

## THE RELATIONSHIP BETWEEN MANAGEMENT BEHAVIOR AND SOCIAL STRUCTURE —Improving Human Performance: Better Theory, More Accurate Accounting—

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Of all the tasks of management, managing the human component is the central and most important task, because all else depends upon how well it is done. The management of the human component of an organization is the topic of this paper.

Most organizations today base their standard operating procedures and practices on classical organizational theories. These theories rely on key assumptions about human behavior made in the past by well-known practitioners of management and reflect the general principles they expound. Practitioners' points of view vary one from the other and through time as new schools of practice become fashionable.

Until recently, the shifting sands of practitioner judgment were the major if not the only source of knowledge about how to organize and run an enterprise. Now, research on leadership, management, and organization, undertaken by social scientists, reveals the principles used by the most successful managers and provides a more stable body of knowledge than has been available in the past. The art of management can be based on verifiable information derived from rigorous, quantitative research. Independent investigators can repeat the research and test the validity of the findings. Not only is the body of knowledge more stable and accurate, but it is likely to grow continuously as the results of additional research on management are accumulated. Quantitative research anywhere in the world can add to this body of knowledge.

On theoretical grounds there is good reason to expect that research on leadership, management, and organizational performance will yield the same basic principles and body of knowledge regardless of the country or culture in which the research is done. In all situations where high productivity or performance per unit of investment or per employee is being sought one can expect to find the same fundamental pattern of findings. There are several theoretical reasons for expecting this.

In the first place, basic human nature, in terms of inherited qualities, is the same the world over.

Second, the scientific method is the same in all nations and, competently used, yields similar observations irrespective of the cultural orientations of the investigator. Third, the available evidence does not indicate the need to have different *principles* of management for different cultures. Culture is a conditioning variable which influences the methods and procedures for applying the basic principles of management. Finally, industrialization is likely to narrow the cultural differences which may have existed among nations prior to their industrialization. Industrialization makes nations much more alike in their organizational existence. It creates large-scale enterprises with large numbers of employees and substantial interdependence. This results in an increase in urban living and a decrease in rural life. The technologies of a given industry tend to be the same everywhere as do the socio-technical systems created to operate the industrial enterprises. These characteristics produce great forces to bring about cultural changes in countries which are industrializing. These forces are sufficiently pervasive and powerful to cause major changes in the traditional social and family organization of old, established cultures which until industrialization have withstood successfully previous attempts to alter them. As these changes occur in nations which are industrializing, the differences in culture among the industrial nations is likely to become progressively less. Accompanying these changes will be a trend on the part of managers in industrializing nations to rely increasingly on the same basic body of knowledge in their practice of the art of management.

Research findings as they have become available in recent years are yielding results which confirm these expectations based on theory.<sup>1</sup> There is a growing body of data which indicate that the same fundamental principles yield the highest productivity and best performance in widely different countries and cultures. *Managers in all industrialized and partially industrialized nations, consequently, can improve their performance by basing their management on these principles.*

We shall start examining the evidence for this statement by summarizing briefly some fundamental concepts emerging from extensive research in the United States. We shall then examine data from other countries concerning the extent to which these same fundamental concepts appear to yield the highest productivity and best over-all performance.

### *The Pattern of Research Findings in the United States*

The Institute for Social Research has conducted studies in over 200 United States firms involving thousands of managers and tens of thousands of employees. These studies have revealed that the highest producing managers in American firms are using, on the average, the same basic principles of managing the human organization. These principles differ in fundamental respects from the principles being used by managers who are achieving only average or poor productivity, performance, and earnings.<sup>2</sup> It is possible to integrate these findings into a general organizational theory which can be applied to the structure and management of any enterprise.<sup>3</sup>

This organizational theory recognizes that high levels of *cooperative motivation* are required among the members of an organization. The theory states that to achieve the highest levels of cooperative motivation among the members of an organization, both managerial and non-supervisory, it is necessary to harness fully the non-economic motives so that they reinforce, rather than conflict with, the motivational forces stemming from the economic motives. The theory accepts the view of the highest producing managers that the best results are not obtained by merely buying a man's time and issuing orders; that it is necessary to harness the non-economic motives with the economic motives.

Extensive use of research and development, (R & D), which is characteristic of highly industrialized nations, increases appreciably the necessity for cooperative motivation and behavior within an enterprise. Complex technologies are needed to use effectively the results of R & D. To be successful, firms which use these complex technologies must achieve high levels of cooperative behavior among the highly specialized persons and departments in the enterprise. As increasing use is made of R & D, the extent of cooperative behavior among the members of an enterprise will become increasingly important in determining the success of the firm.

