3.

FYI

MANAGING HUMAN COMPETENCE

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Management is in the business of engineering human competence; it has no other reason for being. There is no reason, at least theoretically, that it should not be an engineering discipline like any other, such as agriculture or chemical engineering: its purpose is to achieve valuable results by the efficient manipulation of costly processes. For management to be viewed in the same systematic way as other engineering disciplines, we need only accomplish three fundamental things:

1. A definition of its subject matter.
2. The development of methods for measuring its subject matter.
3. A system for manipulating and controlling its subject matter.

In this treatise, I give the highlights of a system for accomplishing these three things: a definition of human competence, a description of how it can be measured, and a model for creating and maintaining competence.

One single barrier to the reduction of management to a systematic discipline has been greater than any other. Whenever I ask anyone, "isn't human competence a function of human behavior?" The answer is invariably, "yes." It is widely held that the best way to determine whether someone is competent is to observe his behavior. Nothing, I maintain, could be a more misleading way to look at the subject.

To formalize the standard view of the Great Cult of Behavior, we can say that human competence is a function of the behavior repertory of a person (P) -

or, in shorthand:

$$HC = f(P)$$

Moreover, there are three Subcults of Behavior. The Subcult of Work says that human competence is a function of the quantity (k) of a person's behavior repertory, or:

$$HC = f(kP)$$

Thus, the greater his capacity for hard work, sacrifice, and self-denial, the more competent he is said to be.

In the Subcult of Knowledge, competence is viewed as a function of the quality (q) of the behavior repertory, or:

$$HC = f(qP)$$

The competence of a person is judged by how much he knows. The more he knows, the more competent he is said to be.

In the Subcult of Motivation, the probability (p) of behavior is considered vital, or:

$$HC = f(pP)$$

The more one cares, the more eager he is, or the better his attitude, the more competent he is.

And those behavior cultists with the broadest view will insist that human

competence is the product of work, knowledge, and motivation, or:

$$HC = f\ (k\ .\ q\ .\ p\ P)$$

The really competent person is one who works very hard, knows a lot, and is highly motivated. Certainly, any manager (and other people as well) will tell you that this is the winning combination. Such a view point, I will argue, prevents us from developing a truly systematic science of management. Let's look at the matter from a reverse point of view.

I define human competence as a function of worthy performance. And worthy performance (W) can best be viewed as a function of the ratio of valuable accomplishments (A) to costly behavior (B)*:

$$W = f\ (\frac{A}{B})$$

This is the first and most fundamental theorem of a systematic science of management. It says some surprising yet obvious things. If you can create an acre of okra valued at $1,000 (A) for an investment of behavior that costs only $200 (B), your performance is worthy indeed. If the behavior invested costs you ten times as much to create the same okra, your competence is in serious question. The more behavior required to produce the same accomplishment, the less competent you are. And since we have to pay for work, knowledge, and motivation, they are costly processes that we want to

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*As you will see, behavior (B) and behavior repertories (P) are not identical.

use as efficiently as possible. Anyone who can create an acre of okra with a flick of the wrist, without a flicker of knowledge, and who requires no incentive at all, is truly competent compared to one who labors all summer, studies for years, and demands high returns for his efforts.

The confusion of accomplishments (the valuable results of behavior) with behavior itself is, in my view, the principal barrier to comprehending this first theorem of a management science. Woody Woodwell will illustrate:

Willie has just been appointed to his first management job -- supervision of the company's typing pool. Everyone says that the typing pool is inefficient, and Willie is told he has a chance to become a hero if he can improve its performance. Willie has been trained in systems analysis, behavioral psychology, human factors, and the like. He decides to make a systematic analysis of the behavior of the typing pool. To do this, he draws up a worksheet that looks like this:

BEHAVIOR	REQUIREMENTS	STANDARDS	AVERAGE DEFICIENCY IN OFFICE	IMPACT (HOW IT HURTS)

He reasons that if he can identify the important behavior deficiencies of the typists, he will be able to correct them and create a competent pool. He

shows his worksheet to his boss. Who says, "great; go ahead and do it."

