

How Can We Manage Collaboration Network via Communication?

2008/07/05

Hiroyasu Yuhashi

Mobile Society Research
Institute

NTT DoCoMo, Inc.

(Graduate School of Decision Science and
Technology, Tokyo Institute of Technology)

Junichi Iijima

Graduate School of Decision
Science and Technology
Tokyo Institute of Technology



IS-FMG, T.I.T. All Rights Reserved, 2008
Copyright (C) 2008 NTT DOCOMO, INC.



Research Objectives

Each corporation enhances the knowledge work as a source of competitiveness.

The knowledge work generates from employee's collaboration.

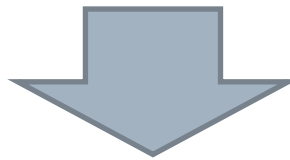
In this research, we propose a method of managing **the collaboration network** by changing employee's **communication behavior**.

Outline of Presentation

- 1. Research Objectives**
 - 2. Scope of Analysis**
 - 3. Research Framework**
 - 4. Data and Analysis**
 - 5. Proposal for Management**
 - 6. Conclusion and Future Work**
-

Introduction

The effective utilization of **organizational capabilities** and management resources built up within a company has become a major area of focus as **a source of competitiveness**. (Hamel and Prahalad, 1989, 1990, 1994)



*when we focus on the
knowledge management,...*

Davenport points out that **the most competent 40 knowledge workers** glean most of their important information **from social networks**. (Davenport, 2005)

Is it possible to stimulate the **collaboration network** for **knowledge works** are conducted through encouraging **communication behavior** ?

Related Works

Burt analyzed how **a social network** of higher management **influences on the promotion** by using the high-tech firm in the United States.

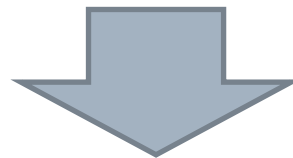
(Burt, 1992)

Cross et al evaluated the social networks occurring companies across a wide range of industries, and **classified** them into **three categories**.

(Cross et al, 2005)

Gloor presented a concept named "Collaborative innovation network (COIN)." The concept shows ideal condition that gives **good influence on business**.

(Gloor, 2006)



However, all of the previous researches conducted **static** analyses to catch a corporate organization at certain time. The contributions of this research is to focus on a **dynamic** aspect.

Scope of Analysis

Company Y, which is the target of analysis in this research, performs a small business operating as a sales agent for office equipment and supplies provided by a major Japanese mail-order company.

The company has been implementing **the management utilizing ICT**, and engaged in **proposal-based sales** to corporate clients based on its know-how to improve workplaces.

The company has 27 employees, but despite its small size, predicts sales of 3.2 billion yen for the current fiscal year.

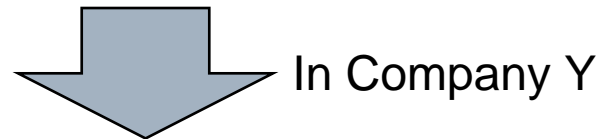
The analysis in this paper was conducted in relation to 21 employees of Company Y who were working in the company between October 2005 and September 2007.



Figure 1. Company Y's Office

Communication

The activity or process of transmitting ideas and information, after sharing place spatially (Co-presence) and recognizing of the other party's existence and intention (Awareness). (Matsushita, 1997)



The Voice-Mail system

The Voice-Mail system is **an asynchronous communication** method like e-mail. **One-on-one** interaction between employees, messages can also be communicated in a **multi-address** transmission to members of a designated work team or to the company as a whole.

