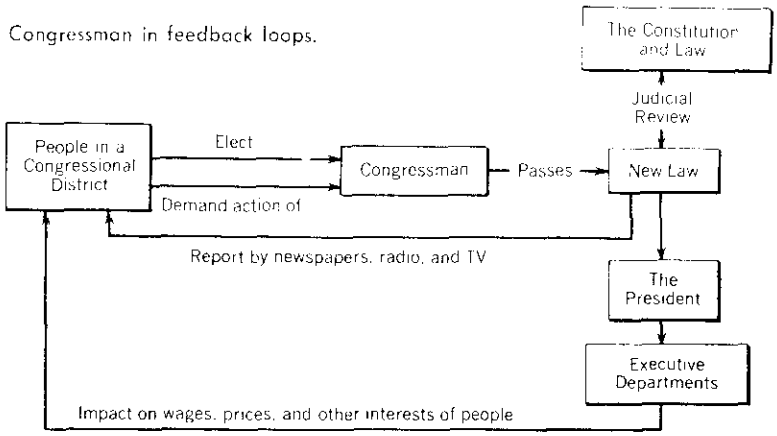
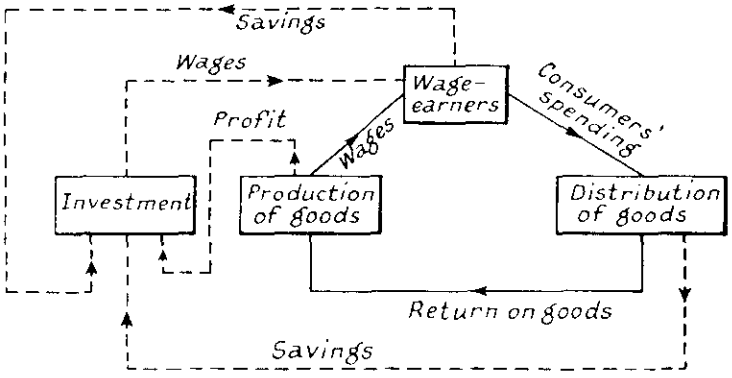
Congressman in feedback loops.



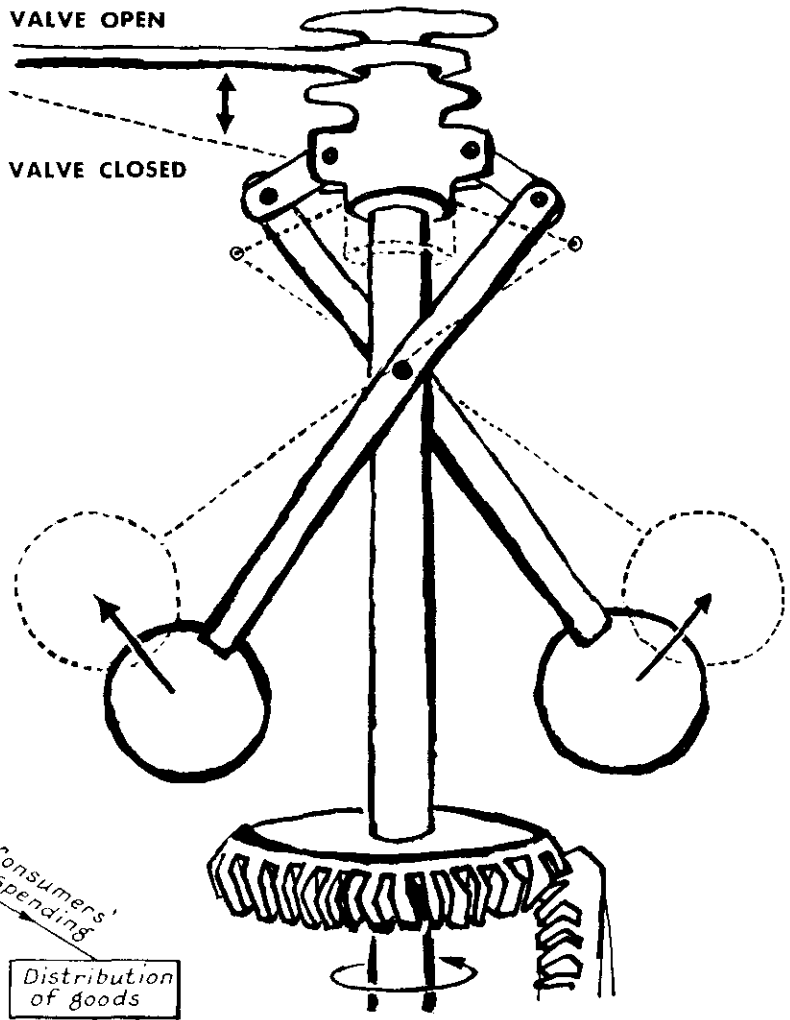
CYBERNETICS

The link between political systems, mechanical systems, and economic systems

Reprinted by permission from
CAREERS AND THE MBA 69



THE ECONOMY AS A SYSTEM OF CLOSED LOOPS.