Willie goes to experts on typing behavior to establish some reasonable standards, and he also sets up procedures for measuring the behavior he is actually getting in the typing pool. Here is how he fills out his worksheet:

BEHAVIOR	REQUIREMENTS	STANDARDS	AVERAGE DEFICIENCY IN OFFICE	IMPACT (HOW IT HURTS)
Typing	a. Rate	60WPM	None: 10 stenos average 90WPM	-
	b. Accuracy	1. strike wrong key once in 5000 characters, on the average	None: Average one error every 10,000 characters.	-
		2. corrects erors neatly	Three stenos occasionally have sloppy appearing corrections.	Probably makes a bad impression on clients

As Willie studies his worksheet, he becomes very depressed. His typists are fifty percent faster than the experts say is a reasonable standard, and they make only half the errors. The few sloppy looking corrections simply aren't enough to take seriously. So Willie shows his analysis to his boss, Ollie Oldtimer, and argues that the typing pool is more efficient than people

think. Ollie responds immediately.

"I don't give a damn about behavior -- only about results. I don't care how good they are, they aren't doing the job. Now find out why."

Willie goes away feeling that his boss doesn't appreciate systematic analysis. But as he thinks about it, he asks himself, "What did Oldtimer mean about 'results'? Maybe I shouldn't look at behavior at all."

So Willie creates a new worksheet and positions himself outside the typing pool so that he is unable to observe anyone's behavior. Here is what he finds (notice, his first column reads accomplishments, not behavior):

ACCOMPLISHMENTS	REQUIREMENTS	STANDARDS	AVERAGE DEFICIENCY	HOW IT HURTS
1. Typed engineering reports	a. Accuracy	1. No typos	1. Average 2 typos per report	Retyping or pages less than $1,000 per year
		2. No corrections visible in Xerox copy	2. None	
	b. Frequency	3. Average 20 reports per week	3. Average 15 reports a week	2 extra stenographers cost $15,000 annually
2. Typed sales letters	a. Accuracy	1. No typos visible in original	1. None	
	b. Timeliness	2. In mail at the end of day	2. Often in mail a day late	Loss of sales caused by late mail - 10 last year at $3,000 each= $30,000 annually

Now Willie feels better. He has located two serious deficiencies, one which creates unnecessary expense, and another which loses revenues.

Of course, Woodwell's worksheet (I call it a Performance Table) doesn't tell him why his stenographers have problems or immediately what to do about them. But it does tell him where he has problems and what return he will get if he corrects them. This he must know before he looks for causes, which may or may not be found in the behavior repertories of his typists.

First Leisurely Theorem

The first theorem (you will shortly see why I call it a leisurely one) distinquishes between behavior and accomplishment, and defines worthy performance:

> Human competence is a function of worthy performance, which is a function of the ratio of valuable accomplishment to costly behavior.

By this theorem, performance is a transaction of both behavior (B) and accomplishment (A):

PERFORMANCE

BEHAVIOR ⟶ ACCOMPLISHMENT

and the worth of performance is a function of the ratio of the accomplishments to behavior. Farming provides the simple example:

PERFORMANCE (Farming)

BEHAVIOR (planting) ⟶ ACCOMPLISHMENT (The crop)

Obviously, the worth of farming performance depends directly upon the value of the crop (accomplishment), but is inversely related to the cost of planting (behavior). Thus, as the theorem states,

$$\text{Worthy farming} = f\left(\frac{\text{value of the crop}}{\text{cost of planting}}\right)$$

This deceptively simple theorem tells us quite a few valuable things:

1. It says that the way to achieve human competence is to increase the value of our accomplishments while reducing the energy required for the effort.

2. It tells us that great quantities of work, knowledge, and motivation in the absence of at least equal accomplishment, is unworthy performance.

3. It tells us that great accomplishments aren't worthy if the cost in human behavior is also very great. The Egyptian Pyramids are silent monuments to worthless achievement; and a really worthy achievement stares you in the face: the alphabet, a labor saving device of incalculable worth.

