Journal of the Korean
OR/MS Society
Vol. 17, No. 1, April 1992

Relationships among Leadership, Communication and Outcomes in Research Teams

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Abstract

The relationships among leadership, leader-subordinate interpersonal communication and outcomes in research teams were investigated for six research institutes sponsored by the Korean Government. Consideration and initiating structure of leader behavior were used as leadership dimensions. Subordinate satisfaction with supervision and with work, and project success were considered as outcomes in a research team.

Leader-subordinate interpersonal communication was positively related to both of consideration and initiating structure of leader behavior. Outcomes in a research team were differently related to the communication according to leadership types. Finally, several theoretical and managerial implications are discussed.

1. Introduction

Organization is defined as a human group interacting with each other for common goals or as a network of interdependent relationships. It is composed of a leader and subordinates who are classified by the difference of power and responsibility of people within the group. Leadership is defined as the behavioral process of influencing individuals or groups toward set goals or as goal-directed interpersonal communication [2].

From the above definitions of organization and leadership, it becomes clear that leadership, leader-subordinate interpersonal communication and outcomes in a research team are closely related to one another. A number of studies have been conducted to identify the characteristics of leadership and leader-subordinate communication. However studies on the relationships among leadership, the communication and outcomes in a research team as a whole are rare and most studies on leadership and the communication have been conducted in advanced Western coun-

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tries. In addition, prior studies indicate that a difference in culture makes a difference in leadership and communication [1].

In this study, relationships among leadership, leader-subordinate interpersonal communication, and outcomes in terms of subordinate satisfaction and project success in a research team were empirically investigated for research institutes sponsored by the Korean Government.

The project leader of this study engaged in research as a researcher while he coordinated the efforts of his subordinates toward project goals within time and budget constraints as a research manager.

2. Leadership and Communication

Much of the recent leadership research [4, 10] has focused on leader's consideration and initiating structure, the two dimensions of leadership identified in the Ohio State University Study [14]. Showing consideration of leader behavior describes the degree to which a leader creates a supportive environment of psychological support by doing such things as being friendly and approachable, looking out for the personal welfare of the group, doing little things for subordinates, and giving advance notice of changes. Initiating structure of leader behavior describes the degree to which a leader initiates psychological structure for subordinates by doing such things as assigning particular tasks, specifying procedures to be followed, clarifying his expectations of subordinates, and scheduling work to be done [3]. Research on organizational management indicates that nearly 80 percent of a typical manager's day was spent in interpersonal communication and other studies report that between one third and two thirds of a superior's time is spent in communication with subordinates, and face-to-face discussion is the dominant mode of interaction [7].

Leader-subordinate communication is vertical communication either from leader to subordinates or vice versa, and includes formal or informal communication. Most of the studies on communication between a leader and his subordinates have focused on formal, vertically downward and instrumental (job-related) communication [11]. However, it is expected that not only formal, downward and instrumental but also informal, upward and expressive (non-job related) communication are also affected by leader behavior. Moreover, it is expected that informal, upward and expressive communication are also important for outcomes in research teams as well as the other communication. In this paper, leader-subordinate communication includes downward or upward, formal or informal, and instrumental or expressive communication.

3. Leadership and Outcomes

Job satisfaction can be defined as the feelings a worker has about his job and can be distinguished as five dimensions of work, supervision, pay, promotions, and coworkers [11]. In this article, subordinate satisfaction with supervision and with work are considered as dimensions of job satisfaction because it is expected that the two dimensions are much influenced by leadership and leader-subordinate communication in a research team. Subordinate satisfaction with supervision includes supervisory style and influence, technical adequacy, human relations and administrative skills. Subordinate satisfaction with work includes intrinsic interest, variety, opportunity for learning, difficulty, amount, chances for success and control over work flow [8].

The two dimensions of subordinate satisfaction, and project success are considered as dimensions of outcomes in a research team. Project success is defined as the extent that the subordinate himself perceived the efficacy of the project which his team conducted recently, based on the argument that the bottom-line indicator of project success is whether key personnel associated with the project are satisfied with the overall results, and that such factors as controlling costs and meeting the schedule ultimately take a back seat to this global appraisal [6].

