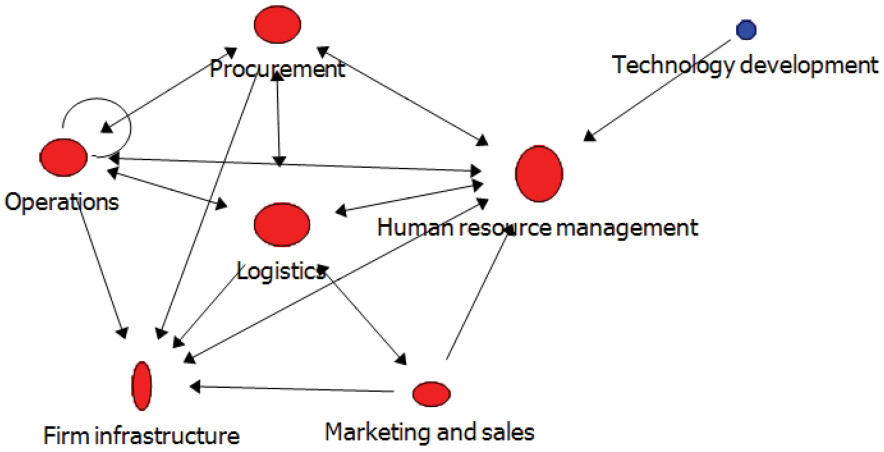

FIGURE 5. The network of the value chain

administration. The result says that the solution is needed to reduce work burdens of the division. Thus, the alternative to split the division can be selected and the organizational structure is reformed. The department of financial accounting can be outsourced because of the highest bottleneck-index.

The image matrix on value activities is derived by block-modeling from the process network as shown in Figure 5. Each department has its own value activity as the concept of the value chain. The image matrix is indicating the presence or absence of significant links between blocks. Each value activity is measured by degree centrality analysis as shown in Table 2. It shows that there are a number of business processes connected to the HRM and logistics; they are regarded as the business processes of the core competence in the company. On the contrary, it is essential to improve the competence of technology development and marketing because their values are low; they need to be more competitive at the business area. Thus the department of sales management which belongs to the value activity of marketing had better split into domestic and international department to increase the amount of work. In addition, the department of R&D management which

TABLE 2. The degree centrality analysis of Figure 5

An activity of the value chain	*Degree Centrality(%)*
Firm infrastructure	*0.1364*
Human resource management	*0.2273*
Logistics	*0.2045*
Marketing and sales	*0.0909*
Operations	*0.1591*
Procurement	*0.1591*
Technology development	*0.0227*

TABLE 3. The flow-betweenness centrality analysis

No	*Department*	*Flow-Between Centrality(%)*
1	*Managerial Accounting*	*0.1429*
2	*Purchasing Management*	*0.1001*
3	*Tech & Info Management*	*0.0407*
4	*Planning Management*	*none*
5	*Production Management*	*0.1155*
6	*Export & Import Management*	*0.0087*
7	*R&D Management*	*none*
8	*Sales Management*	*0.0794*
9	*Human Resource Management*	*0.1842*
10	*Inventory Management*	*0.1348*
11	*Financial Accounting*	*0.0874*
12	*Quality Management*	*0.1061*

belongs to the value activity of technology development had better split into two departments with applications or products. Thus, the alternative to split each department is chosen and the organizational structure is reformed.

Figure 6 represents that Euclidean distances between departments are expressed graphically by a dendrogram; departments are clustered in the order which they are near. The differences between the distances mean different patterns of task of each department. The number of the clusters is regarded as the number of positions. The number is properly two because of the low hierarchy score of the process network; the first group G1 composed of managerial accounting, financial accounting, and human resource management and the second group G2 composed of the rest departments. The result says that three departments of G1 have similar task patterns which are explained as similar positions, i.e., they had better hold similar positions. Table 3 shows the analysis result of flow-betweenness; it says that human resource management and managerial accounting are expected as control units and they have the strong control power and authority in the process network. The positions of human resource management and managerial accounting refer to be higher than the other departments. However, their positions do not suit for the organizational structure. They had better act as mediators between the CEO and other departments. Thus the alternative to move them is selected and the organizational structure is improved.

