

Cultural Differences in Performance in Communication Networks among Filipino, African, and American Students*

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Communication Networks

Problems connected with the relaying and receiving of information which arise in large bureaucracies have led behavioral scientists to experiment with communication networks, or the channels through which information is passed from one individual to another. Particularly active in this research have been small-group specialists who have studied such network types as the "circle," the "chain," the "Y," and the "wheel." Figure 1 illustrates the information channels and positions of members in these four different communication networks. Here, each line represents a two-way linkage; that is, each individual can either be a receiver of information or a sender.

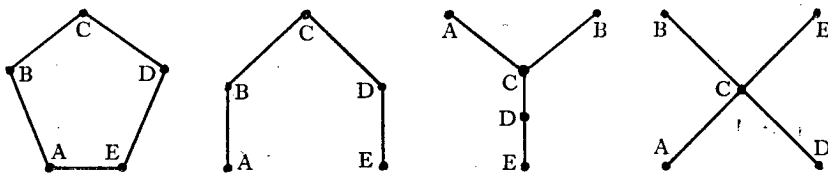


FIG. 1. *Four types of communication network*¹

A study of the different networks would reveal that the greatest number of two-way links exist in the circle network. At the same time, the circle network is devoid of a central figure, or an individual who is in the position closest to all the other positions; this figure, who appears as C in the wheel, chain, and Y, is most dominant in the wheel. The effects of these two factors—informa-

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¹ Adapted from Hare 1962: 240.

tion linkage and centrality of position—on the performance of network subjects involved in problem-solving tasks have been the subject of past research, as well as of the present study.

Leavitt's experiment. Experimenting with these four types of network, Leavitt (1951) found that subjects involved in the wheel network solved a relatively simple problem faster than those in the circle, and reported the emergence of a leader more often than the latter. On the other hand, those in the circle were more equally satisfied with their positions than were those in the other networks; in the Y, wheel, and chain, the members at the peripheral positions enjoyed their work less than those in the central position.² Summing up his results, Leavitt (1951:46) says:

. . . the circle, one extreme, is active, leaderless, unorganized, erratic, and yet is enjoyed by its members. The wheel, at the other extreme, has a distinct leader, is well and stably organized, is less erratic, and yet is unsatisfying to most of its members.

With regard to the emergence of a leader, a later experiment by Hirota (1953) with groups of Japanese subjects established that the central figure becomes the leader in the chain, Y, and wheel. Other researchers following Leavitt have concerned themselves with such objectives as finding out how more complex problem-solving affects performance in the different networks (Shaw 1954), the speed of adaptation of subjects from one network to another (Smith 1951), and the effects of "noise," or irrelevant information, on subjects in different networks (Heise and Miller 1951).

The Present Study

Background

Before I arrived in Africa in 1964, I had assumed that all possible variations of the Leavitt experiment had already been performed and that one more study would hardly contribute anything new to our understanding of behavior in this particular research setting. For several years I had used one version of the experiment as a classroom demonstration in introductory-sociology classes. Usually I compared four-man groups in the wheel and circle networks, assigning the subjects the same task of "finding the common symbol" and employing the same set of symbols which Leavitt had used. Usually, only three trials in each network were necessary to show most of the effects of learning which Leavitt had shown after over 15 trials. Sometimes I ran different groups in the wheel and the circle and sometimes used the same groups,

² In the experiment, subjects were separated from each other by partitions, and communication was limited to the passing of notes through mail chutes built into the partitions. The task of the five members of a network was to find out which of six possible symbols they held in common.

changing the network after the first three trials from wheel to circle, or circle to wheel. Aside from an increase in speed and a reduction of the number of messages sent in the second three trials—a result of increased familiarity with the task—the findings were always the same as those found in the many published studies (Glanzer and Glaser 1961; Hare 1962). I also obtained the same results with groups of high-school students when the experiment was used as a demonstration of the laboratory technique in social science.

Since the results of the experiment seemed so predictable, I decided to use the experiment as a demonstration in an introductory-sociology course and in advanced social-psychology courses that I was giving at Makerere University College in Uganda, Africa. In three different classes, I asked four volunteers to solve three problems in the wheel network and four more volunteers to solve three problems in the circle network. Contrary to my expectations, the students in the wheel network took much longer to solve the problems than those in the circle network. The person in the middle of the wheel seemed especially harassed as messages poured in from the other group members. Under stress he seemed to have difficulty piecing together the bits of information in order to find the missing symbol. Each individual in the circle network, on the other hand, apparently solved the problem without this difficulty. The unexpected results in the wheel network raised several questions for research. Was the task more difficult for African students, especially under stress? Were African students less accustomed to taking the central role in a cooperative problem-solving group? Was there something unusual about this task in a culture different from American culture? Since I was only visiting Makerere for one term, I had to wait until I reached Nigeria, where I lectured for three terms, before it was possible to do a formal experiment which might establish the significance of the differences I had observed between American and African groups.