4. It tells you that the true value of human competence is derived from accomplishment, not from behavior. Human competence can't be found by observing behavior because it doesn't exist there.

5. It tells you that money, energy, or time invested in reducing the behavior required of performance can pay off splendidly. Since such investments often can simultaneously increase the numerator (accomplishment) as they decrease the denominator (behavior) -- thus we are doubly rewarded.

But increasing behavior requirements (as I shall show) often decreases the value of accomplishments -- thus we are doubly duped.

6. It tells us that a system that rewards people for the behavior (work, knowledge, and motivation) they ~~experience~~ exert in making an accomplishment, encourages incompetence. Also, a system that rewards people only for their accomplishments invites managers to squander other people's energies.

7. It tells us that leisure can best be achieved if we reward worthy performance only -- if we measure and respond directly to human competence. Leisure, the dictionary tells us, is opportunity*, and need only be seized to create more leisure by finding ways to reduce behavior requirements and increase the value of accomplishments.

This first leisurely theorem identifies the subject matter of human competence, and it tells us not to confuse the plow (behavior) with the crop (accomplishment).

Accomplishments are the outputs, products of behavior and never the behavior itself. The music a chorus makes is an accomplishment of a musical director -- and we can only value his performance by how good that music is, not by his own behavior. The behavior of directing has no value, but creates a cost that must be paid for. A director who could get exactly the same music merely by rubbing his elbows together would be competent indeed.

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*Oxford English Dictionary. The second definition OED gives is fascinating: "Time allowed before it is too late."

We can place value only on the accomplishment side of performance -- and cost only on the behavior side. Knowledge, hard work, and motivation are expensive and have no value in themselves. They are costly behavioral means to the valuable accomplishments we seek.

THE PIP AND EXEMPLARY PERFORMANCE

The measure of competence I have found most useful is the PIP -- the potential for improving performance. No matter how worthy performance may be, if it could be worthier, there is potential for improvement. The greenhorn who sews seeds in fertile ground may have worthy performance -- the value of the crop being greater than the cost of the effort. But if the green thumb can get twice the yield for half the cost, the greenhorn must be considered relatively incompetent.

To measure the PIP, we must have a standard of what is possible. The standard I choose is exemplary performance: the worth of the historically best instance of the performance, or the highest worth that can be reasonably achieved. If you are interested in human competence, why set mediocrity as a standard? Thus, if a typical (t) gardener's acre yields $1,000 in okra at a cost of $500*, his worth index ($W_t$) is two:

$$W_t = \frac{\$1,000}{\$\ 500} = 2$$

*Dollars are convenient units, but the PIP is by no means restricted to them.

acc/cost = worth indef Greatest worth indef / Lesser " " = PIP

But if the green thumb creates $2,000 in okra for only $250, his exemplary (X) worth index (W_X) is 8. Then the typical gardener's PIP is 4, meaning that he has the potential for doing four times as well as he is doing. Thus the basic measure of human competence can be further defined by the second leisurely theorem, which states:

> Human competence is inversely proportional to the potential for improving performance (the PIP), which is the ratio of exemplary performance to typical performance. Expressed in shorthand, this theorem states that:

$$PIP = \frac{W_x}{W_t} * \frac{8}{2} = 4$$

After years of observing exemplary performance in many areas of human ~~behavior~~ performance, I have become greatly impressed with the leisurely manner in which true exemplars perform. Generally, they accomplish more with less expenditure of work knowledge, and energy. They do things more simply -- and (if we but study them) their performance becomes easier to emulate than the performance of their typical colleagues. An almost religious awe, unfortunately, has prevented many people from studying them carefully. Exemplary standards are the most reasonable standards to pursue -- not only because they are worthier, and also because they are easier to obtain once we proceed systematically to engineer performance.

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*The PIP of the exemplar is obviously 1.0, since his typical performance is exemplary.