Figure 7 shows the strongest cooperation of tasks among departments; it is measured by clique analysis and there are three subgroups in which each department has a number of associations with others. The members of subgroups are listed in Table 4. To discover

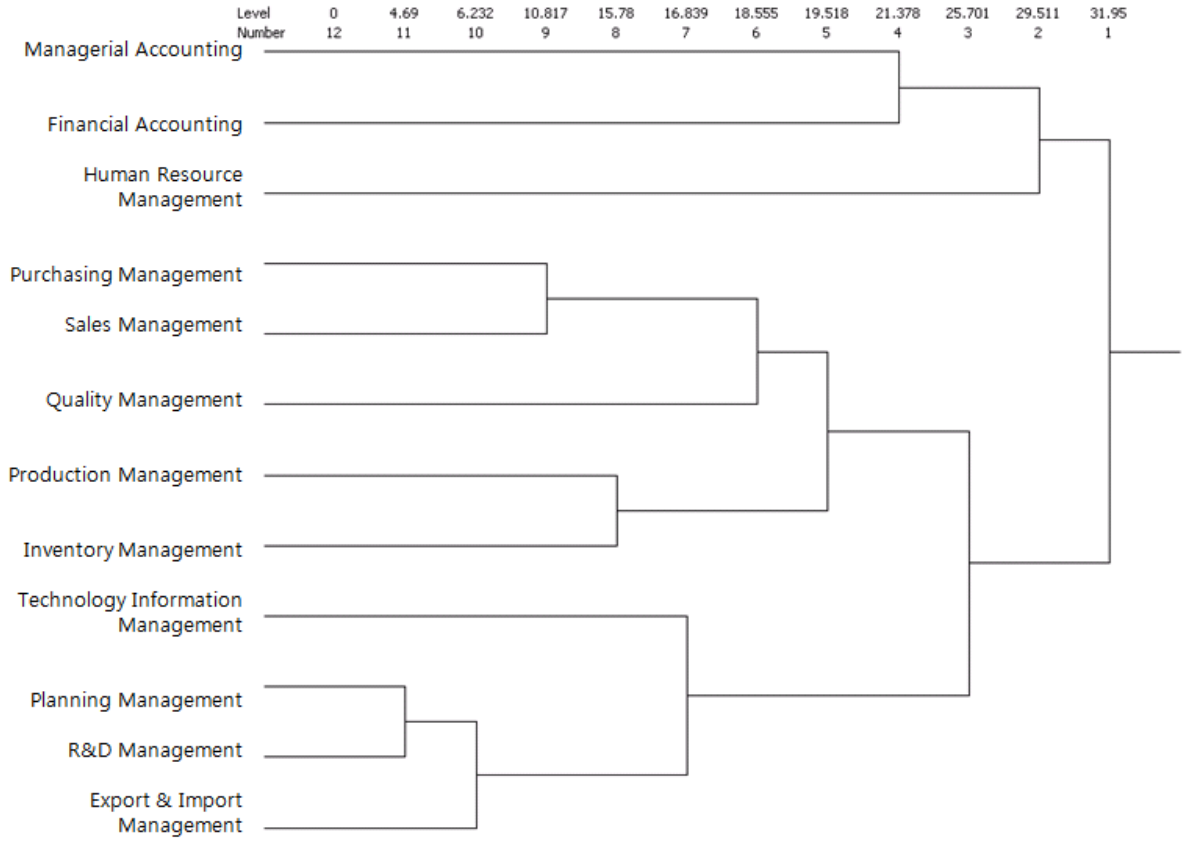

FIGURE 6. The dendrogram by measuring the Euclidean distance

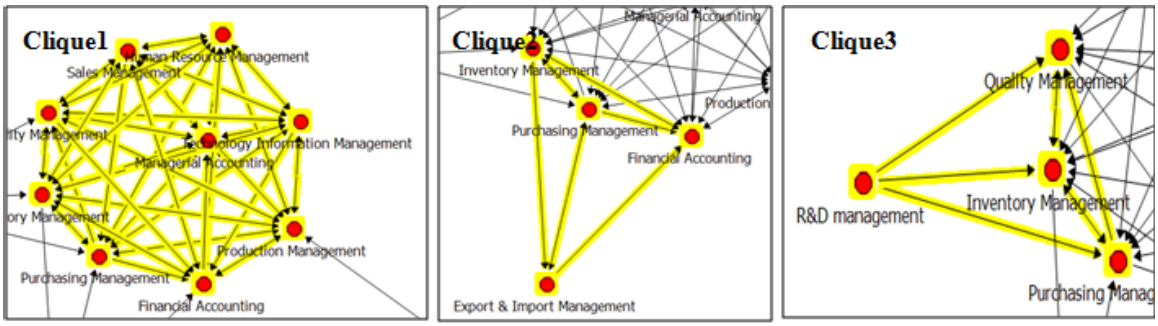

FIGURE 7. The result of clique analysis

TABLE 4. The cliques list referred to a transaction list

Clique #	Members
Clique1	Purchasing, Inventory, F-Accounting, Production, Sales, HRM, M-Accounting, Tech&Info, Quality (9)
Clique2	Purchasing, Inventory, F-Accounting, Export&Import (4)
Clique3	Purchasing, Inventory, R&D, Quality (4)

the significant association-rules in the cliques list, the supports of the co-occurrence between them are calculated as shown in Table 5. Three significant rules are found; R1: X(8)→Y(2), R2: X(9U10)→Y(2) and R3: X(9U10)→Y(8). Since R1 is already true that purchasing management and inventory management are in the same division, the rule