It is well-known that an effective leadership style in one situation may be ineffective in another. Leader consideration is usually associated with higher subordinate satisfaction and performance [13]. But previous research findings concerning the relationship between leadership and subordinate job satisfaction indicate many circumstances in which initiating structure of leader behavior is related to higher subordinate satisfaction and preformance [12].

4. Communication and Outcomes

Planning, organizing, staffing, directing, coordinating and controlling are the most often mentioned functions of management. A common thread that can describe all these functions of management is the necessity of establishing and maintaining a network of interpersonal relationships. To provide direction and stimulate motivation, they must attend not only to the needs of the organization but to individual's needs as well. Human needs are not universal, that is, different people have different needs and the same individual has different needs at different times. To discover an individual's needs managers must be able to perceive those needs and im-

prove individuals' opportunities to express their needs. This can only be accomplished through effective interpersonal communication relationships [2].

From the aforementioned discussions concerning relationships among leadership, leader-subordinate interpersonal communication and outcomes in a project team, this research addresses the following three research questions:

Question 1. What are the relationships between leadership style and leader-subordinate interpersonal communication in a research team ?

Question 2. What are the relationships between leadership style and outcomes in a research team ?

Question 3. What are the relationships between the leader-subordinate communication and outcomes in a research team ? More specifically, under a given leadership style, how does the communication influence outcomes in a research team ?

5. Method

5. 1 Sample

The data for the study were collected from 199 individuals of small project teams of six research institutes sponsored by the Korean Government. The sample size for each institute was determined considering the number of its researchers and research teams. The respondents of each institute were randomly selected from as many research teams as possible and all respondents were assured of anonymity. Most of the respondents were highly educated and 79 percent of them completed graduate school. Eighty three percent of respondents were males and their average age was 31. The average size of the project teams is four and the size of the teams ranges from two to nine. About 79 percent of the respondents reported that their project leaders were Ph. D.'s and 65 percent of the Ph. D.'s were educated in the United States.

5. 2 Hypotheses

Based on the prior discussions of the relationships among leadership, leader-subordinate communication and outcomes in a research team, the following four hypotheses were tested.

Hypothesis 1. Leader-subordinate interpersonal communication in a research team is positively related to the two dimensions of leadership — consideration and initiating structure.

Hypothesis 2. Outcomes in a research team in terms of subordinate satisfaction with supervi-

sion and with work and project success are positively related to the two leadership dimensions.

Hypothesis 3. Leadership style makes a difference in leader-subordinate interpersonal communication and in each dimension of outcomes in a research team.

Hypothesis 4. Each dimension of outcomes in a research team is positively related to leader-subordinate interpersonal communication and their relationships are different according to the leadership style.

5. 3 Instrument

To measure leader-subordinate interpersonal communication, a scale modified from the instrument developed by Penley & Hawkins [10] was prepared. The communication scale composed of 13 items measures the extent that leaders or subordinates communicate information each other.

The Leader Behavior Description Questionnaire (LBDQ) Form XII [14] were used to measure consideration and initiating structure. Four types of leadership style are determined by two-by-two categorization of the leader behavior. Subordinate satisfaction with supervision and with work were measured by the scale modified from the instrument developed by Smith et al. [11]. Project success was measured by a scale consisting of eight items indicating the extent to which subordinates themselves perceived the efficacy of the project which their team conducted recently. All instruments to measure the leadership, communication and outcomes in a research team consist of the seven-point Likert scale multi-items.

5. 4 Analysis

The zero-order correlations among all variables were computed to determine the degree to which the variables were related. These intercorrelations are presented in Table 1, along with the mean, standard deviation and value of Cronbach alpha for each variable. As shown in Table 1, all scales show high levels of reliability in this sample, and all are within normally acceptable limits [9]. The zero-order correlations are generally consistent with expectations.