A Steam Governor

The Use of Cybernetics To Solve An Employee Communication Problem

by Frederick B. Wood, Ph.D.

Cybernetics Consultant

John Jaguar, a fresh MBA, has just been hired by a large corporation to be a special assistant to the manager of one of their engineering development laboratories. The manager has just called Mr. Jaguar into his office and says:

"Welcome on board John. I've heard a lot about the case method at HBS. We've got another case study all ready for you, only this one is for real. Here is the problem;

1) We have a few engineers and computer programmers who are grumbling about various things. But they don't seem to be complaining about wages, working conditions, and the usual concerns workers complained about in the past. Now they are complaining because they cannot put notices on the company bulletin board about all sorts of external meetings that have nothing to do with the business of this corporation. They want to have luncheon speakers like Eldridge Cleaver, Caesar Chaves, and Brigit Bardot.

2) We have this restrictive bulletin board policy to minimize the possible interference of outside organizations with the work of our engineering laboratory. Until recently we have had no significant objections to these bulletin board policies. We are puzzled why employees are now asking for bulletin board space for community meetings on race relations, problems of the ghetto, and political science seminars.

3) We hired an outside management consultant to examine this problem, but he died of a heart attack after a few days of study. The nurse at the hospital says his dying words were "Try Cybernetics."

4) We also checked out all the books on Cybernetics and Management and didn't find anything that clearly applies to this problem.

The laboratory manager then told Mr. Jaguar that he had thirteen days in which to come up with a proposed solution. Below is a copy of the report that Mr. Jaguar delivered to the laboratory manager on a Sunday evening fifteen days later.

Case Study: Cyber-0001

THE USE OF CYBERNETICS TO SOLVE AN EMPLOYEE COMMUNICATION PROBLEM AT XYZ CORPORATION

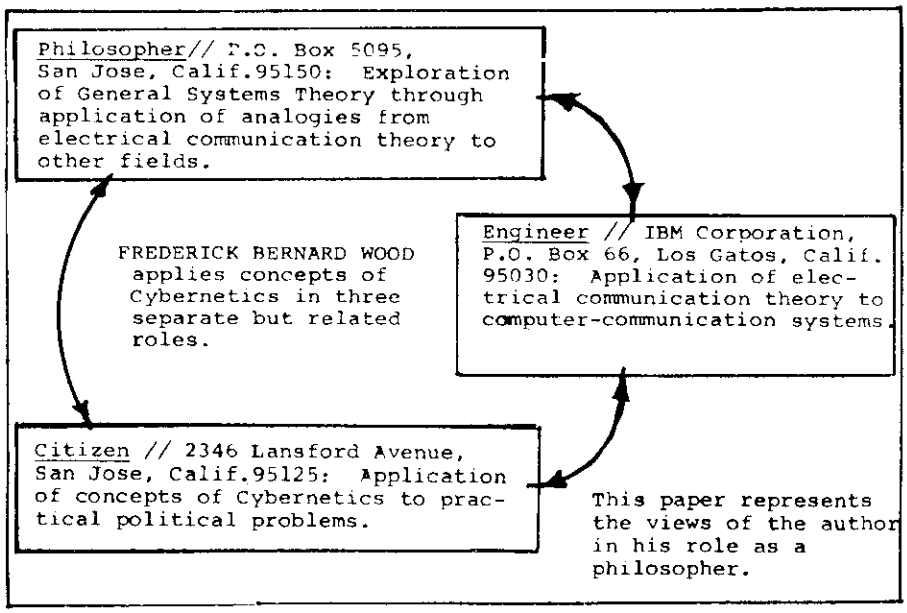
By John Jaguar

This problem centers around XYZ employee demands for bulletin board space within the plant -- private property of the corporation -- for activities not related to the traditionally defined "business" of the corporation. These new demands of the employees appear to be related to the problems Peter F. Drucker was talking about in *The Future of Industrial Man* (1942):

"In other words, the plant must be made into a functioning self-governing community. It must be made capable of serving industrial society in the same manner in which the village served the rural society and the market at the mercantile society (p205)".