In order to apply the theory to a particular company or plant, it is necessary to develop operating procedures, e.g., for supervision, communication, compensation, decision-making, etc., which are applications of the theory appropriate to the unique conditions and traditions of that company. A fundamental principle, *the principle of supportive relationships*, can be used as a guide to derive the operating procedures most suitable for a particular company in the light of its history and current situation. This principle can be stated as follows:

The leadership and other processes of the organization must be such as to ensure a

maximum probability that in all interactions and all relationships within the organization each member will, in the light of his background, values, and expectations, view the experience as supportive and one which builds and maintains his sense of personal worth and importance.<sup>4</sup>

Consistent with this principle, the highest producing managers create an organization which approaches the following model:

This social system is made up of interlocking work groups with a high degree of group loyalty among the members and favorable attitudes and trust between superiors and subordinates. Sensitivity to others and relatively high levels of skill in personal interaction and the functioning of groups are also present. These skills permit effective participation in decisions on common problems. Participation is used, for example, to establish organizational objectives which are a satisfactory integration of the needs and desires of all members of the organization and of persons functionally related to it. High levels of reciprocal influence occur, and high levels of total coordinated influence are achieved in the organization. Responsibility for the organization's success is felt individually by the members and each initiates action, when necessary, to assure that the organization accomplishes its objectives. Communication is efficient and effective. There is a flow from one part of the organization to another of all the relevant information important for each decision and action. The leadership in the organization has developed what might well be called a highly effective social system for interaction and mutual influence.<sup>5</sup>

The system of management based on this theory has been labelled System 4 for convenient reference. An indication of the leadership style and operating characteristics of this management system is illustrated by the items in Table 1. These items compare System 4 with prevailing management systems based upon traditional theories of organization. The items in Table 1 are from a much longer table.<sup>6</sup>

A steadily growing body of data from an increasing number of studies reveal that firms (plants, departments, etc.) whose management systems are toward the System 4 end of the continuum, in comparison with firms whose management systems are more toward the System 1 end, achieve higher productivity and earnings, lower costs and less waste, less absence, better labor relations and employee satisfaction, and better physical and mental health among their employees.<sup>7</sup> Moreover, as firms shift their management system toward System 4, they experience a favorable shift in these variables, providing the shift is not so rapid or great that it exceeds the expectations and skills of the members of the organization to adapt successfully to it. That is, the

Table 1

## PROFILE OF ORGANIZATIONAL CHARACTERISTICS

		SYSTEM 1	SYSTEM 2	SYSTEM 3	SYSTEM 4
Leadership	1) How much confidence is shown in subordinates?	None	Condescending	Substantial	Complete
	2) How free do they feel to talk to superiors about job?	Not at all	Not very	Rather free	Fully free
	3) Are subordinates' ideas sought and used, if worthy?	Seldom	Sometimes	Usually	Always
Motivation	4) Is predominant use made of 1) fear, 2) threats, 3) punishment, 4) rewards, 5) involvement?	1, 2, 3, occasionally 4	4, some 3	4, some 3 and 5	5, 4, based on group set goals
	5) Where is responsibility felt for achieving org. goals?	Mostly at top	Top and middle	Fairly general	At all levels
Communication	6) What is the direc. of info. flow?	Downward	Mostly downward	Down and up	Down, up, & sideways
	7) How is downward comm. accepted?	With suspicion	Poss. with suspicion	With caution	With open mind
	8) How accurate is upward comm.?	Often wrong	Censored for boss	Limited accuracy	Accurate
	9) How well do superiors know problems faced by subordinates?	Know little	Some knowledge	Quite well	Very well
Interaction	10) What is character of interaction?	Little, always with fear and distrust	Little, usually with some condescension	Mod., often fair amt. confidence and trust	Extensive, high degree confid. & trust
	11) How much cooperative teamwork is present?	None	Relatively little	Moderate amount	Very substantial amt. throughout organ.
Making Decisions	12) At what level are decisions formally made?	Mostly at top	Policy at top. some delegation	Broad policy at top, more delegation	Throughout but well integrated
	13) What is the origin of technical and professional knowledge used in decision making?	Top management	Upper and middle	To certain extent throughout	To a great extent throughout
	14) Are subordinates involved in decisions related to their work?	Not at all	Occasionally cons.	Generally consulted	Fully involved
	15) What does decision making process contribute to motivation?	Nothing, often weakens it	Relatively little	Some contribution	Substantial
Setting Goals	16) How are org. goals established?	Orders issued	Orders. some comm. inv.	Aft. disc. by orders	Group action (except crisis)
	17) How much covert resistance to goals is present?	Strong resistance	Moderate resistance	Some resistance at times	Little or none
Feedback Control	18) How concentrated are review and control functions?	Highly at top	Relatively high at top	Moderate delegation to lower levels	Quite, widely shared
	19) Is there an informal organization resisting the formal one?	Yes	Usually	Sometimes	No - same goals as formal
	20) What are cost, productivity, and other control data used for?	Policing, punishment	Reward and punishment	Reward, some self-guidance	Self-guidance, problem solving