The Nigerian communication-network experiment

Method. Although the University of Ibadan was a national university, few students from the Northern Region were enrolled there. As a result, the student body, numbering about 2500, consisted primarily of members of two tribes, the Yoruba and the Ibo. In cultural background, the Yoruba are said to be more "authoritarian," and the Ibo more "democratic" (LeVine 1966). Therefore, I predicted that the Yoruba would be more at home in the wheel network, and the Ibo in the circle network. If the Makerere experience proved to be typical, members of both tribes might be expected to send more messages and to take more time to solve the problems than the American groups. Between them, however, Yoruba should be most efficient in the wheel and the Ibo in the circle.

To test these hypotheses, I recruited volunteers by having it announced in various university classes that Yoruba and Ibo students would be paid ten shillings for participating in a two-hour experiment. Four groups—each group made up of four students—were tested at one time; of these four, two groups were Yoruba and two, Ibo. One group of each tribe had three trials in the wheel network, followed by three trials in the circle. The other group had three trials in the circle followed by three trials in the wheel. Thus there were four experimental conditions: *Yoruba wheel first*, *Ibo wheel first*, *Yoruba circle first*, and *Ibo circle first*. After each set of three trials, the subjects were given a short questionnaire asking them to do the following: (a) indicate who the leader of the group was, if there was one, (b) draw a sketch of the communication network of the group (this was intended to check if subjects were using only those communication channels which they were allowed to use), and (c) indicate how satisfied they were with their position, using a 100-point scale.³ After the experiment, each subject filled out a social-background questionnaire, an attitude scale measuring “autonomy,” and a Conditional Personality Test.⁴

To keep track of the originator of each message, I gave each subject a pen with colored ink and called him throughout the experiment by the color of ink in his pen. Thus, the members of each group were Mr. Blue, Mr. Red Mr. Black, and Mr. Green. As a holdover from my practice with American groups, I placed Mr. Red in the center of the wheel network. It was only halfway through the experiment that I discovered that the color red was, unfortunately, associated with blood and death in Nigeria. If one believed in *ju ju*, or sorcery, and wished some ill to befall someone, he would write notes to him in red ink. I therefore felt that having Mr. Red as the central member in the wheel might raise some unintended conflicts in the minds of the other subjects. A cultural anthropologist on the project staff informed me that the color blue had no negative cultural connotations and that actually there was no word for blue in the Yoruba language. So halfway through the experiment, I shifted the central man to “blue.” In summarizing the data, I have added the figures for comparable positions. Thus the data for subjects who were on the right, the left, and opposite Red for the first five sets of groups are added to those on the right, left, and opposite Blue in the last five sets of groups.

³ This was the same question Leavitt (1951) asked at the conclusion of his experiment.

⁴ Autonomy may be defined here as that personality trait which manifests any of the following qualities: resistance to influence or coercion, independent-mindedness and striving for independence, seeking of freedom (in a new location). It may even manifest itself at times as defiance of authority. Papers discussing the autonomy scale have been presented by A. Paul Hare and Rachel T. Hare (1968, 1969) and A. Paul Hare and Dean Peabody (1968). The Conditional Personality Test is a new type of test which asks subjects to indicate how they would react if another person with specific social and personal characteristics were with them in the discussion group. The data on this test have not yet been published.

In all, there were 10 groups in each set, or 40 groups. Throughout the experiment, two groups at each run were monitored by me and the other two by either of two research assistants.

After the experiment was finished, two more groups were run to replace two whose performance seemed too different from the usual to be included in the sample. In one of the latter, a student who was under psychiatric treatment had been assigned the central position. Four out of the six trials for this group had to be stopped by the experimenter since this student could not solve the problems, either in the wheel or in the circle. In the other group, the members used all channels of communication instead of limiting themselves to a wheel network. Both of these groups were Ibo, circle first.

Results. The average number of messages sent by the subjects in each position, the time spent on each trial, and the average satisfaction after the third and sixth trials for Yoruba and Ibo in the wheel-first combination are given in Tables 1, 2, 3, and 4.

Table 1

Average number of messages sent by Yoruba groups (10 in all) in wheel-first communication-network experiment, classified by network and trial, crossclassified by group member.

Network	Trial	Group member				Total	Time (minutes)
		Blue	Red	Black	Green		
Wheel	1	20.4	9.3	8.1	9.1	46.9	14.6
	2	15.3	6.3	5.1	6.3	33.0	8.7
	3	13.5	5.6	4.8	4.7	28.6	6.3
Circle	4	7.9	7.2	7.7	7.7	30.5	5.3
	5	8.9	7.3	8.2	7.9	32.3	4.5
	6	8.3	8.4	8.0	8.1	32.8	4.4

Table 2

Average satisfaction scores of Yoruba groups (10 in all) in wheel-first communication-network experiment, classified by network, crossclassified by group member.

Network	Group member			
	Blue	Red	Black	Green
Wheel	93.9	63.9	69.2	85.0
Circle	82.2	82.9	83.1	92.4

Table 3

Average number of messages sent by Ibo groups (10 in all) in wheel-first communication-network experiment, classified by network and trial, crossclassified by group member.