Voice-Mail Log

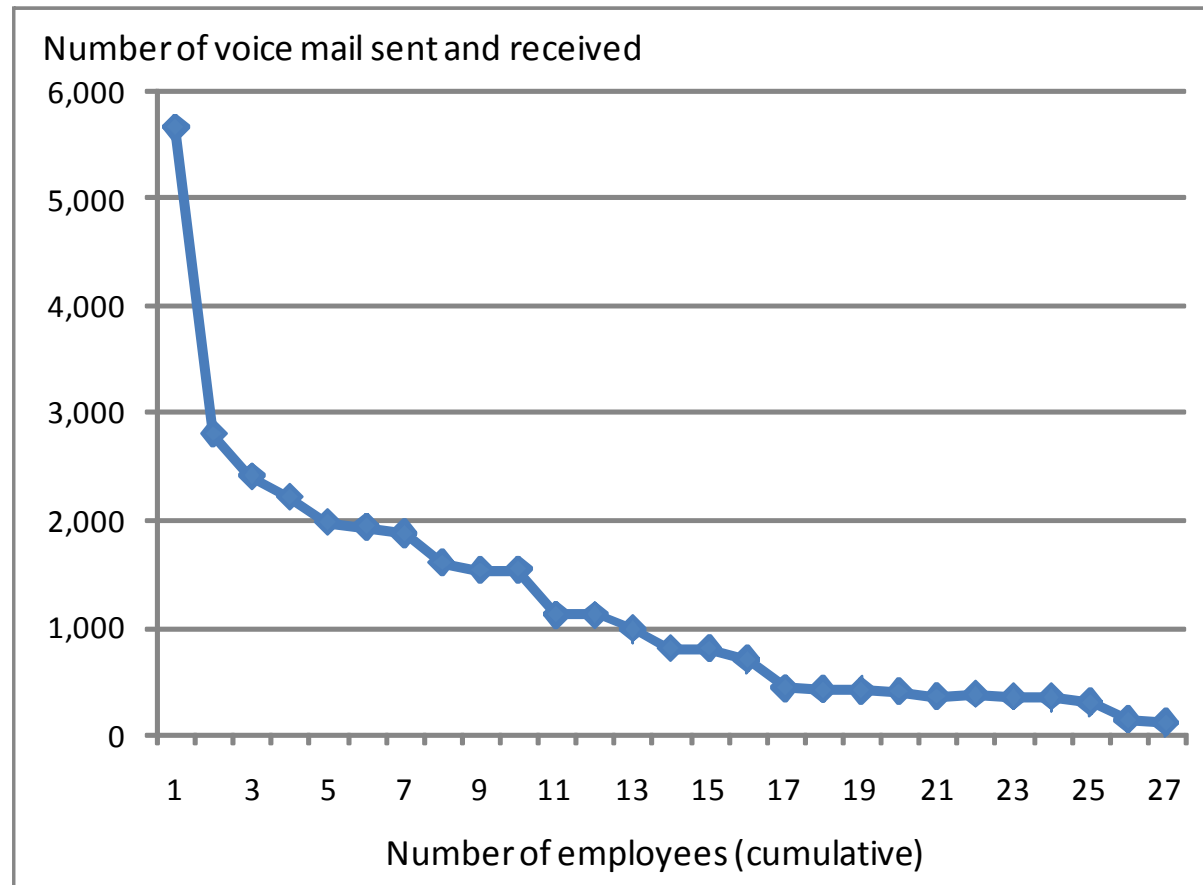
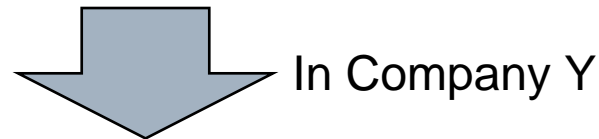


Figure2. Number of Voice-Mail transactions (as of September 2007)

Collaboration

In the environment to which the employees bear the different role respectively, the employee obtains **the cooperated result** better than individual result by **mutual intervention to activity**. (Lepper, M. R., Whitmore, P. C., 2000)



Thanks-Card's rule

Every time an employee receives **advice** or **assistance** regarding his/her works from another employee, they send the employee who helped them a handwritten Thanks-Card. This practice of exchanging Thanks-Cards enhances the employee's motivation for **collaboration** between them.