I have studied PIPs widely, and I can make some interesting generalizations about them. In the world-of-athletics PIPs are characteristically small -- almost always less than 1.5. Mark Spitz, the Olympic medalist, swims 100 meters about ten percent faster than the typical entrant in a high school swim contest -- thus, these school swimmers have a PIP of about 1.1. The average professional golfer has a similar PIP when compared with Jack Nicklaus, who is surely the exemplary golfer. Even the average duffer has a PIP of only about 1.5 when compared with Nicklaus. The typical baseball player has a similar PIP when compared with the man who wins the batting title. Rarely in sports can you find a PIP as high as 2.0. This should not be surprising: it says that athletics is greatly competitive.

In the world-of-work most PIPs, by contrast, exceed 1.5. Here are just a few of the PIPs I have actually observed (comparing exemplary to average performance):

- .Insurance sales by salesmen (revenues)..... 14
- .Packaging machine operator production..... 2.5
- .Clerical productivity, microfilm reading..... 2.6
- .Sales of industrial natural gas..... 7.6
- .Effects of training on performance..... 6
- .Coverage of safety inspectors..... 4
- .Encyclopedia sales..... 12

.Grocery store management..... 5

.Metal fabricating plant productivity..... 3

.Clerical productivity, telephone book entries..... 2.1

.Productivity of supervisors' clerical groups..... 2.3

.Productivity of supervisors' mfg. groups..... 2.9

.Telephone operators' productivity..... 1.6

.Sales of chewing gum to distributors..... 2.2

.Manufacturing scrap, supervisory groups..... 3.4

.Effectiveness of auditor reports..... 4

.Consultation on building design..... 7

.Managers of a publishing service..... 5

.Managers of food processing plants..... 2.3

.Engineering troubleshooting..... 3.8

Indeed, it is difficult to find PIPs less than 1.5 when managers or employees are measured on variables over which they have genuine control -- and PIPs of accomplishments over which one has no control are meaningless. Sales PIPs are, by and large, exceptionally large. Management PIPs tend to run in the neighborhood of 3.0, which shows that management is not as competitive as it would like to think. PIPs in routine, simple jobs, such as clerical performance, are among the lowest -- usually between 1.5 and 2.0.

Naturally, the size of the PIP is not the entire story. The PIP is a vital piece of information we need to determine our priorities in creating programs

to improve performance. Everything else being equal, we would apply our energies to tasks that have the greatest PIPs. But we must take into consideration two other factors:

1. The economic impact of improving the PIP.
2. The true source of the PIP.

The first of these factors simply reminds us that the PIP is expressed here as a comparative ratio, but that two PIPs of equal size may not represent the same economic potential. A PIP of 2.0 in a group of 10 sales engineers who make large-dollar unit sales will be more rewarding to correct than a PIP of 5.0 in a group of 10 newspaper hawkers. With appropriate worksheets (Performance Tables) one can convert PIPs into dollar potential. Managers first using such worksheets are almost always surprised, since both the size of PIPs and their dollar potential often lie in unexpected areas. A rather remarkable case study will serve to dramatize this.

Micah Battle has been transferred over to be the new acting head of the State Forest Service's Parks and Recreational Areas. He knows his job is

temporary until they can replace the old boss, Birch Lobby, with another politician; but he's determined to do the best job he can.

He begins his new job by conducting a performance audit of his department. He shows each of his managers how to use Performance Tables and gives them a couple of weeks to do the work. He is particularly pleased with the work of Aymen Awe, his Supervisor of Recreational Rangers. The Rec. Rangers, as they are called, manage the camping areas of the state's parks and forests. However, Micah notices that Awe has not followed through on one of the accomplishments he has listed for the Rec. Rangers.

"'Head counts'," you've got here, Aymen; but you haven't done anything with it. "What's a 'head count'?" Micah asks.

"Well, that's not very important - didn't want to bother you with it," Aymen says.

"But what is a 'head count'?" Micah persists.

"Uh... the Rec. Ranger is supposed to count and tally the number of people who visit his area each day, and he turns the tallys in once a month. Just a little thing."

"Let's make sure," Micah says. "We'll work it through the Performance Table. What are the requirements for a 'head count'?"