Network	Trial	Group member				Total	Time (minutes)
		Blue	Red	Black	Green		
Wheel	1	16.6	7.1	6.0	5.6	35.3	10.8
	2	11.3	4.2	3.4	3.4	22.3	6.8
	3	9.9	3.4	3.4	3.5	20.2	4.6
Circle	4	8.6	8.4	7.3	8.2	32.5	5.5
	5	7.7	6.9	7.2	7.2	29.0	3.9
	6	7.8	7.0	6.4	7.8	29.0	3.8

Table 4

Average satisfaction scores of Ibo groups (10 in all) in wheel-first communication-network experiment, classified by network, crossclassified by group member.

Network	Group member			
	Blue	Red	Black	Green
Wheel	90.8	77.5	76.1	67.3
Circle	77.9	89.5	91.4	85.9

With three exceptions (Blue, Red, and Green on trial four) the average Yoruba in each position sends *more* messages in each trial than the average Ibo. While the differences taken one position at a time are not significant, there is a significant difference between the totals of the number of messages sent for trials one through three.⁵ That the Yoruba would send more messages than the Ibo was contrary to my expectations.

The Yoruba also take more time on each trial.⁶ In terms of satisfaction with position, the differences between Yoruba and Ibo are not significant, and the man in the center of the wheel, Blue, is the most satisfied in each case, as we would expect. Blue, as expected, also sends more messages in the wheel, thus reconfirming the generalization that the person who does the most communicating (and has the most control) is the most satisfied.⁷

The results of the circle-first version of the experiment (see Tables 5, 6, 7, and 8) also indicate that the man in the center of the wheel sends the most messages

⁵ At the .02 level, two-tailed test.

⁶ While trial-by-trial differences in length of time are not significant, the difference between the total time of the Yoruba for the first three trials and that of the Ibo is significant at the .05 level.

⁷ In all eleven samples Blue is the most satisfied. This result is statistically significant at the .05 level at least, using the sign test.

and is the most satisfied. However, there are no significant differences between Yoruba and Ibo in the wheel network. Apparently the Yoruba do not send more messages in the wheel when the task has first been learned in the circle.

There are no significant differences between Yoruba and Ibo in the circle network. Thus, contrary to what we had expected, the more democratic Ibo did not perform better in the circle.

Table 5

Average number of messages sent by Yoruba groups (10 in all) in circle-first communication-network experiment, classified by network and trial, crossclassified by group member.

Network	Trial	Group member				Total	Time (minutes)
		Blue	Red	Black	Green		
Circle	1	9.1	7.8	8.1	8.6	33.6	7.1
	2	5.8	5.8	6.5	6.7	24.8	4.4
	3	6.3	5.9	6.3	6.5	25.0	4.0
Wheel	4	11.5	4.7	4.1	4.9	25.2	6.9
	5	8.9	3.5	3.0	3.7	19.1	4.9
	6	9.7	3.6	3.1	3.4	19.8	5.3

Table 6

Average satisfaction scores of Yoruba groups (10 in all) in circle-first communication-network experiment, classified by network, crossclassified by group member.

Network	Group member			
	Blue	Red	Black	Green
Circle	89.8	82.4	87.9	84.7
Wheel	88.0	85.0	76.4	78.7

Table 7

Average number of messages sent by Ibo groups (10 in all) in circle-first communication-network experiment, classified by network and trial, crossclassified by group member.

Network	Trial	Group member				Total	Time (minutes)
		Blue	Red	Black	Green		
Circle	1	9.7	10.2	8.2	8.3	36.4	10.1
	2	6.6	6.6	6.3	6.6	26.1	5.0
	3	5.7	5.8	5.8	5.5	22.8	4.5
Wheel	4	12.6	5.2	4.1	4.3	26.2	8.0
	5	9.2	2.7	2.8	3.2	17.9	4.9
	6	9.0	2.4	2.7	3.4	17.5	4.8

Table 8
Average satisfaction scores of Ibo groups (10 in all) in circle-first communication-network experiment, classified by network, crossclassified by group member.

Network	Group member			
	Blue	Red	Black	Green
Circle	83.3	85.7	87.2	83.9
Wheel	91.8	75.1	75.5	81.1

The American communication-network experiment

Method. To provide a comparable set of data for the wheel-first version of the experiment for Americans, nine groups of students in the introductory-sociology course at Haverford College were run through the experiment after my return to the United States. All nine groups were in the room at the same time. I was assisted in monitoring the groups by two sociology majors who had participated in the experiment earlier. The instructions and materials for the American groups were the same as those for the Nigerian groups. This time Blue was in the center of the wheel for all groups.

Results. The results, given in Tables 9 and 10 show that in all positions the Haverford students send significantly fewer messages, take less time per trial, and are less satisfied with the non-central positions in the wheel. They also tend to give lower satisfaction ratings in the circle.