TABLE 5. The matrix of the co-occurrence and the support to it

*No	1	2	3	4	5	6	7	8	9
1									
2	1 **(0.33)								
3	1 (0.33)	1 (0.33)							
4	0 (0)	1 (0.33)	0 (0)						
5	0 (0)	1 (0.33)	0 (0)	0 (0)					
6	1 (0.33)	1 (0.33)	1 (0.33)	0 (0)	0 (0)				
7	1 (0.33)	1 (0.33)	1 (0.33)	0 (0)	0 (0)	1 (0.33)			
8	1 (0.33)	3 (1)	1 (0.33)	1 (0.33)	1 (0.33)	1 (0.33)	1 (0.33)		
9	1 (0.33)	2 (0.67)	1 (0.33)	1 (0.33)	0 (0)	1 (0.33)	1 (0.33)	2 (0.67)	
10	1 (0.33)	2 (0.67)	1 (0.33)	0 (0)	1 (0.33)	1 (0.33)	1 (0.33)	2 (0.67)	1 (0.33)

* 1: Managerial Accounting, 2: Purchasing Management, 3: Production Management, 4: Export&Import Management, 5: R&D Management, 6: Sales Management, 7: Human Resource Management, 8: Inventory Management, 9: Financial Accounting, 10: Quality Management.

** The number put in round brackets is the support to the co-occurrence.

TABLE 6. The matrix of the confidence and the improvement

No	1	2	3	4	5	6	7	8	9
1									
2	0.333 *(1)								
3	1 (3)	1 (1)							
4	0 (0)	1 (1)	0 (0)						
5	0 (0)	1 (1)	0 (0)	0 (0)					
6	1 (3)	1 (1)	1 (3)	0 (0)	0 (0)				
7	1 (3)	1 (1)	1 (3)	0 (0)	0 (0)	1			
8	0.333 (1)	1 (1)	0.333 (1)	0.333 (1)	0.333 (1)	0.333 (1)	0.333 (1)		
9	0.5 (1.5)	1 (1)	0.5 (1.5)	0.5 (1.5)	0 (0)	0.5 (1.5)	0.5 (1.5)	1 (1)	
10	0.5 (1.5)	1 (1)	0.5 (1.5)	0 (0)	0.5	0.5 (1.5)	0.5 (1.5)	1 (1)	0.5 (0.75)

* The number put in round brackets is the improvement.

is not considered. In addition, since R2 includes financial accounting which is regarded as a bottleneck, we only consider the sub-rule; R2*: X(10)→Y(2) in R2. In R3, financial accounting is not also considered, then only R3*: X(10)→Y(8) is considered as the sub-rule in R3. Table 6 says that R2* and R3* are reliable as the both of confidences are 1. Continually the degrees of improvements about the rules are all 1. It means that purchasing management and inventory management have business relations with quality management but since they perform their tasks independently, it is not necessary to collect in one division. Therefore, the quality management of the manufacturing division can be moved closer to the division including purchasing department and inventory department. The association-rule of marketing division is also remarkable. The co-occurrence of R:X(6)→Y(4) is 0 that there are no business relations between them; however, they belong to one division. The departments related with export & import management are inventory management and financial accounting in Table 5. But financial management is not considered because of a bottleneck. Thus export & import management are transferred into the division of logistics & procurement including inventory management. Therefore, the alternatives to move quality management and export & import management are selected.

4.2. **The final alternative for redesigning organization structure.** The final alternative of redesigning organizational structure is suggested as shown in Figure 8. It is

recommended that financial management is outsourced and decentralized to solve problem with a bottleneck. It is also recommended that human resource management and managerial accounting are combined with the division of general affairs and placed under CEO as shown in Figure 9.