"Accuracy - and timeliness, I suppose. They're supposed to hand them in once a month."

"And what is exemplary performance?"

"Well, we checked on it a couple of years ago, and Adam Knight - he's a conscientious fellow - counted a 100 per cent accurately and got all his tallies in at the end of the month. Its not hard."

"What's typical performance?" Micah asks.

"A couple of years ago, when we checked, our guys were only counting about half the people who visited the areas. We sent out a memo saying they ought to do better, but I don't think anybody paid attention to it. Most of them think its a lot of busy-work."

"O. K. so we have a PIP of 2. What shall I put in the impact column? What the hell difference do these head counts make? Is it busy-work?"

"Well, I don;t know for sure," Aymen muses, "but the state law says that money will be allocated to the recreation program on the basis of how many people use the recreation areas, so many dollars per head. Come to think about it, I guess they are important."

"My God!" Micah yells, nearly coming out of his seat. "You mean to tell me that money is appropriated to us on the basis of the head count and we only count half the heads?"

"Well, thats about the size of it Mr. Battle. I really hadn't thought of it that way before."

"Tell me, ~~Micah~~ Aymen, didn't you ever point this out to Birch Lobby?"

"Well, sir, he was always so busy with the legislators that he didn't want to be bothered with the details of how things were done," Aymen says a bit sadly.

"I'll get Lobby on the phone right now and tell him about it. This might help him raise more money than likkering up a bunch of legislators."

After talking to Lobby, Micah Bottle puts the phone down and stares blankly at Aymen.

"What did he say?" Aymen asks.

"Will you believe it? He asked me to leave things alone. He said, 'What would the legislature say if we suddenly doubled the head count?'."

"You mean 'doubled since he left the job'?" Aymen demurs. "Well, I didn't think he'd want to be bothered."

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The second factor that should influence the interpretation of the PIP is the comparison of ~~difficient~~ different levels of management involved in essentially the same mission. For example, we may find a clerical PIP of, say, 1.75 and quickly conclude that the best way to realize this potential is to develop some method of improving the performance of clerks. The cause of the PIP may lie more with management than with the employees. My colleagues were once asked to develop a training system to improve clerical performance. The client was a company employing thousands of clerks to do this job -- typically in groups of ten clerks each. Table I shows data for just three of these groups (two of them quite typical).

The average productivity of the clerks is 80.4 units per hour, and the best clerk produces 141 per hour. Thus the clerical PIP seems to be 1.75:

$$\text{PIP clerks} = \frac{141}{80.4} = 1.75$$

TABLE I

COMPARATIVE CLERICAL PRODUCTIVITY -- UNITS PER HOUR

SUPERVISOR A		SUPERVISOR B		SUPERVISOR C	
Clerk	U/Hr.	Clerk	U/Hr.	Clerk	U/Hr.
1	65	11	62	21	141
2	65	12	61	22	137
3	63	13	61	23	137
4	60	14	60	24	134
5	60	15	59	25	130
6	58	16	50	26	130
7	56	17	50	27	126
8	54	18	50	28	121
9	51	19	45	29	120
10	48	20	40	30	119
AVE.	58.0	AVE.	53.8	AVE.	129.5

But of much greater importance is the supervisory PIP (calculated here by taking the average of all groups except the highest)*:

$$\text{PIP super.} = \frac{129.5}{55.9} = 2.32$$

Clearly the difference between the ordinary supervisors and the exemplary supervisor is more significant than that between clerks. This tells us that

*Only because I've chosen but three groups for illustration. Thus, inclusion of the exemplary groups would distort the true average obtained by using the actual 250 groups.

we should look first to supervisors, not clerks, to improve clerical performance. One supervisor is obviously doing something right, and we should find out what it is. Until we do this it would be foolish to think about clerical training. Of course PIPs can reveal themselves at higher levels of management than the first-line supervisor, and often do. Table II is a stylized, simplified representation of data for four different automobile metal fabrication plants.