To test the relationships between the communication and leadership (Hypothesis 1), and the relationships between outcomes and leadership (Hypothesis 2), two-way analysis of variance was used. Leaders can be classified according to the scores for their consideration and initiating structure, using the Ohio State scales [14].

It is necessary to employ a two-by-two categorization of leader behavior to classify leaders.

Table 1. Means, Standard Deviations, Intercorrelations and Reliabilities for Variables

Variable	Mean	1	2	3	4	5	6
1. Showing	4.07	[.90]					
Consideration	(1.27)						
2. Initiating	4.17	.62	[.86]				
Structure	(1.08)						
3. Communication	4.25	.80	.57	[.91]			
	(1.13)						
4. Supervision	4.21	.83	.63	.72	[.84]		
Satisfaction	(1.23)						
5. Work	4.21	.30	.27	.32	.26	[.81]	
Satisfaction	(1.28)						
6. Project	4.85	.44	.42	.45	.35	.54	[.91]
Success	(0.95)						

1. Value in [ ] is Cronbach alpha.
2. All correlations are significant ($p < 0.01$).
3. Value in ( ) is standard deviation.

Thus a leader may be high in both consideration and initiating structure, low in both, or high in one and low in the other. Such classification is possible even though the two dimensions fail to be independent [5]. For this purpose, consideration and initiating structure of leader behavior were split at their medians in order for them to be used as categorical variables. According to the scores of their project leaders, all cases in a sample would be assigned 2 if high, and 1 if low, on the variable.

To test difference according to leadership style in the communication and in each dimension of outcomes (Hypothesis 3), Scheffe's test was applied. The whole sample was divided into four groups according to two-by-two categorization of leader behavior, and then regression analysis was applied to each subsample to test the relationships between each dimension of outcomes and the communication (Hypothesis 4).

6. Results and Discussion

Table 2 reports two-way ANOVA results of the relationships between the two dimensions of leadership and leader-subordinate communication (Hypothesis 1) and between the leadership di-

Table 2. Results from ANOVA of the Relationships between Leadership and Communication/ Outcomes

Dependent Variable	Cell Means: Low C Low S (Ⅰ) (n=71)	Low C High S (Ⅱ) (n=29)	High C Low S (Ⅲ) (n=27)	High C High S (Ⅳ) (n=72)	Two-way ANOVA(F): C	S	C×S	One-way ANOVA: F Value	Scheffe Results[a]
Communication	3.43 (0.91)	3.77 (0.95)	4.60 (0.80)	5.13 (0.76)	88.8**	10.6**	0.5	52.5**	Ⅰ,Ⅱ<Ⅲ<Ⅳ
(Outcomes)									
Supervision Satisfaction	3.19 (0.92)	3.74 (0.73)	4.75 (0.77)	5.20 (0.85)	127.4**	13.9**	0.2	73.4**	Ⅰ<Ⅱ<Ⅲ,Ⅳ
Work Satisfaction	3.89 (1.31)	4.36 (1.07)	3.77 (1.38)	4.67 (1.13)	0.2	12.5**	1,2	6.2**	Ⅰ,Ⅲ<Ⅳ
Project Success	4.39 (1.03)	4.86 (0.77)	4.77 (0.96)	5.34 (0.66)	9.7**	14.6**	0.1	14.4**	Ⅰ,Ⅲ<Ⅳ

a : Significant differences between pairs of group means at the. 05 level.
n : Number of Cases
( ) : Standard Deviation
C : Showing Consideration of Leader Behavior
S : Initiating Structure of Leader Behavior
C×S : Interaction of C and S
** : $p<0.01$

mensions and each dimension of outcomes (Hypothesis 2). This table includes two main effects of consideration and initiating structure as well as an effect that is due to interaction of the two variables.

For the communication, the two main effects accounted for significant differences among the four groups defined by the possible combinations of high and low consideration and initiating structure of leader behavior and there was no significant univariate F for the interaction effect. The results shown in Table 2 suggest that the communication is positively related to both of consideration and initiating structure of leader behavior, and consideration is more positively related to the communication than initiating structure is.