Collaboration Network

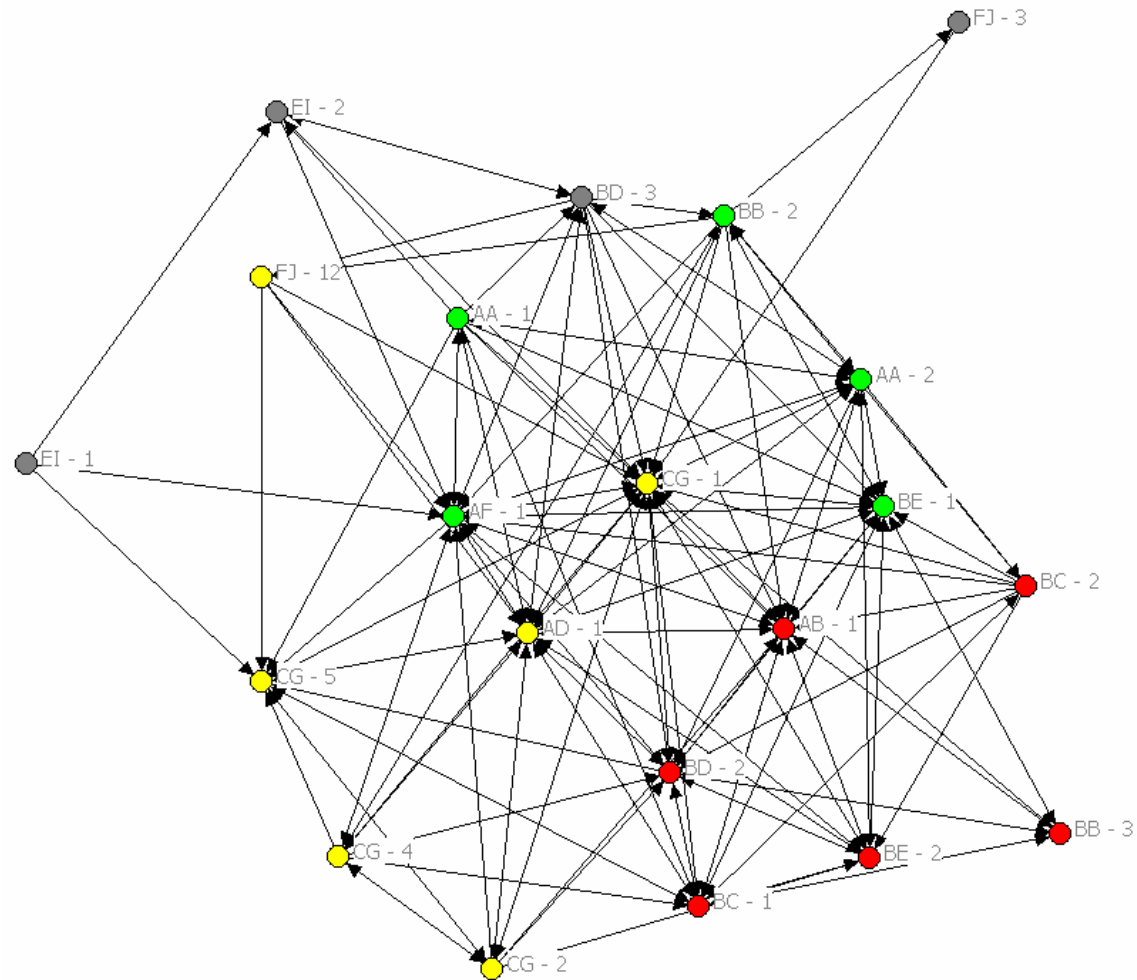