There were existing data for American students for the circle-first version. In 1960 I had run 15 groups of introductory-sociology students, first for three trials in the circle, followed by two trials in the wheel (see Tables 11 and 12). Though there were only two trials in the wheel, most of the groups had approached the "ideal" pattern of three messages relayed to the center with informa-

Table 9
Average number of messages sent by Haverford groups (9 in all) in wheel-first communication-network experiment, classified by network and trial, crossclassified by group member.

Network	Trial	Group member				Total	Time (minutes)
		Blue	Red	Black	Green		
Wheel	1	8.7	3.1	2.5	3.0	17.3	3.4
	2	5.8	1.7	1.3	1.4	10.2	3.4
	3	5.2	1.4	1.0	1.6	9.2	1.7
Circle	4	3.7	4.0	4.4	4.2	16.3	1.8
	5	3.8	3.4	4.1	3.9	15.2	1.1
	6	3.4	3.6	3.6	4.0	14.6	1.1

tion, and three messages sent back with the answer by the second trial. The differences between these groups and the Nigerians in the same experimental condition are significant.

Table 10
Average satisfaction scores of Haverford groups (9 in all) in wheel-first communication-network experiment, classified by network, crossclassified by group member.

Network	Group member			
	Blue	Red	Black	Green
Wheel	89.8	38.8	16.1	30.2
Circle	72.6	73.3	63.7	53.3

Table 11
Average number of messages sent by Haverford groups (15 in all) in circle-first communication-network experiment, classified by network and trial, crossclassified by group member.

Network	Trial	Group member				Total	Time (minutes)
		Blue	Red	Black	Green		
Circle	1	6.0	5.9	5.7	5.5	23.1	3.5
	2	4.4	4.4	4.5	4.6	17.9	2.3
	3	3.7	3.8	4.1	3.8	15.4	1.5
Wheel	4	6.4	1.7	2.3	2.7	13.1	1.9
	5	4.3	1.1	1.9	1.8	9.3	1.0

Table 12
Average satisfaction scores of Haverford groups (15 in all) in circle-first communication-network experiment, classified by network, crossclassified by group member.

Network	Group member			
	Blue	Red	Black	Green
Circle	75.5	80.4	76.7	79.7
Wheel	87.7	62.3	61.7	66.0

The South African communication-network experiment

Method. In 1965 I conducted the communication-network experiment with groups of sociology and anthropology students at the University of Cape Town, South Africa. Three groups of four persons each were run in the wheel and four groups in the circle. I then left Africa and the following year, when I returned, I was able to run a larger number of groups in both the wheel and

the circle. In the 1965 experiment, some of the groups were mixed, that is, they contained both men and women. In the 1966 experiment, each group was composed of either men alone or women alone. The results were very similar. As an example, only the groups from the second experiment are reported here (see Tables 13 and 14 for males and Tables 15 and 16 for females).

Results. All of the subjects in the Cape Town experiment had a European cultural background. Although both men and women sent more messages in both the wheel and the circle networks than the Haverford groups, their pattern of activity is clearly more like that of the American groups than that of the Nigerian groups.⁸ Since the pattern of activity of groups in East Africa is similar to the pattern of those in Nigeria, and since the pattern of groups in South Africa approximates the American pattern, the variation in performance would appear to spring from differences between "Bantu" and "Western" cultures, rather than from simply living on the continent of Africa. This conclusion will be discussed in more detail below, after we first consider the data from the Philippine experiment.

Table 13
Average number of messages sent by Cape Town male groups in communication-network experiment, classified by network and trial, crossclassified by group member.

Network	Trial	Group member				Total	Time (minutes)
		Blue	Red	Black	Green		
Wheel (N = 5)	1	11.2	3.8	4.2	6.0	25.2	5.8
	2	5.2	1.8	1.8	2.8	11.6	2.6
	3	4.0	1.2	1.4	2.0	8.6	1.8
Circle (N = 5)	1	3.4	6.6	6.6	5.2	21.4	4.7
	2	3.8	7.4	7.2	6.4	24.4	2.9
	3	4.8	6.6	5.6	6.6	23.6	4.5

Table 14
Average satisfaction scores of Cape Town male groups in communication-network experiment, classified by network, crossclassified by group member.

Network	Group member			
	Blue	Red	Black	Green
Wheel (N = 5)	96.0	28.0	18.0	31.0
Circle (N = 5)	60.0	66.0	74.0	60.0

⁸ For the total number of messages sent on trials one through three in the wheel, the differences are significant at least at the .05 level.

Table 15

Average number of messages sent by Cape Town female groups in communication-network experiment, classified by network and trial, crossclassified by group member.

Network	Trial	Group member				Total	Time (minutes)
		Blue	Red	Black	Green		
Wheel (N = 6)	1	10.3	4.2	3.3	3.0	20.8	5.4
	2	7.3	2.3	1.8	1.8	13.3	4.7
	3	5.7	2.2	1.8	1.7	11.3	2.3
Circle (N = 7)	1	7.2	7.1	7.1	7.1	28.9	4.6
	2	5.0	6.9	3.9	5.7	22.1	2.6
	3	5.1	5.3	6.4	4.4	21.3	1.7

Table 16

Average satisfaction scores of Cape Town female groups in communication-network experiment, classified by network, cross-classified by group member.