shift, if it is to yield beneficial results, has to be within the interactional capabilities of the members of the organization as determined by their cultural heritage. When a firm shifts toward System 1 in its management system, the *long range consequences* are unfavorable just as a shift toward System 4 is favorable. The short range results from a shift toward System 1 usually appears to be favorable, but as we shall see, this is due to serious inaccuracies and inadequacies in the accounting reports of firms. When all the assets of a firm are considered, a shift toward System 1 decreases the actual earnings of a firm even though there may be an increase in cash flow from the liquidation of human assets.

Data have not been obtained yet from a nationwide probability sample of firms in the United States concerning the management system they employ. Consequently, it is not possible to state with confidence the management system used by the average United States firm. Data from thousands of managers in firms which are somewhat more successful than the average would indicate, however, that the median firm in the United States has a management system in the middle range of System 2.

The results from United States firms show also that the kind of management system being used by a particular manager varies somewhat by hierarchical levels. Higher levels of management tend to see the management system of their firm somewhat more toward System 4 than do the managers at lower hierarchical levels. Conversely, employees at the lowest hierarchical levels are more likely to see the management system of their firm somewhat more toward System 1 than do the higher levels.

#### *Comparable Results are Obtained in Other Nations*

Research in other countries is yielding an increasing body of findings consistent with the general pattern found in the United States. In each nation, there is a range in the management systems used by the enterprises in that nation. In the most highly industrialized nations, this range spreads more toward the System 4 end of the continuum and less toward the System 1 end. That is, the management systems used on the average in these nations tends to be more complex and sophisticated than in the less industrialized nations. In the less industrialized nations, the range in the management systems used tends to extend more toward System 1 and less toward System 4. Irrespective, however, of where along the System 1 to System 4 continuum the range of a particular nation may fall, the available evidence indicates a comparable pattern from country to country:

1. The higher producing, more successful enterprises, departments, or offices tend to fall more toward the System 4 end of the range for that nation;
2. The low producing, less successful organizations have management systems more toward the System 1 end of the range.

This pattern of findings is illustrated by a study which has been completed recently in Yugoslavia to

learn whether the System 4 theory is applicable in that country. The following is taken from a paper<sup>8</sup> which describes the findings:

"The System 4 participative approach to management implies a system of control or influence different from that in the traditional organization, but it is *not* a permissive or a laissez-faire system, as some stereotypes of participative management suggest. Through their participation in supportively led, highly cohesive, overlapping groups, organization members at all levels engage in the influence process. The result is more, not less, control than is usually found in organizations.<sup>9</sup>

"Evidence for the validity of this model has been found in a number of American industrial and business organizations but the model should apply broadly to organizations in other countries too. We expected it to have validity in Yugoslavia for two reasons. First, the 'principle of supportive relations,' upon which the model is based, has very wide if not universal applicability. The need for a sense of personal worth or importance is shared by people in most, if not all cultures, although the means for enhancing this sense of worth will vary among cultures as a function of prevailing values. Second, as Yugoslav social scientists, the first two authors were struck by how well System 4 described what should be some of the social and psychological characteristics of the legally and administratively defined system of self-management in Yugoslavia. It seemed reasonable, therefore, that 'System 4 theory,' which makes use of the social and psychological aspects of participation and which has found support through research in American organizations would apply in Yugoslavia despite manifest differences between Yugoslavia and the United States.<sup>10</sup>

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"The industrial system in Yugoslavia is based on the principle of collective ownership; industry belongs to all the people, rather than to the state. The technical distinction between collective and state ownership has an important consequence in Yugoslavia, namely the system of self management in which workers' councils, elected by the members of each organization are delegated authority for all major policy decisions within the organization. Further-more, this system of self management, in which broad policy-making power resides with the councils, requires a certain decentralization in the Yugoslav economy. Industrial organizations do not have to meet centrally determined production quotas; rather they compete on an open market and they have considerable discretion to determine their production and marketing policies. They may invest, expand, and raise the wages of their members—providing they have the necessary funds either through loans or from profits. Most of the control exercised over plants by Belgrade is limited to the granting or withholding of bank loans, and the levying of taxes.<sup>11</sup>

Research

"Table 2 illustrates the major elements of the theory to be investigated. In this chart the 'causal variables' which include management practice are said to affect the 'intervening variables' which include prevailing attitudes and motives in the organization which, if favorable, result in high levels of such 'end-result variables' as performance and other criteria of effectiveness.