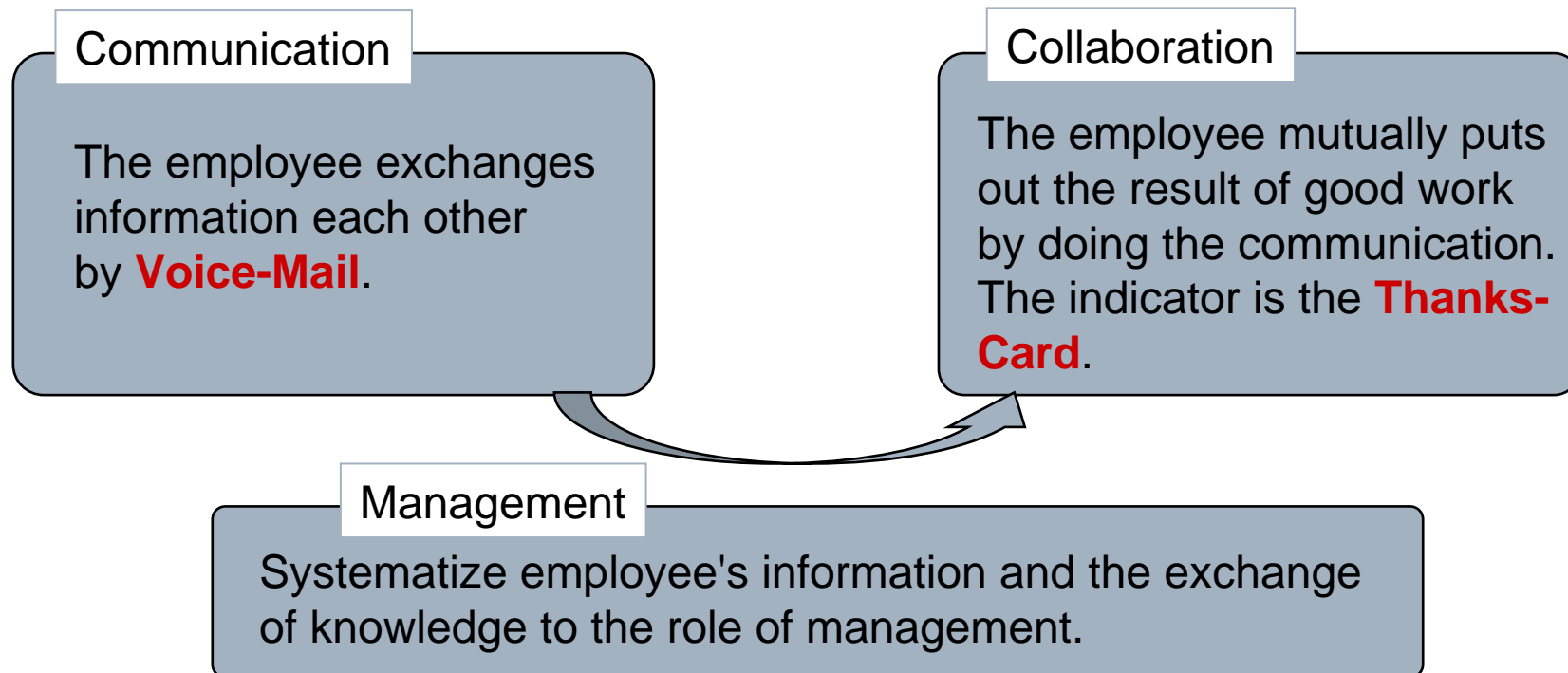