Network	Group member			
	Blue	Red	Black	Green
Wheel (N = 6)	81.7	43.3	35.0	31.7
Circle (N = 7)	70.0	60.0	77.1	70.1

The Philippine communication-network experiment

Method. The communication experiment in the Philippines was conducted at three Catholic colleges. Filipino college students tend to be younger than their American counterparts since many go directly from grade school to a four-year high school. In the provinces there is typically no junior high school with seventh and eighth grades. At the Ateneo de Manila University in Manila, almost all the students were Catholic and their parents were members of the wealthiest business and professional classes. Students from the two provincial colleges in Zamboanga and Jolo were from families with less means. At the Ateneo de Zamboanga in Zamboanga, on the southern island of Mindanao, the students were either Christians or Muslims, while at the Notre Dame of Jolo in Jolo, an island in the Sulu sea, the students were predominantly Muslim in religious background. All of the subjects were male.

At each college some groups were run in the wheel and others in the circle. In each case the experiment took place in a large classroom, with all the groups participating at the same time. Several assistants were present, each supervising two groups, one wheel and one circle (see Tables 17, 18, 19, 20, 21, and 22).

Results. In their general pattern of interaction, the Philippine groups follow the "Western" style. Fewer messages are sent in the wheel than in the circle. The subjects in the circle are generally more satisfied than the non-central members of the wheel. The subject in the center of the wheel sends the most messages and is the most satisfied in his network. Although the students at the Ateneo de Manila appear to be faster in the wheel and to send fewer messages in the circle, the differences between the Manila, Zamboanga, and Jolo groups are not significant.

Table 17

Average number of messages sent by Ateneo de Manila (Filipino) groups in communication-network experiment, classified by network and trial, crossclassified by group member.

Network	Trial	Group member				Total	Time (minutes)
		Blue	Red	Black	Green		
Wheel (N = 12)	1	15.9	6.9	6.0	6.3	35.2	8.9
	2	9.4	3.6	3.1	3.3	19.4	4.1
	3	7.2	2.8	1.9	2.6	14.4	2.7
Circle (N = 12)	1	10.2	10.4	11.2	10.0	41.7	5.9
	2	7.7	7.9	7.2	7.0	29.8	3.3
	3	6.0	6.3	5.9	6.3	24.5	3.1

Table 18

Average satisfaction scores of Ateneo de Manila (Filipino) groups in communication-network experiment, classified by network, crossclassified by group member.

Network	Group member			
	Blue	Red	Black	Green
Wheel (N = 12)	89.3	87.8	69.3	69.1
Circle (N = 12)	95.4	95.8	97.3	89.2

Table 19

Average number of messages sent by Ateneo de Zamboanga (Filipino) groups in communication-network experiment, classified by network and trial, crossclassified by group member.

Network	Trial	Group member				Total	Time (minutes)
		Blue	Red	Black	Green		
Wheel (N = 5)	1	18.8	8.0	7.6	6.6	41.0	11.8
	2	11.2	3.6	3.2	4.0	22.0	4.8
	3	8.8	3.8	3.0	2.6	18.2	3.4
Circle (N = 5)	1	10.4	13.8	16.4	12.8	53.4	9.8
	2	7.0	5.8	8.4	6.8	28.0	4.0
	3	6.6	7.4	8.0	7.4	29.4	3.8

Table 20

Average satisfaction scores of Ateneo de Zamboanga (Filipino) groups in communication-network experiment, classified by network, crossclassified by group member.

Network	Group member			
	Blue	Red	Black	Green
Wheel (N = 5)	90.0	42.0	79.0	70.0
Circle (N = 5)	96.0	100.0	100.0	76.0

Table 21

Average number of messages sent by Notre Dame of Jolo (Filipino) groups in communication-network experiment, classified by network and trial, crossclassified by group member.

Network	Trial	Group member				Total	Time (minutes)
		Blue	Red	Black	Green		
Wheel (N = 5)	1	10.2	8.2	5.6	5.0	29.0	16.4
	2	8.4	5.2	2.8	4.0	20.4	7.4
	3	6.8	4.2	2.8	2.8	16.6	6.8
Circle (N = 5)	1	15.0	11.4	12.0	17.6	56.0	14.6
	2	7.6	7.2	7.6	7.6	32.0	6.6
	3	8.0	7.0	6.8	8.6	30.4	4.0

Table 22

Average satisfaction scores of Notre Dame of Jolo (Filipino) groups in communication-network experiment, classified by network, crossclassified by group member.

Network	Group member			
	Blue	Red	Black	Green
Wheel (N = 5)	90.0	89.0	84.0	86.0
Circle (N = 5)	91.0	90.4	86.0	96.0

Table 23

Student samples classified by number of groups tested, average number of messages sent, and average length of time spent on experiment, crossclassified by network employed (wheel or circle).