"In order to investigate this notion we selected ten pairs of industrial organizations, each pair containing a high performing and a low performing organization. The organizations within each pair were comparable with respect to type of product, technology, amount of capital investment, market conditions, opportunities for credit, degree of modernity and location (rural-urban). The more successful plants were slightly larger (average size 871) than the less successful (average size 751) and the former experienced some growth in manpower while the latter suffered some decline during the past three years. The more successful plants also have a slightly higher proportion of professional personnel than the less successful.

"Two criteria that define the 'end-result variables' of Table 2 were employed in selecting the more successful and less successful plants: 1) net profit, which reflects overall performance including productivity, sales and costs, and 2) average wages and salaries of all employees, which is related to gross profit. Figure 1 shows the levels of the plants on measures of these criteria averaged separately for the more successful and less successful plants. These data come from company records.

"In the more successful plants the employees were judged on the average to spend between 70 and 90 per cent of their time efficiently compared to between 50 and 70 per cent for the less successful plants. In response to a question concerning whether or not the respondents thought of quitting the enterprise, 11 per cent in the more successful plants compared to 51 per cent in the less successful plants responded that they had thought of leaving their enterprise. In fact, company statistics indicate an average yearly turnover in 1968 of 60 persons in the more successful plants compared to 143 in the less successful.

*Management Systems: More Successful vs. Less Successful Plants*

"Table 1 reproduces the questions which are designed to show the 'causal' and 'intervening' variables of the theory, and Figure 2 shows the results obtained in the ten more successful and the ten less successful plants based on these questions. The headings shown in Table 1 were not included in the questionnaire. The data of Figure 2 were obtained from ten respondents in each plant including the five leading managers and the five top officers of the workers' council. The results

shown in this figure are a simple average of the measures obtained from all respondents in the more successful and less successful plants respectively.<sup>12</sup> While Figure 2 does not show the results for each plant separately, an analysis of these data reveals that *each* successful plant is closer to the System 4 model than its less successful counterpart, a result that would occur by chance fewer than once in a thousand times.

"It is quite clear that the two groups of plants differ in their leadership practices and in the social, psychological, and motivational consequences of these practices as reported by our respondents. As the data in Figure 2 show, the more successful compared to the less successful plants are characterized by:

1. greater confidence by superiors in subordinates
2. more freedom felt by subordinates to talk to their superiors
3. more frequent seeking and use of subordinates' ideas
4. use of involvement rather than threats
5. mutual confidence and trust in interactions, rather than condescension by superiors and fear by subordinates
6. greater participation by subordinates in decisions related to their work
7. productivity, cost and other accounting data used by departments for self-guidance rather than by top management for punitive purposes

"The motivational bases for control also displayed different pattern in the two sets of plants. The more successful plants, to a greater extent than the less successful, are characterized by:

1. widespread feeling of responsibility for achieving the goals of the organization
2. mutual expectations that each person will do his job well and help others
3. cooperative attitudes to achieve goals, rather than covert resistance to them and restriction of output."