Figure3. Collaboration Network of Thanks-Cards

Role of Management



The approach for this research changes the position on the **collaboration network** by appealing to employee's **communication behavior**.

Classification of Network

In the Cross et al, the social network is classified based on the types of relationships employees. In this research, we divided the collaboration network by the **structural equivalence** between employees.

We can use a method called Convergence of iterated Correlations (CONCOR) to categorize structurally similar employees.

[Grouping result by CONCOR]

Group A is the group of employees who have frequent communication outside the group. (5 people)

Group B consists of employees who have many relationships of an employee. (6 people)

Group C is comprised of people with Thanks-Cards issued by its members are distributed mainly within the group. (6 people)

Group D comprises people who engage in low levels of communication and rarely send and receive Thanks-Cards.(4 people)

Relation between Groups

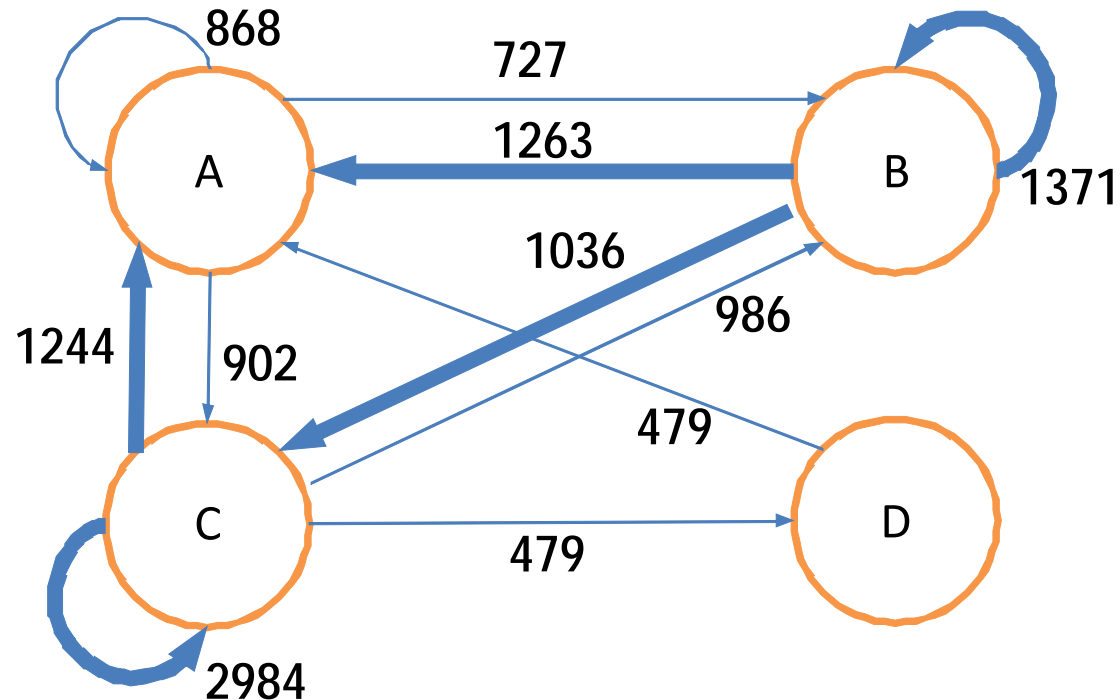


Figure4. Thanks-Card exchange relationships between the 4 groups
*The numerical value is a number of circulations of Thanks-card

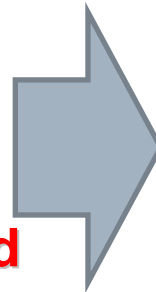
Group B is composed of the executive job and the staff of proposal-based sales. Especially, because the nature as the knowledge worker is requested, We decided to focus on Group B.

Multiple Regression Analysis

Group B is composed of the executive job and the staff of proposal business. Especially, because the nature as the knowledge worker is requested, We decided to **focus on Group B**.

We examined the correlation between employee's communication behavior using the Voice-Mail system and the index of the collaboration network of Thanks-Cards.

X_1 : No. of logins/month
 X_2 : No. of minutes used
 X_3 : No. of **Voice-Mails sent**
 X_4 : No. of **Voice-Mails received**



Y_1 : **Size** of each employee's
egocentric network
 Y_2 : **Degree** of each employee's
egocentric network
(No. of relations)
 Y_3 : **Betweenness** of each
employee's
egocentric network

Network Size

The fact that employees have a large social network means that they have many more **resources available**. We defined this variable as Y_1 .

The results of analysis of the egocentric network size (Y_1) showed an extremely high multiple correlation coefficient R of 0.840528, and **R^2 of 0.698102** when adjusted for degrees of freedom.

Table 1. Results of analysis of network size

	Coefficient	Standard margin of error	t value	P value
Intercept	1.872949	1.212586	1.54459	0.124703
No. of logins/month	0.023474	0.008667	2.70836	0.007605
No. of minutes used	-0.00555	0.001791	-3.09688	0.002363
No. of Voice-Mails sent	0.005632	0.001597	3.527491	0.000568
No. of Voice-Mails received	0.022266	0.002979	7.47556	7.62E-12

Centrality

We used the degree, which is one of the indicators of an employee's centrality, as a variable, in order to examine whether an employee is in an **advantageous position** within the egocentric network. We defined this variable as Y_2 .