For each dimension of outcomes (Hypothesis 2), the results shown in Table 2 suggest that (1) subordinate satisfaction with supervision is positively related to both of consideration and initiating structure of leader behavior, (2) subordinate satisfaction with work is positively relat-

ed to initiating structure but not significantly related to consideration of leader behavior, and (3) project success is positively related to both dimensions of leader behavior.

Table 2 also reports one-way ANOVA results of relative effectiveness of different leadership types provided by the Scheffe's test for significant difference between pairs of group means (Hypothesis 3). Low consideration of leader behavior (Type Ⅰ & Ⅱ) had significantly lower communication than high consideration of leader behavior (Type Ⅲ & Ⅳ), and Type Ⅲ (high C, low S) leader had lower communication than Type Ⅳ (high C, high S) leader. No significant difference in the communication was found between Type Ⅰ (low C, low S) and Type Ⅱ (low C, high S) leader.

High consideration of leader (Type Ⅲ & Ⅳ) had higher subordinate satisfaction with supervision than low consideration of leader (Type Ⅰ & Ⅱ). Type Ⅱ leader had higher subordinate satisfaction with supervision than Type Ⅰ leader. No significant difference in subordinate satisfaction with supervision was found between Type Ⅲ and Type Ⅳ leader.

Type Ⅳ leader had higher subordinate satisfaction with work and project success than Type Ⅰ and Type Ⅲ leader. No significant difference in subordinate satisfaction with work and in project success was found between Type Ⅰ and Type Ⅲ leader, and between Type Ⅱ and the other leadership types (Type Ⅰ, Ⅲ & Ⅳ).

Leadership style was significantly related to the communication and to each dimension of outcomes in a research team, and made a difference in the communication and subordinate satisfaction and project success among leadership types (Hypothesis 3).

Table 3 reports the results of regression analysis of the relationships between the communication and each dimension of outcomes (Hypothesis 3). For entire sample, each dimension of outcomes was positively related to the communication, and subordinate satisfaction with supervision is most highly and strongly related to the communication ($\beta=0.72$, $R^2=0.51$).

For entire sample, leadership style was significantly related to the communication and to each dimension of outcomes in a research team (in Table 2), and the communication was also significantly related to each dimension of outcomes in a research team (in Table 3). In order to investigate the net effect of the communication for outcomes in a research team, relationships between the communication and each dimension of outcomes were examined through regression analysis for each category of leader behavior.

Subordinate satisfaction with supervision was positively related to the communication in all leadership types (Hypothesis 3). However, the subordinate satisfaction with work and project success were partly supported. Subordinate satisfaction with work was positively related to the

Table 3. Regression Results for Relationships between Communication and Outcomes

Dependent Variable	Leadership Type	Communication	
		β	R^2
Supervision satisfaction	Entire Sample	0.72**	.51
	Type I (Low C, Low S)	0.43**	.18
	Type II (Low C, High S)	0.62**	.39
	Type III (High C, Low S)	0.37*	.14
	Type IV (High C, High S)	0.47**	.22
Work Satisfaction	Entire Sample	0.32**	.10
	Type I (Low C, Low S)	0.26*	.07
	Type II (Low C, High S)	0.48*	.23
	Type III (High C, Low S)	0.16	.03
	Type IV (High C, High S)	0.20	.04
Project Success	Entire Sample	0.45**	.20
	Type I (Low C, Low S)	0.29*	.08
	Type II (Low C, High S)	0.17	.03
	Type III (High C, Low S)	0.29	.08
	Type IV (High C, High S)	0.30*	.09

* : $p<0.05$, ** : $p<0.01$

communication for low consideration of leader behavior (Type I & II) but not significantly related to the communication for high consideration of leader behavior (Type III & IV). Project success was positively related to the communication for Type I & IV leader but not significantly related to the communication for Type II & III leader.