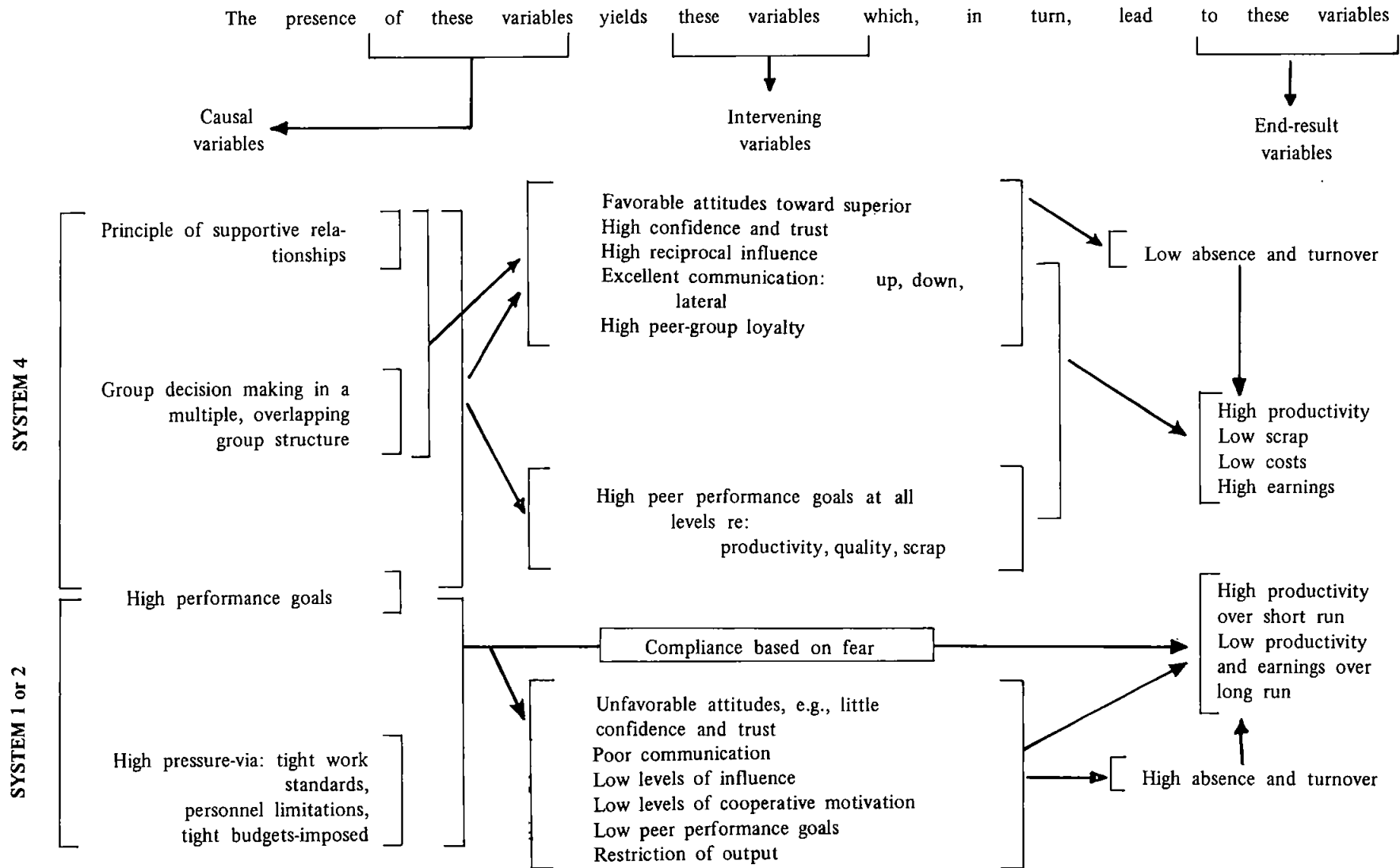
*Results from Japan*

About two years ago more than 100 middle managers in Tokyo were asked to describe the management system used by the highest producing firm or department which they knew well. For this purpose a table comparable to Table 1 was used. After completing this task, they were then asked to answer the table again to describe the management system of the lowest producing firm or department which they knew well. They were requested, if possible, to use for their lowest producing firm one from the same general industry as their high producing firm and preferably of about the same size. Similar data were obtained from another group of over 80 middle managers in Fukuoka.

The results from these two groups of managers were essentially the same. The average (mean) management system score of their high producing organizations placed them in the upper middle part of System 3. The average score for their low producing