The results of analysis of the degree (Y_2) of the egocentric networks showed an extremely high multiple correlation coefficient R of 0.815136, and **R^2 of 0.654859** when adjusted for degrees of freedom.

Table2. Results of analysis of degree

	Coefficient	Standard margin of error	t value	P value
Intercept	-60.8961	26.98022	-2.25707	0.025552
No. of logins/month	0.471717	0.192847	2.446071	0.015683
No. of minutes used	-0.10914	0.039841	-2.73936	0.006957
No. of Voice-Mails sent	0.127708	0.035523	3.595115	0.000448
No. of Voice-Mails received	0.424087	0.066273	6.39909	2.19E-09

Betweenness

We defined the betweenness as Y_3 , which indicates whether an employee serves as a **mediator** between other employees.

In regard to the betweenness (Y_3), analysis showed passable results of a multiple correlation coefficient R of 0.594446, and **R^2 of 0.334891** after adjustment for degrees of freedom.

Table3. Results of analysis of betweenness

	Coefficient	Standard margin of error	t value	P value
Intercept	-3.22812	2.231776	-1.44644	0.15029
No. of logins/month	0.010184	0.015952	0.638411	0.524249
No. of minutes used	-0.0098	0.003296	-2.97485	0.003454
No. of Voice-Mails sent	0.013417	0.002938	4.566035	1.08E-05
No. of Voice-Mails received	0.016165	0.005482	2.948683	0.003741

Influence of Time

It can be expected that the act of communication precedes a change in the status of collaboration networks.

In order to examine it, we performed multiple regression analysis on datasets of communication activities preceding the change in collaboration network by one month or two months.

The results showed the highest R_2 for the **size** and **degree** using the **synchronous** datasets.

The results showed the **betweenness** takes one **month** lag from communication activity.

Table4. R^2 , after adjustment for degrees of freedom, and dataset

	Synchronous dataset	Dataset preceding by one month	Dataset preceding by two months
Size of egocentric network	0.697345241	0.601636388	0.520645339
In-degree and out-degree	0.654197312	0.554023438	0.461210938
Ego betweenness	0.334623143	0.361317389	0.309113345

Key Factors

It has the participation of management in communications, and the method of controlling the state of the collaboration network is examined.
(We used a standardized partial regression coefficient.)

The number of **messages received** is the principal factor for the **size** of network and the **degree** of centrality.

The number of **messages sent** is the principal factor for the **betweenness**.

*Table5. Determination of principal factors
(Standardized partial regression coefficient)*

	No. of logins/month	No. of minutes used	Total no. of Voice-Mails sent	Total no. of Voice-Mails received
Size of egocentric network	0.315819	-0.36575	0.274131	0.637267
In-degree and out-degree	0.003125	-0.35194	0.294337	0.607859
Ego betweenness	0.110496	-0.52149	0.526682	0.373097

Proposal for Management

In this work, the management technique of the interpersonal relationship network on the business that comes in the place of the knowledge work has been being examined aiming at the competitive edge strengthening of the corporation.

It proposes the method of management based on the analysis result.

Point 1

It is necessary to locate the employee at a **center position** on the collaboration network. It is effective to control the information style of communications so that **the employee may always** obtain **information** for that.

Point 2

Height mediate of a center employee becomes important so that the collaboration network may demonstrate the **problem-solving ability**. It is necessary to appeal on business for that to encourage **sending information** for employees at the central position.

Conclusion and Future Work

Conclusion

1. **The strong correlation** between the act of **communication** and employee's **collaboration network was found**
2. The point to focus on to **encourage employee's communication activities** was clarified by identifying major factors for the correlation stated above.

Accordingly, we have established the possibility of managing collaboration networks.

Future Work

The issue of **generalization** of the results still remains unverified, and it is necessary to examine whether similar results could be achieved with a **major corporation**.

End

Thank you for listening.

Hiroyasu Yuhashi

Mobile Society Research
Institute

NTT DoCoMo, Inc.

(Graduate School of Decision Science and
Technology, Tokyo Institute of Technology)

Junichi Iijima

Graduate School of Decision
Science and Technology
Tokyo Institute of Technology