Thus, given the dominant role of the industrial corporation in our society, it must provide greater opportunity for individual growth and development. These employees at XYZ want to communicate and interact in a meaningful way with each other. They are asking that through the bulletin board their roles as individuals as well as organization men be recognized. (See Fig. 1, Environmental Forces.)

The problem then for us is to find a possible solution which will allow room for both the corporate employee's role as an individual and as an organization man. Let us explore what the outside consultant meant by his dying words "Try Cybernetics," and see how the MBA can use his education to apply Cybernetics to the bulletin board problem at XYZ.



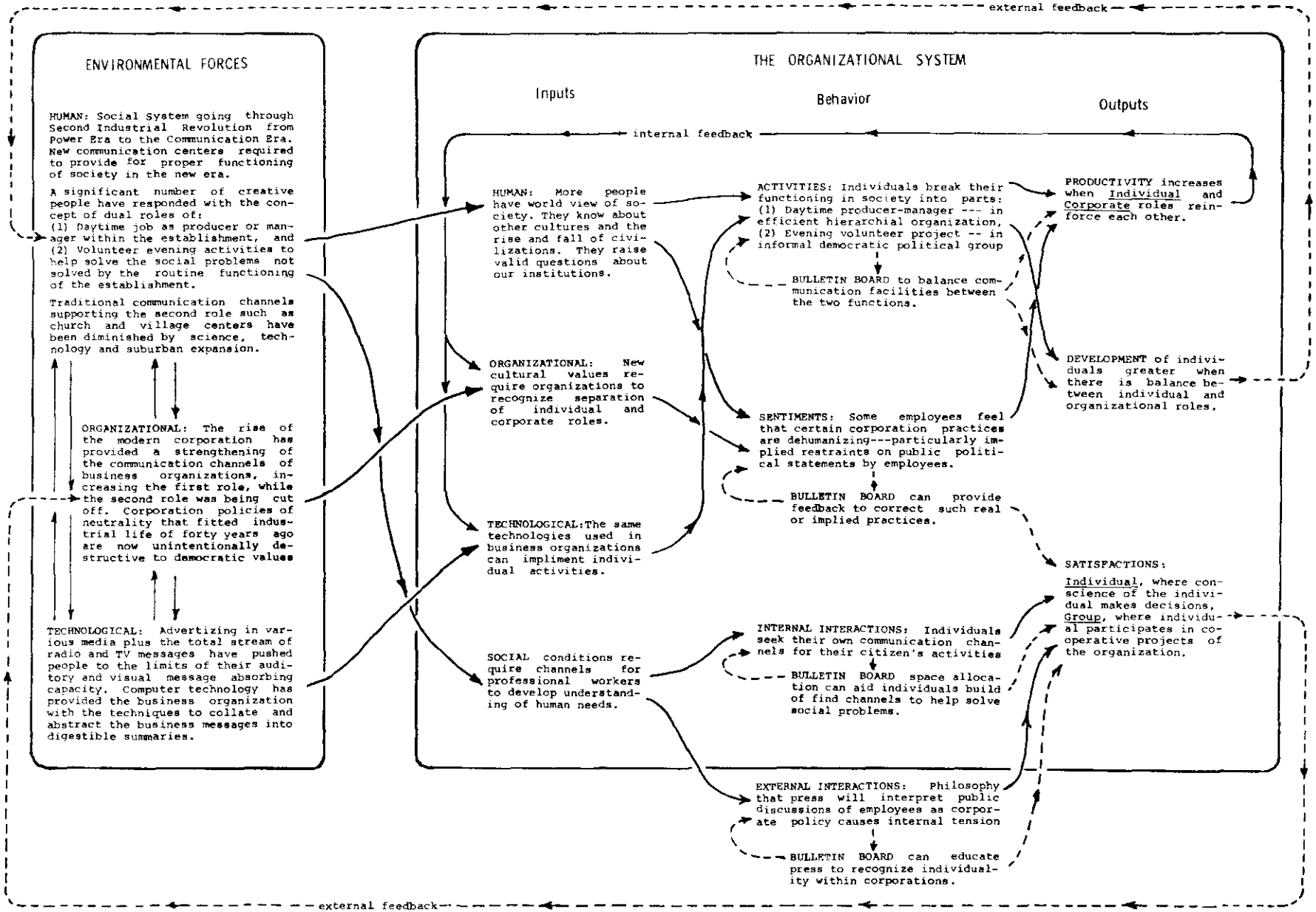


Fig. 1 - Diagrammatic Analysis of XYZ Corp. Employee Communication Problem.