Student sample	Number of groups		Number of messages		Time (minutes)	
	Wheel	Circle	Wheel	Circle	Wheel	Circle
Haverford*	9	15	36.7	56.4	8.5	7.3
Cape Town						
Male	5	5	45.4	69.8	10.2	10.1
Female	6	7	45.5	72.3	12.4	8.8
Ateneo de Manila	12	12	69.0	96.0	15.6	12.2
Zamboanga	5	5	81.2	110.8	20.0	17.6
Jolo	5	5	66.0	118.4	30.6	25.2
Yoruba*	10	10	108.5	83.4	29.6	15.5
Ibo*	10	10	78.0	85.3	22.2	19.6

* For the United States and Nigerian samples the data are given for the wheel or circle networks when they were encountered on the first round.

There are, however, marked differences between the Filipino groups and those from other cultures with regard to the total number of messages sent in both the wheel and the circle.⁹ These differences are apparent in Table 23, which gives summary data for the three trials in the wheel and the circle.

⁹ To achieve a comparison between cultures, the data for all three Philippine colleges were combined, as were the data for males and females in South Africa. The Filipino subjects send significantly more messages (.05 level or better) than the students at Haverford and Cape Town. They also send significantly more messages in the circle than the Nigerians (.05 level). In the wheel, they send significantly less messages than the Yoruba (.01 level, *t* test); they also send less than the Ibo, though the difference is not significant.

In the wheel, the average Philippine group sends more messages than the American or South African groups but less than the Nigerian groups. In the circle, the Filipino groups send more messages than any other cultural group. These differences seem to be related to a high value placed by Filipinos on "smooth interpersonal relations" (Lynch 1965), which leads them to send more messages to "check up" and see if they are being understood. This observation will be further explained below, after we first consider the cultural differences in background and task interpretation between students from Nigeria and those from the United States.

Discussion

Background characteristics of students from Nigeria and the United States

All of the students in the Nigerian and American experiments were male. Both the modal Ibo and the modal Yoruba were 22 years old, Protestant, and the first male child. Neither the subject's father, who was a farmer, nor his mother had a formal education. The modal father had only one wife. Ten students in the sample were 28 years old or older, bringing the mean, or average, age to 24 years.¹⁰ The means for the number of father's wives and education of parents were also higher than the modes. Ibo fathers had an average of two wives and Yoruba, three. For both groups, the mean for father's education was three years and for mother's education, one and one-half years. There were, among the Ibo, more Catholic students and no Muslims or members of other religions. The modal number of siblings for the Ibo was five or eight; for the Yoruba, it was fifteen. In sum, compared to the Yoruba, the Ibo was more likely to be a Catholic and the child of a man with fewer wives and fewer children.

The modal Haverford student, on the other hand, was 18.5 years old, Protestant, and the first male child. His father was a professional with one wife and a college education, and his mother had also been to college.

Cultural differences in task interpretation

Since the Haverford students were younger and from more educated families than the Ibadan students, we might expect them to be quicker in solving problems and to be more familiar with the type of puzzle used in the Leavitt experiment. However, the most important factor in explaining the differences in performance between the American and Nigerian students would seem to be their interpretation of the instructions given by the experimenter. Whereas

¹⁰ In statistics, the mode is the most frequently occurring number or value in a distribution, whereas the mean is the arithmetic average of all numbers. Thus, most subjects in a sample may have only one wife, but if the others have two or more wives, the mean for the whole sample will be more than one.

the American student seemed to understand the task as a cooperative effort and was willing to accept the answer from other group members, the Nigerian student appeared to see the task in more competitive terms and often insisted on solving the problem for himself. This difference in approach would produce the greatest behavioral differences when the wheel network was encountered first and the task was relatively unfamiliar.

My instructions to each set of groups were substantially the same and were read from two typed cards. I first explained that the experiment had not been done before in Africa (or in the Philippines). The members of each group were to communicate in writing, using colored pens, and the messages were to be in English. The instructions continued as follows:

You will have six problems to solve. They are quite similar. In each case there are five symbols: $\bigcirc \triangle \diamond \square +$ [the symbols were drawn on the blackboard]. We will call the first problem Trial 1. For Trial 1 each of you has a slip of paper with four of the five symbols. One of the symbols is missing from each of your slips of paper. This means that the four members in your groups have only one of the five symbols in common. Your task is to discover what the common symbol is. You may communicate with each other only by passing written notes. The trial is over when each of you thinks he has the answer. When you think you have the answer, write the word "answer" on a note together with the symbol which you believe all members of your group have in common. Then raise your hand. When all four of you have raised your hands, the trial is over and the notes will be collected.

I then went on to explain the slots in the partitions through which messages could be passed and began the first trial. As each person found the answer, he was recognized and told that he could put his hand down and continue to pass notes until all members of the group had the answer.

These instructions appear to be similar to the ones Leavitt (1951) used with his subjects in five-man groups. Leavitt (1951:41) says that "when *all five* men indicated that they knew the common symbol, a trial was ended." In Leavitt's experiment, the partitioned work space for each subject was provided with a board with a switch for each symbol. When a subject found an answer to the problem, he was to throw the proper switch, which would turn on a light on a master board in the observer's room. When a light was on for each member of the group, the observer called a halt to the trial.