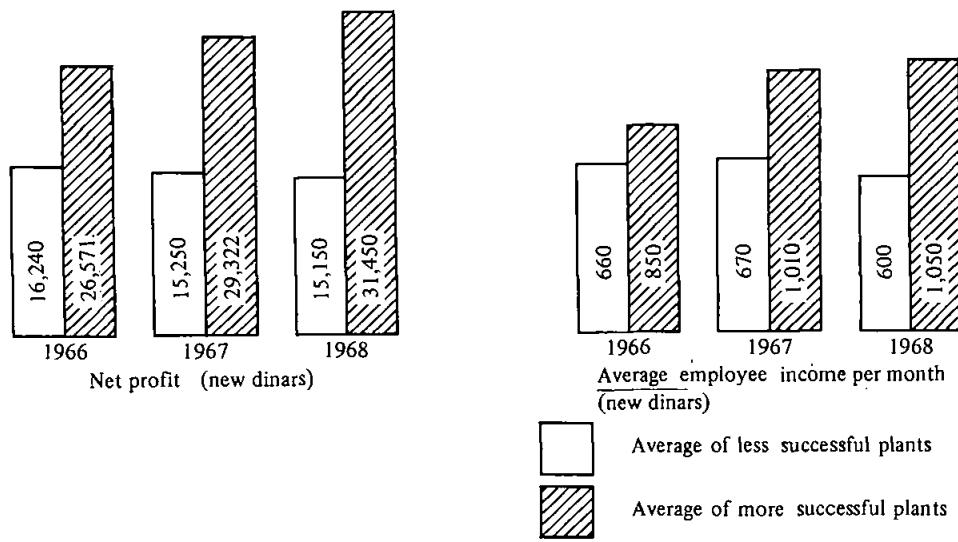
**Table 2**

**Simplified Diagram of Relationships Among Variables for System 1 or 2 and System 4 Operation**

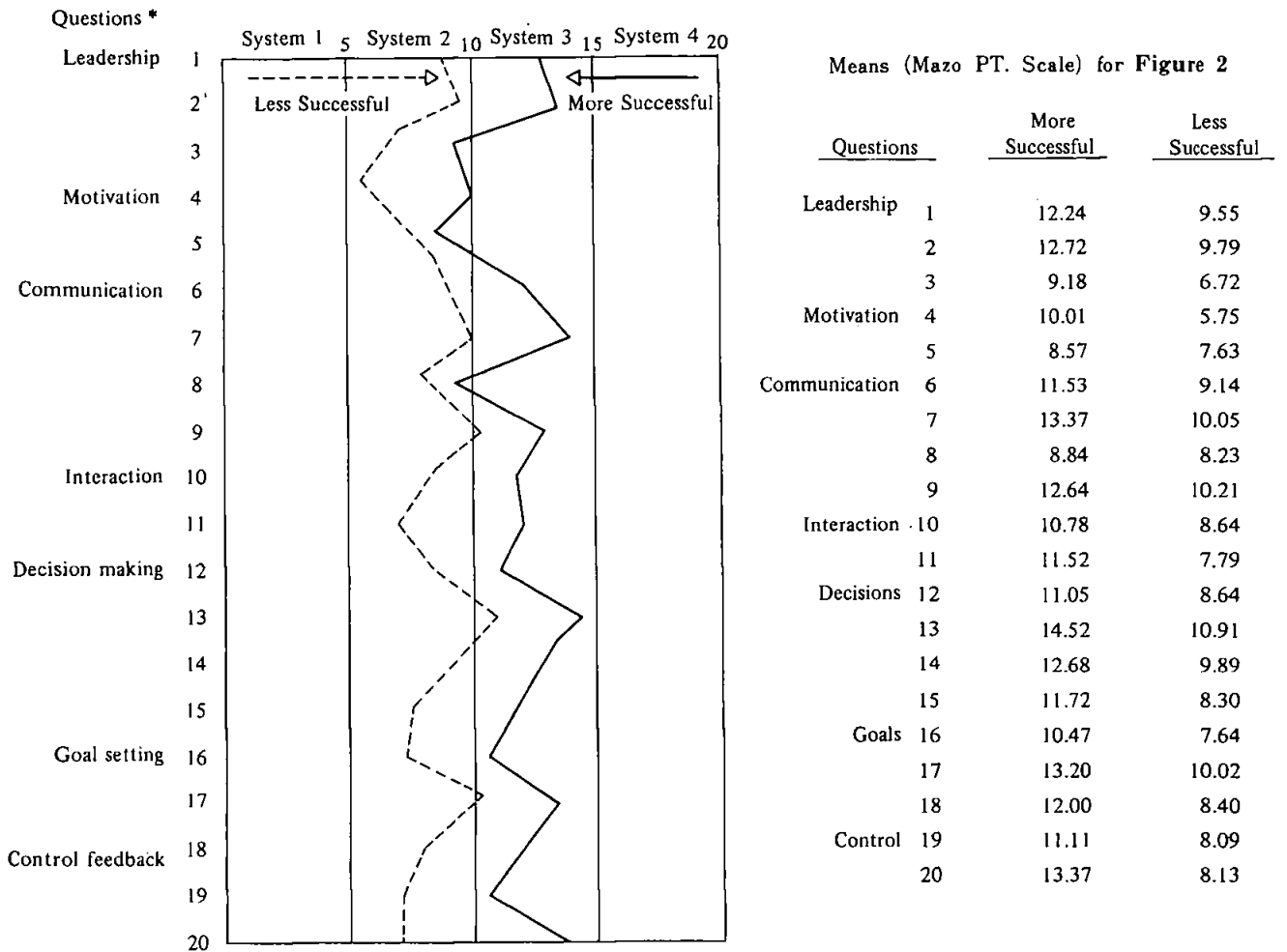


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**Figure 1** Levels of Two End-Result Variables for the More Successful and Less Successful Plants



**Figure 2** System Characteristics of More Successful and Less Successful Plants



\* See Table 1 for question wording

organizations was at the border between System 1 and System 2.