Reviewing the literature of Cybernetics indicated two possible applications to our problem: (1) The qualitative clarification of the feedback loops in the business organization with regard to the bulletin board problem (similar to the analyses in our HBS human behavior courses), and (2) The quantitative calculation of the information content of the messages to be put on the bulletin boards through the extension of the probability concepts from the HBS course on statistics (MERC II-III) as extended by Shannon's book: The Mathematical Theory of Communication (1949).

Figure 1 outlines the qualitative structure of the feedback system involved in the employee communication problem of XYZ Corporation. Here we indicate the impact of changing environmental forces on the inputs to the organizational system. The potential impact of appropriate bulletin boards in satisfying the demands of employees for better communication is shown by the additional communication channels. The internal feedback and external feedback loops indicate how the bulletin boards could help stabilize both the inputs and the environmental forces in a

AFRO-AMERICAN PARTY	NATIONAL STATES RIGHTS PARTY
AMERICAN INDEPENDENT PARTY	PEACE AND FREEDOM PARTY
AMERICAN LABOR PARTY	PROHIBITION PARTY
COMMUNIST PARTY	REPUBLICAN PARTY
CONSERVATIVE PARTY	SOCIALIST PARTY - SOCIAL DEMOCRATIC FED
DEMOCRATIC PARTY	SOCIALIST LABOR PARTY
INDUSTRIAL GOVERNMENT PARTY	SOCIALIST WORKERS PARTY
LIBERAL PARTY	

Fig. 2 - Allocation of Bulletin Board Space with Equal Space for Each Political Party

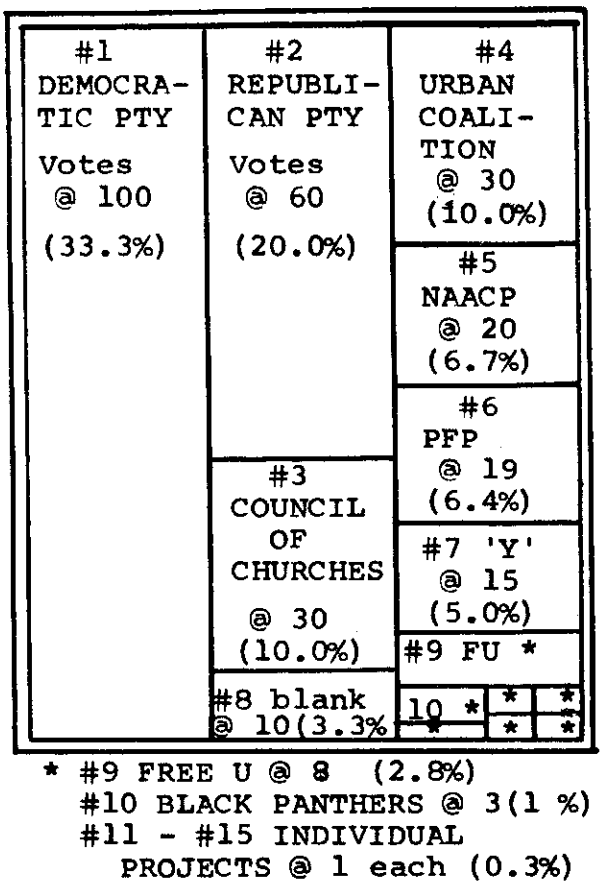


Fig. 3 - Distribution of Bulletin Board Space in Proportion to Preference Probability

constructive way.

For the moment let's assume that the manager agrees to expand human communication and provide some additional bulletin board space on the laboratory premises. We now have a decision to make as to the basis for bulletin board space allocation.

One way would be to give equal space on the bulletin board to each national party that ran a candidate for president in at least one of the last four presidential elections as illustrated in Figure 2.

However, a more effective basis for space allocation is to use internal criterion such as the distribution of preferences among the employees of the laboratory. Last week we made a survey by distributing a confidential questionnaire to all the employees of the lab. We distributed the questionnaire to all 350 employees, and received returns from 300. Of the 300, ten were returned blank or with comments objecting to the bulletin board project.

The results of the survey are listed by number of employee votes and percentages in Figure 3, and are plotted as a probability distribution in Figure 4A. In this survey we stated that preference could be given to any political party, religious group, social group, or even to a one-man project.