After the first few sessions in the Nigerian experiment, it was apparent that some subjects would insist on collecting all the information and solving the problem for themselves, even though some other member might pass them the correct answer. For this reason I decided to give them an extra hint by

stressing the group nature of the task and adding the following statement to the instructions: "If one member of the group thinks he has the answer he may pass it on to the others."

This statement was read to all subsequent groups, including those at Haverford, Cape Town, and the Philippines. Even with this additional instruction, however, there is evidence from direct observation and from the content of the messages that in all but four of the forty Nigerian groups, the non-central members solved the problem for themselves, using the central member as a message center. This increased the number of messages sent and the time per trial in the wheel. Of the four groups in which the central person clearly made the decision, two were Yoruba and two were Ibo. For each tribe, the fastest group was one of the two groups in which the central member solved the problem.

As in the United States, the use of the central member to solve the problem in the wheel can result in greater speed if the central member is effective. However, it can also lead to a greater number of errors if the central member makes a mistake. In the Yoruba sample, the second group which used the central member to make the decision was one in which the central member made a mistake in trial two. He sent a total of 39 messages in the process of correcting the mistake. This resulted in the greatest number of messages sent for any of the ten Yoruba groups in the wheel-first version of the experiment.

As a sample of the content of the communication in the Nigerian groups, I have selected the messages sent by one member, Green, of an Ibo group in the first trial using the wheel network. This was the slowest of all the Ibo groups, and in fact was stopped at the end of 16 minutes because the members did not seem to be getting the answer.¹¹ The messages were, unfortunately, not collected in the order in which they were sent, but they still give some idea of the interaction. All of these messages were directed to Red, who was in the center of the network:

Green: Can you communicate with any other members of the group?

What are their signs?

Can you communicate with any other member or members of the group?

If yes, what other symbols have they got?

(Picture of four symbols.)

How about Black? Find out Black's symbols from Blue and give me please!

(Picture of symbols for Green, Blue, and Red.) Find out Black's symbols from Blue and find the answer.

¹¹ One Yoruba group was also stopped on the first trial in the wheel after 21 minutes.

You gave me the wrong symbols. Black's symbols again!
I am waiting for you! Hurry up! Black's or Blue's symbols please!
Apart from the plus sign what other symbols have you got?
I want the signs of the people you communicate with. Not your own.
Have you found Black's symbols? Give them to me please.
Have you got a plus sign on your card?

If a cultural tendency to be more competitive or cooperative explains a major part of the difference in performance between the United States and Nigerian groups, then how shall we explain the differences between Ibo and Yoruba in the wheel network? Or, the differences between fast and slow Ibo groups, or between fast and slow Yoruba groups? Within each tribe there was considerable variation. The range of the total number of messages sent during the first three trials for the Ibo was 54 to 123 and for the Yoruba, 53 to 142.

For help in understanding these differences as well as to explain the relatively high level of satisfaction of those in the non-central positions in the Nigerian groups, I sought out some Nigerian students at Lincoln University after my return from Africa the first time. A dozen students, all Ibo, volunteered to take part in the communication-network experiment. In three groups of four persons each, they solved three problems in the wheel network. In the total number of messages and length of time spent on the problem, they behaved very much like their countrymen in Africa, although most of them had been in college in the United States for at least a year. As before, the messages poured in to the central member as each person tried to solve the problem for himself.

When the experiment was over, I tabulated the results on a blackboard and asked the students to explain what had been going on. Why, for example, were the non-central members so satisfied when it had taken so long to solve the problem? "Why not?", they answered, had not each of them been able to solve the problem in spite of the difficulties I had placed in their way by forcing them to communicate through only one person? Perhaps I should have known that a society which values the "palaver," or long discussion, as a method of solving problems, would place little value on sending the least number of messages in the shortest possible time.

But what about the differences between Ibo and Yoruba? Why do the Yoruba take so much longer in the wheel network? "Ah," said the Ibo, "the Yoruba do not trust each other." Presumably, if they had more trust they would be more willing to accept the answer from the man in the middle of the network. The following summer, when I was again at the University of Ibadan, I

talked to a Yoruba sociologist about the results of the experiment. Did trust make a difference? He replied in the negative, and proceeded to explain that the Ibo are strangers in Ibadan; they are from the Eastern region and Ibadan is in the Western region, where the Yoruba are predominant. As strangers they were more likely to work together than the Yoruba, who were in their home region. Although I tried to develop a "trust" scale from attitude questions which had been asked as part of the Autonomy Scale, and tried to devise a measure of the extent to which members of each group were strangers to each other by noting the distance between their home towns, I have so far been unable to demonstrate that any of the variance within or between groups results from the variable of "trust" or "strangeness." The testing of these hypotheses is the task of future research.

Message content in the Philippines

The content of the messages in the Philippines is quite similar to that of messages in the United States. On first reading it is not easy to see where the differences lie. As a sample, the following messages were sent by Green on the first trial in the circle in one of the Ateneo de Manila groups:

Green: Yes, I do.