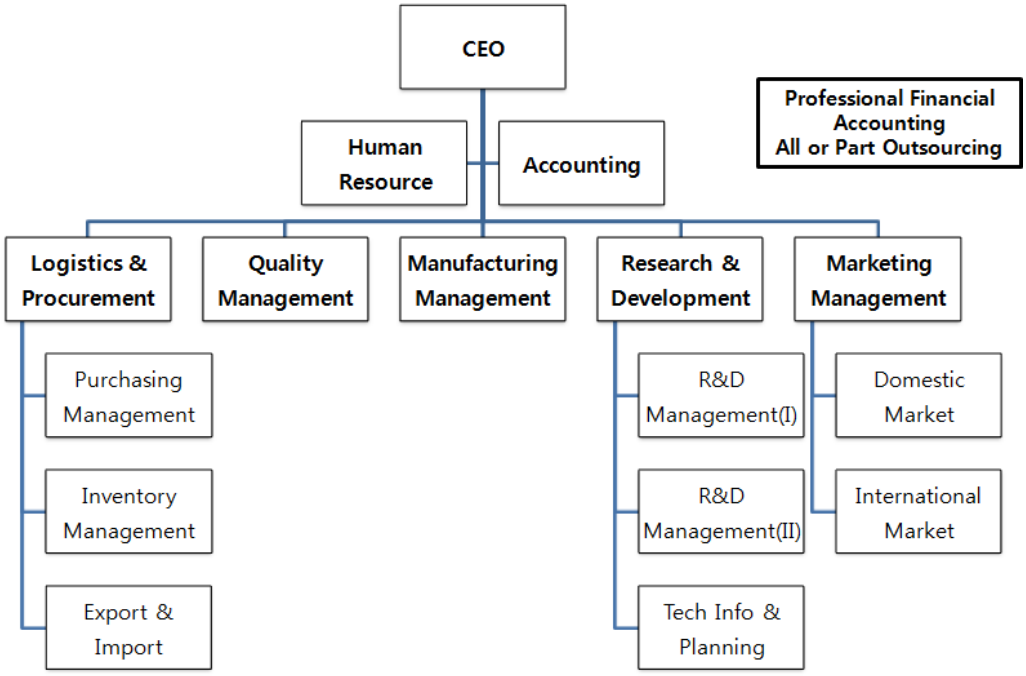

FIGURE 8. The final alternatives for redesigning the organizational chart

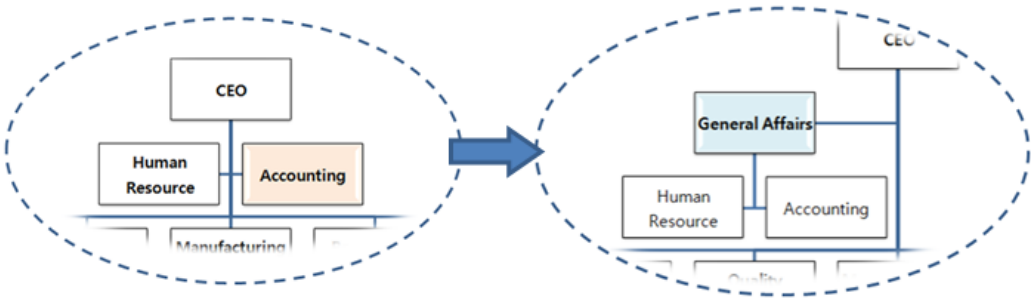

FIGURE 9. Combining HRM and accounting with the general affairs

5. **Conclusions.** This paper proposes a methodology to derive organizational structure which is suitable for business processes. In order to derive organizational structure, business relations are mined by transfer-of-work metrics and SNA techniques are used for analysis of the relations. Redesigning guideline is proposed to adopt SNA results. By applying to the standard of business process models, a case study is illustrated for the applicability of this methodology.

In the previous studies [5-9], they analyzed social relations among organizational units derived from process logs and models. However, they had limitations on practical application for redesigning organizational structure. This paper improves the limitation by

problems-oriented approach compared with methods-oriented approach in existing studies. By suggesting 5 possible problems and solving those using SNA techniques, this paper differentiates the application from the previous studies.

This paper is trying to focus on redesigning organizational structure. Such an idea is enough to amplify recognition on organization and the deeper research. This kind of new trial will help other researchers to offer new idea for the business process analysis and recognize that the organization structure is an important factor. Also the idea such as this methodology can become a tool to diagnose problems inside a company before the executives try to improve their own organization.

However, the results of this study should be considered in the following limitations. This paper uses only models of business process to test a methodology. The results of analysis have to be proved by actual logs of business processes. Another limitation is that our methodology is applied to resources of departments not people. If the resources of people are used, it is expected that better redesigning alternatives are proposed. Also the characteristics of business processes should be considered because they are regarded as the same weight in this paper; for example, the properties as order, command, approval and report are not considered in this paper. Though the criteria of setting weights are the more complex topic, it should be researched more in the future. In addition, many companies have diverse structures such as horizontal, matrix, process-based and team-based, but this paper considers only vertical and functional structure. Future research can use various structures to apply and improve our methodology.

The next research is trying to derive more realistic alternatives for redesigning by the application of actual logs of business processes. Using real data helps us to validate this study and to seek shortcomings on the progress of research.

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