Results from other studies in Japan confirm the pattern of findings concerning the management system used by the most successful managers. When measurements are obtained from Japanese managers who achieve high productivity and earnings, the data show that their style of leadership and management is much more like System 4 than is the style of the low-producing managers.<sup>13</sup>

#### *A World-wide Trend Toward System 4 from Industrialization*

The results from Yugoslavia and Japan as well as from other nations indicate that in every nation, there appear to be competitive and experiential forces tending to shift the prevailing management system gradually toward System 4. This trend is likely to be present unless there are powerful political forces in the nation restraining such development. The probability that this trend will occur, especially in countries which industrialize, can be used in guiding the plans of an enterprise for the hiring, training and development of its management staff. The ability to know today the general direction of development for the next decade or two can be helpful in training managers today for successful management in tomorrow's world.

#### *Available Findings Understate the Effectiveness of System 4*

Although research in other countries<sup>14</sup> also is yielding results which support the conclusions presented concerning System 4, there is reason to believe that the findings in every nation seriously understate the magnitude of the true relationships. The operation and financial reports of firms commonly overstate or understate the actual performance and earnings of a particular firm. Often the error is sizeable since the present financial reports ignore a large proportion of the assets of each firm.

The start-up costs of new plants, stores, or other enterprises reveal the magnitude of the investment which firms have in the loyalty and effectiveness of their human organization. In addition, supplier loyalty, share-holder loyalty, customer loyalty, and reputation in the community also represent substantial assets for most firms. Nevertheless, none of these assets is represented in the balance sheet and virtually no firms keep *rigorous quantitative surveillance* over these assets to tell whether they are increasing or decreasing in value from year to year and by how much.

A crude estimate can be obtained of the value of the human organization of a firm by asking:

"Suppose that tomorrow morning your firm had all of its plants, office, laboratories, warehouses, stores, and all of its equipment—everything, but no personnel except for one person, namely, the president of the firm, and suppose that he had to start rebuilding the human organization of the firm back to where

it is today: a well-knit, effectively functioning human organization, how much would it cost expressed in terms of payroll? Would it require one-half year's payroll, one year's, two year's, five year's, or ten year's payroll? That is, what would the total cost be of recruiting, hiring, training, and organization building to rebuild the organization to its present level of effectiveness?"

Estimates by hundreds of U.S. company presidents and top managers based on start up costs and other evidence yield figures ranging from two to ten times payroll. The most frequent estimates are three to five times payroll. The complexity of the technology of the industry influences these estimates in that the more complex the technology, the larger the estimates tend to be.

Let us be conservative and assume for a typical industry that the human organization of an enterprise is worth three times its annual payroll. On the average for U.S. firms, the ratio of payroll to net earnings, after taxes, is roughly eight to one. For a typical firm, its human organization, therefore, is worth twenty-four times its net earnings (human organization = 3 X payroll = 3 X 8 X earnings).

Since firms rarely keep careful surveillance over the value of their human organization by means of rigorous quantitative measurements, ten or even twenty per cent fluctuations upward or downward in the value of the firm's human organization can occur and go undetected by top management and boards of directors.

This means that an able company president, who manages so as to increase the productive capability and hence the value of the firm's human organization by five per cent in a year is actually achieving earnings substantially larger than the figure reported on the balance sheet. Such behavior by a company president is not now recognized nor rewarded. Several years usually elapse before his contribution is realized.

Conversely, it is equally possible for the top management of a firm to report as earnings a cash flow which comes in part or almost entirely from liquidation of part of the value of the firm's human organization. Ruthless pressure in the form of budget cuts, personnel limitations, tightened work standards, and similar steps represent a shift in the management system toward the System 1 end of the continuum. When this occurs the productive capability of the human organization decreases. The increase in cash flow which occurs when such ruthless, punitive pressure is applied is treated erroneously at present as "earnings" in the accounting reports. The decrease in the performance capability of the human organization, however, is usually greater than the increased cash flow since the liquidation of the human organization usually yields in cash only a fraction of the assets liquidated.