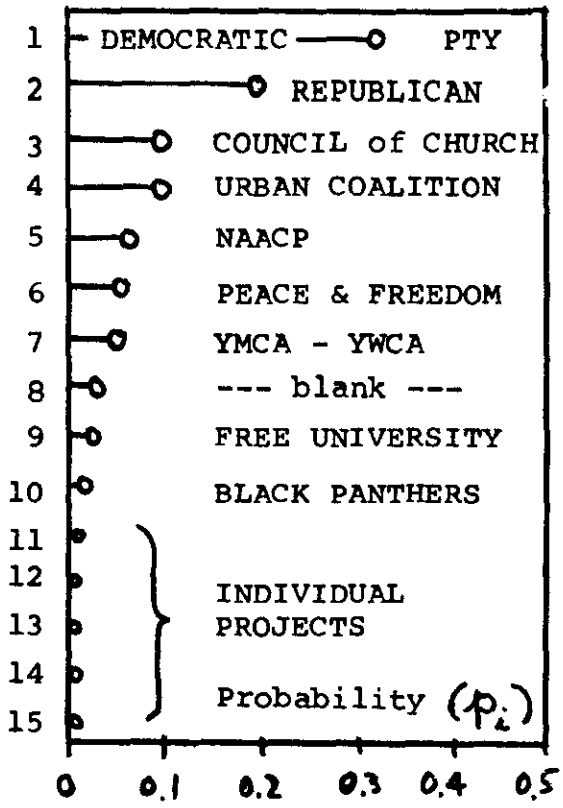


Fig. 4(A) - Probability of Different Preferences

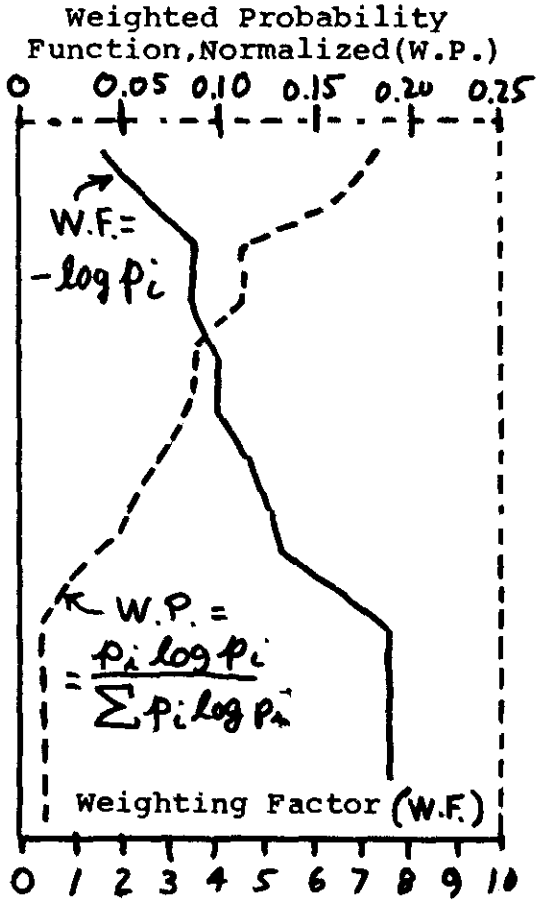


Fig. 4(B) - Weighting Factor and Product of W.F. and Probability for Space Allocation

The next question is what formula should we use to allocate the space. One simple way is to allocate the space in proportion to the votes employees in the lab gave to the indicated groups. The space allocation in Figure 3 illustrates this type of bulletin board. This allocation appears logically fair, but somewhat inefficient.

The Democratic and Republican Parties have more space than they have messages with which to fill the spaces. The Black Panthers and Individual Projects No. 1 through No. 5(11-15) have barely enough space to list their name and telephone numbers. Isn't there some way of weighting the probability distribution which will make more efficient use of the space and still be an equitable division?

The division of space on a bulletin board is similar to the design of a telegraph code. We can get a rough approximation using the technique used over a century ago by S. F. B. Morse used in designing the original Morse Code, or we can be more sophisticated and use Claude Shannon's definition of information as proportional to the logarithm of the probability.

Starting with the probability distribution of the preference of lab employees for particular groups in Figure 4A, we compute a weighting factor based on Shannon's definition of the measure of information in a message. In Figure 4B the weighting factor and the weighted probability distribution are plotted. Then a bulletin board layout with space proportional to the weighted probability function is shown in Figure 5.