Yes he has a square.

Does Red have a square too?

I have a square and a plus.

Do you have a plus?

Do you have a triangle?

Do you have a square?

I have a triangle and a plus. What are yours?

Please tell me if Red has a triangle.

I think it is a square too.

Compared with American and Nigerian subjects, the Philippine subjects are more polite in their message content. They also send more messages which "check up" on the correct answer or make sure that they are being understood. While such messages are found in other cultures, the increased frequency in the Philippines results in a significant increase in messages in the circle network, where each subject is communicating with the two persons on either side of him. Also following the Eastern tradition of politeness, the Philippine students give much higher ratings on satisfaction with the experiment: It would not be good form for one to say that he was not satisfied with his position. Although the relative differences in satisfaction between the central and non-central positions in the wheel are still apparent, more subjects in the circle checked 100 per cent satisfaction in the Philippine sample than in any other nationality group.

Summary

Communication problems in large bureaucracies have led to experimental research with different types of communication network. Noteworthy in the history of this research is the Leavitt experiment with the circle, chain, Y, and wheel communication networks.

In a variation of the Leavitt communication-network experiment, Yoruba and Ibo students from the University of Ibadan in Nigeria were tested in two conditions in four-man groups: wheel network followed by circle network, and circle followed by wheel. The results of the Nigerian experiment were then compared to those for students in the United States, South Africa, and the Philippines in terms of average number of messages sent, length of time to solve a problem, and level of satisfaction with one's position in the experiment.

The largest differences appear between the American groups and Nigerian groups in the wheel, and the American groups and Filipino groups in the circle. The American students send fewer messages, take less time to solve the problems in both types of network, and tend to give lower ratings on satisfaction when they are not in the center of the wheel. With the exception of the Yoruba in Nigeria, all groups send fewer messages in the wheel than in the circle, but take more time to solve the problems. In all nationality groups, the average member is more satisfied in the circle than he is in the non-central positions in the wheel.

Nigerian groups apparently take longer to solve the problems, especially in the wheel, because they are more likely to interpret the task as one in which each individual should solve the problem for himself, rather than cooperate and accept the answer from another group member. Since this is not true at the University of Cape Town in South Africa, it is evident that the difference lies in a "non-Western" approach to problem-solving, rather than in simply living on the continent of Africa.

In the Philippines, both the great number of messages in the circle and the high level of satisfaction with the task seem to reflect a concern for "smooth interpersonal relations," which leads group members to continually check the extent of their agreement and understanding and to inhibit the overt expression of negative comment.

REFERENCES

- Glanzer, M., and R. Glaser
 1961 Techniques for the study of group structure and behavior: empirical studies of effects of structure in small groups. *Psychological Bulletin* 58: 1-27.
- Hare, A. P.
 1962 *Handbook of small group research*. New York, Free Press.
- Hare, A. P., and Rachel T. Hare
 1968 Social correlates of autonomy for university students in the Philippines, United States, and Africa. *In* *Modernization: its impact in the Philippines III* ("IPC Papers," No. 6). Walden F. Bello and Alfonso de Guzman II, editors. Quezon City, Ateneo de Manila University Press. Pp. 92-104.
- Hare, A. P., and D. Peabody
 1968 Attitude content and agreement set in the autonomy scale for Filipino, American, and African university students. *In* *Modernization: its impact in the Philippines III* ("IPC Papers," No. 6). Walden F. Bello and Alfonso de Guzman II, editors. Quezon City, Ateneo de Manila University Press. Pp. 105-113.
- Hare, Rachel T., and A. P. Hare
 1968 Social correlates of autonomy for Nigerian university students. *Journal of Social Psychology* 76: 163-168.
- Heise, G. A., and G. A. Miller
 1951 Problem solving by small groups using various communication nets. *Journal of Abnormal and Social Psychology* 46: 327-335.
- Hirota, Kimiyoshi
 1953 *Shudan no kadai kaietsu to communication* (Group problem-solving and communication). *Japanese Journal of Psychology* 24: 105-113.
- Leavitt, H. J.
 1951 Some effects of certain communication patterns on group performance. *Journal of Abnormal and Social Psychology* 46: 38-50.
- LeVine, R. A.
 1966 *Dreams and deeds: achievement motivation in Nigeria*. Chicago, University of Chicago Press.
- Lynch, Frank, and Mary R. Hollnsteiner
 1967 *Understanding the Philippines*. Quezon City, Ateneo de Manila University Press. (Mimeo.)

REFERENCES (*continued*)

Shaw, M. E.

- 1954 Some effects of problem complexity upon problem solution efficiency in different communication nets. *Journal of Experimental Psychology* 48: 211-217.

Smith, S. L.

- 1951 Communication pattern and the adaptability of task-oriented groups: an experimental study. Cited in A. Bavelas, *Communication patterns in task-oriented groups*. In *The policy sciences: recent developments in scope and method*. D. Lerner and H. Lasswell, editors. Stanford University Press. Pp. 193-203.