#### *Quantitative Surveillance Can Be Maintained Over Human Assets*

Recent progress in social science research has developed the methods which enable any firm which

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wishes to do so to maintain surveillance over the value of its human organization. Periodic measurements can be obtained which yield information of useful accuracy indicating whether the value of the human organization is remaining about the same or is increasing or decreasing a little or a great deal. At present, it is not possible to attach dollar estimates of the amount of shift when an increase or decrease occurs, but we expect to be able to do this in a preliminary way in another few years. We are developing human resource accounting to make this possible.

We are presently engaged in developing procedures for estimating the actual costs incurred in recruiting, selecting, training employees and familiarizing them with all aspects of their work and in establishing effective working relations with others in the organization. This work will enable a firm to estimate its investment in individuals and groups of individuals in the organization.<sup>15</sup>

It is essential, however, for a firm to know not only its investment in human resources but to know as well the present productive capability of that human organization, i.e., its present value to the firm. These value estimates cannot be made until reasonably accurate estimates exist of the relationships over a span of years for each kind of work among the causal, intervening, and end-result variables. Data to permit these estimates are now being obtained. Experimental calculations indicate that useful estimates can be derived from this approach. Let me illustrate.

To assess correctly the state of the human organization, it is necessary to differentiate between causal and intervening variables. These can be defined briefly as follows:

1. The *causal* variables are independent variables which can be directly or purposely altered or changed by the organization and its management and which, in turn, determine the course of developments within an organization and the results achieved by that organization. "General business conditions," for example, although an independent variable, is *not* viewed as causal since the management of a particular enterprise can do little about them. Causal variables include the structure of the organization, and management's policies, decisions, business leadership strategies, skills, and behavior.
2. The *intervening* variables reflect the internal state, health, and performance capabilities of the organization, e.g., the loyalties, attitudes, motivations, performance goals, and perceptions of all members and their collective capacity for effective action, interaction, communication, and decision making.

We are finding when we measure key causal variables, such as the extent to which a manager is seen by his subordinates as behaving supportively, that we can predict trends in productivity and cost performance and other end-result variables two years

in advance. For example, measurements made in the early part of 1966 of the extent to which department managers in a continuous process plant behaved supportively or built cooperative teamwork among their subordinates accounted for approximately one-half the variation in cost performance against standards among these departments in the early part of 1968.

These and results from other firms indicate that we can assess with useful accuracy whether the human organization of a firm is becoming more or less productive. We feel confident, consequently, that we can develop methods for estimating changes from year to year in the economic value of the human organization of an enterprise. In addition, we can do much more with what we are now able to measure.

We are finding that the relationships between the causal and intervening variables on the one hand and the end-result variables on the other and our capability to measure the causal and intervening variables are enabling us to use these measurements to:

1. Predict one to three years in advance the probable trends, unless deliberate efforts are made to change these trends, in the productivity, costs, earnings, and labor relations of an enterprise or any department or sub-unit within the enterprise.
2. Diagnose the causes of the predicted trends and, insofar as these trends are unfavorable, specify the corrective steps to be taken in the operation of the human organization to bring about desired changes.
3. Assess rapidly, and at an early stage, the relative effectiveness of corrective steps which are taken to bring about desired changes and improvements in undesirable trends.
4. If this early assessment of corrective steps reveals that the desired improvement in the human organization is not being achieved, the measurements can be used to discover what other steps are likely to bring about the desired improvement.

As the above uses of the measurement of the causal and intervening variable indicate, they can be used to give management, especially top management, valuable lead time. Data on productivity, costs, scrap, waste, earnings, grievances, and similar end result variables are extremely valuable. But note that all of these data are *after the fact* measurements. When these variables reflect adverse shifts, all too often serious costs or consequences have already been experienced by a firm.

The great merit of measurements of the causal and intervening variables is that they provide substantial lead time over the end result variables in enabling management to recognize problems and trends and promptly to cope with the undesirable trends and to capitalize on the favorable. The measurement of the causal and intervening variables can provide every level of management substantially greater lead time than is now available in recognizing and acting on its

strengths and weaknesses in managing its human organization.

We do not yet know the full magnitude of the lead time which measurements of the causal and intervening variables will provide every manager in a firm and especially its top management. The lead time will be much longer for very large enterprises than for small firms. It is likely also to vary by the complexity

of the technology of the enterprise. It is likely to be appreciably more than one year for most firms and for very large ones may even be as great as a decade.

We also do not yet know the magnitude of improvement in productivity and earnings which an effective shift to System 4 management will bring to a firm. Our preliminary findings indicate that it is likely to be appreciable.

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