Finally, let's apply one more famous Business School concept in evaluating the bulletin board as a solution to the

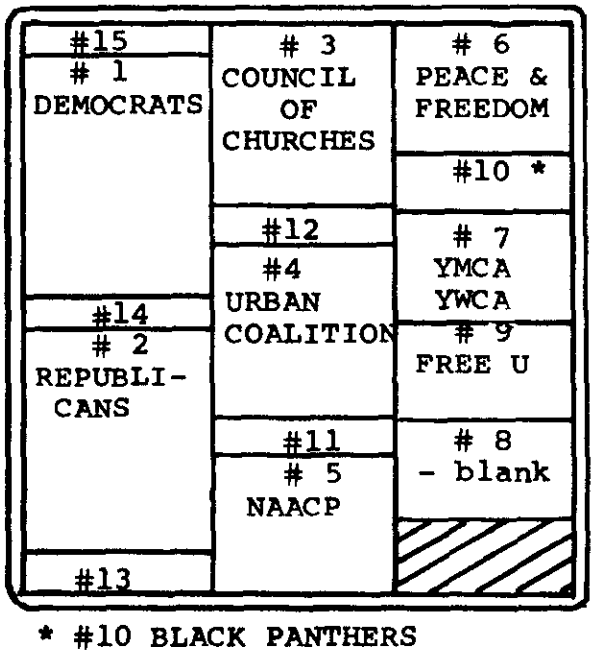


Fig. 5 - Distribution of Bulletin Board Space in Proportion to Weighted Probability Function.

employee communication problem. Figure 6 shows a decision tree and its related outcome table. Instead of the usual dollars gained or lost on the different branches, positive and negative effects on the system are indicated by plus (+) and minus (-) signs. To make the decision tree complete, the choice of no bulletin board is included, and such a decision has a negative outcome for the solution of our problem.

Assuming the manager opts for a bulletin board, the next decision concerns whether external or internal criterion (i.e., national or local employee interests) are to be used as the basis for space allocation.

If the manager decides to follow the second alternative, equal allocation for each political party, we have a positive outcome in three and a half columns of the outcome matrix. However, this alternative doesn't solve the original problem of employee complaints, because the list of national political parties does not relate to all of the local problems.

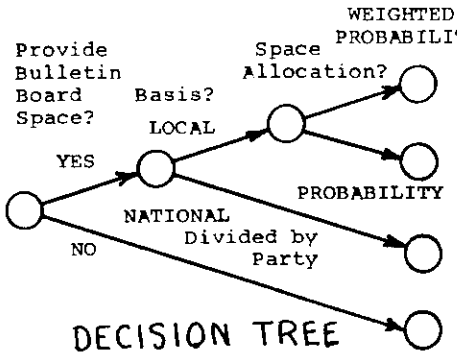
If the bulletin board space is allocated in direct proportion to the probabilities that local employees prefer different groups, we have the board of Figure 3, and we find that this gives a positive outcome in seven out of nine columns in Figure 6.

Finally we examine the probable outcome if the manager chooses a more efficient allocation, namely where space is assigned in proportion to the probability preference weighted by the information content of the group as shown in Figure 5. Here we estimate a positive outcome in all nine columns.

In conclusion, after studying the XYZ employee communication problem using the Cybernetic principles of feedback and feedback loops, we found that the expressed employee need for a bulletin board resulted from the environmental demand that corporations provide greater opportunity for individual growth and development and recognize both the individual citizen role and the organization man role of each employee.

And our decision tree analysis has indicated that this growth and development is facilitated by interpersonal communications which are in turn strengthened by media such as the simple bulletin board.

Finally, we found that efficient and equitable allocation of bulletin board space can be accomplished by using Cybernetic principles from communication and information theory combined with probability and statistics concepts from the MBA curriculum. ●



Resolve problem of employee complaints about bulletin board.	Provide bulletin board space for community projects in a neutral manner.	Fulfill Peter Drucker's specification of community communication center.	Provide pilot test of aid to international corporations to be socially responsible.	Protect corporation from charges of violation of constitutional rights of employees.	Promote respect for the individual in a mass society.	Promote natural development of communication feedback loops.	Promote individual social responsibility.	Be consistent with transition from "Power Era" to "Communication Era."
+	+	+	+	+	++	++	++	++
+	0	+	+	0	+	+	+	+
0	±	+	+	0	−	−	+	0
−	−	−	−	−	−	−	−	−

Fig. 6 - Decision Tree and Outcome Matrix