7. Conclusion

The overall results suggest that (a) leader-subordinate interpersonal communication in a research team is positively related to the two dimension of leadership, (b) subordinate satisfaction with supervision is positively related not only to the two dimensions of leadership but also to the communication for any leadership style, (c) subordinate satisfaction with work is positively related not only to initiating structure of leader behavior but also to the communication for low consideration of leader (Type I & II), (d) project success is positively related not only to the two dimensions of leadership but also to the communication for Type I (low C, low S) and Type IV (high C, high S) leader.

The results of the study indicate that leadership, leader-subordinate interpersonal communication and outcomes in a research team are closely associated with one another as hypothesized. One of the major findings of this study is that subordinate satisfaction and project success in a research team are significantly related to not only leadership but also the communication and they are differently related to the communication according to leadership types. This result suggests that outcomes in a research team could be increased by improving communication between a leader and his subordinates even for given leadership style.

This study extends the present scope of organizational communication literature in R&D settings by integrating leader-subordinate communication, leadership and outcomes. However, this study, cross-sectional and correlational in nature, was unable to capture the dynamic nature of the relationships among the communication, leadership, and outcomes in a systematic manner. That is, one can not sure whether change in leadership causes change in the communication or vice versa, and whether change in the communication causes change in outcomes or vice versa. Furthermore, many situational factors such as characters of task and subordinates, and organizational culture which are believed to moderate the relationships between the communication and outcomes, were not investigated in this study. Therefore, the relationships found in this study should be considered as exploratory and should not be generalized in other research settings before further systematic investigation is undertaken in different situations.

References

[1] 오세철,「한국인의 사회심리」박영사, 1982.

[2] Baskin, O. W. and C. E. Aronoff, *Interpersonal Communication in Organizations*, Goodyear Publishing Company Inc., p. 40, 1980.

[3] House, R. J., "A Path-Goal Theory of Leader Effectiveness," *Administrative Science Quarterly*, Vol. 16 (1971), pp. 321-338.

[4] Keller, R., "A Test of the Path-goal Theory of Leadership with Need for Clarity as a Moderator in Research and Development Organizations," *Journal of Applied Psychology*, Vol. 74, No. 2(1989), pp. 208-212.

[5] Kerr, S. C. C. J. Schriesheim, C. J. Murphy and R. M. Stogdill, "Toward a Contingency Theory of Leadership Based upon the Consideration and Initiating Structure Literature," *Organizational Behavior and Human Performance*, Vol. 12(1974), pp. 62-82.

[6] Larson, E. W. and D. H. Gobeli, "Significance of Project Management Structure on Development Success," *IEEE Trans. Eng. Manag.*, Vol. EM-36(1989), pp. pp. 119-125.

[7] Lawler, E. E. E. W. Porter and A. Tannenbaum, "Managers' Attitudes Toward Interaction Episodes," *Journal of Applied Psychology*, Vol. 52(1968), pp. 432-439.

[8] Locke, E. A., "The Nature and Causes of Job Satisfaction," *Handbook of Industrial and Organizational Psychology*, ed. M. D. Dunnette, Chicago: Rand McNally, 1976.

[9] Nunally, J. C., *Psychometric Theory*, New York: McGraw-Hill, 1978.

[10] Penley, L. E. and B. Hawkins, "Studing Interpersonal Communication in Organizations: A Leadership Application," *Academy of Management Journal*, Vol. 28(1985), pp. 309-326.

[11] Price, J. L. and C. W. Mueller, *Handbook of Organizational Measurement*, Pitman Publishing Inc., 1986.

[12] Schriesheim, C. A. and A. S. DeNisi, "Task Dimensions as Moderators of the Effects of Instrumental Leadership: A two-Sample Replicated Test of Path-Goal Leadership Theory," *Journal of Applied Psychology*, Vol. 66(1981), pp. 589-597.

[13] Schriesheim, C. A., R. J. House and S. Kerr, "Leader Initiating Structure: A Reconciliation of Discrepant Research Results and Some Empirical Tests," *Organizational Behavior and Human Performance*, Vol. 15(1976), pp. 297-321.

[14] Stogdill, R. M., *Manual for the Leader Behavior Description Questionnaire Form* XII, Columbus: Bureau of Business Research, Ohio State University, 1963.