TABLE II

MANUFACTURING PLANT VARIANCES

	SPECIFIC MOTORS, INC.		UNIVERSAL MOTORS, INC.	
	PLANT A	PLANT B	PLANT C	PLANT D
Average Fender Line Production	15/hr	19/hr	24/hr	30/hr
Best Fender Line Production	19/hr	25/hr	27/hr	33/hr

Average fender production in these four plants is 23 units per hour, giving a PIP of 1.54, which -- when comparing such large units as a plant -- is very

significant. But the average supervisory line PIP, taken one plant at a time, is only 1.2. Actually, most of the variance can be attributed to differences between companies. Using Universal Motors as the exemplar, the Specific Motors PIP is 1.59. The hourly employee PIP in factories such as this is extremely low since each man is, like a mule, attached to an assembly line that determines his rate of production. The mass of incompetence in this business can be found in company management at a level above the plant management.*

And, of course, it is quite possible to find considerable PIPs at all levels, where there is a large potential for improving performance in hourly employee, supervisor, middle and top management. But wherever PIPs occur, it makes the most sense to begin a program of improvement at the highest level where a significant PIP exists. In my experience, however, in the world-of-work, management tends to think in the other direction. If things aren't going well, blame it on the hourly employee, and if that argument can't be made to stick, try the first-line supervisor.

SPURIOUS PIPS

People, when confronted by PIPs in which they are involved, commonly dismiss them.

"You can't really compare these departments; they are much too different."

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*Naturally, this management finds it comfortable to lay the blame on low worker productivity.

And so every chewing gum factory is said to be completely unlike any other, and even clerical units performing the same work are declared hopelessly incomparable. But no serious analyst of human competence will take these assessments seriously, unless it can be shown, for example, that one plant is automated and another isn't. But what people are saying is that PIPs represent spurious differences -- differences that result from some condition that has nothing to do with human performance.

One of the divisions in the Waldo, Inc., a national company that compiles and prints city directories, performs the clerical work required to handle new directory entries or changes in the old ones. Each department of the clerical division handles one or more directories. Waldo's personnel department has employed a consultant to help them devise a course in human relations for clerical first-line supervisors. The consultant, Frank Roby, asks to look through production data of clerical departments (called Books), particularly the daily records of individual clerks. People in the personnel department are certain that he has the wrong approach to human relations training, and since no such individual production data is available, Roby has to collect his own. Table III is a simplified representation of what he found (a unit of clerical production is called an entry at Waldo):

TABLE III

CLERICAL PRODUCTION, WALDO, INC.

- ENTRIES PER HOUR -

	CAROLINA DIVISION		GEORGIA DIVISION	
	BOOK I	BOOK II	BOOK III	BOOK IV
SUPERVISOR A	28.0	23.0	11.1	7.2
SUPERVISOR B	24.1	16.9	8.4	4.9
SUPERVISOR C	19.9	10.4	4.7	4.1
TOTALS	24.0	16.8	8.1	5.4
	20.4		6.8	

After studying these data, Roby pointed out to his clients that the difference between Books (departments) seems rather large. His client responds defensively, "But there is no way to compare departments, they are all so different. They have sidely differing procedures, and some of the Books are partly mechanized -- have computer help. Besides, what does this have to do with human relations or supervisory rapport?"

Frank Roby is quite willing to believe that different departments have different procedures -- at least that could account for some of them being so incompetent. He calculates his PIPs like this:

Clerical PIP	3.1	(data not in Table III)
Supervisory PIP	2.1	
Book Manager PIP	1.8	
Divisional PIP	3.0	

These PIPs are all quite sizeable and indicate great potential for improvement in competence. But the client has insisted that these variances are spurious -- caused by factors that have nothing to do with human performance, such as computerization and different procedures. So Roby must investigate these claims. Beginning with computer mechanization, here is what he finds:

Book I	Computerized	24.0	} Entries Per Hour
Book II	Non-Computerized	16.8	
Book III	Non-Computerized	8.1	
Book IV	Computerized	5.4	

So much for the computerization argument, though Roby is inclined to believe that the difference between Book I and Book II might genuinely be caused by computerization, but what about the difference between Books III and IV? He

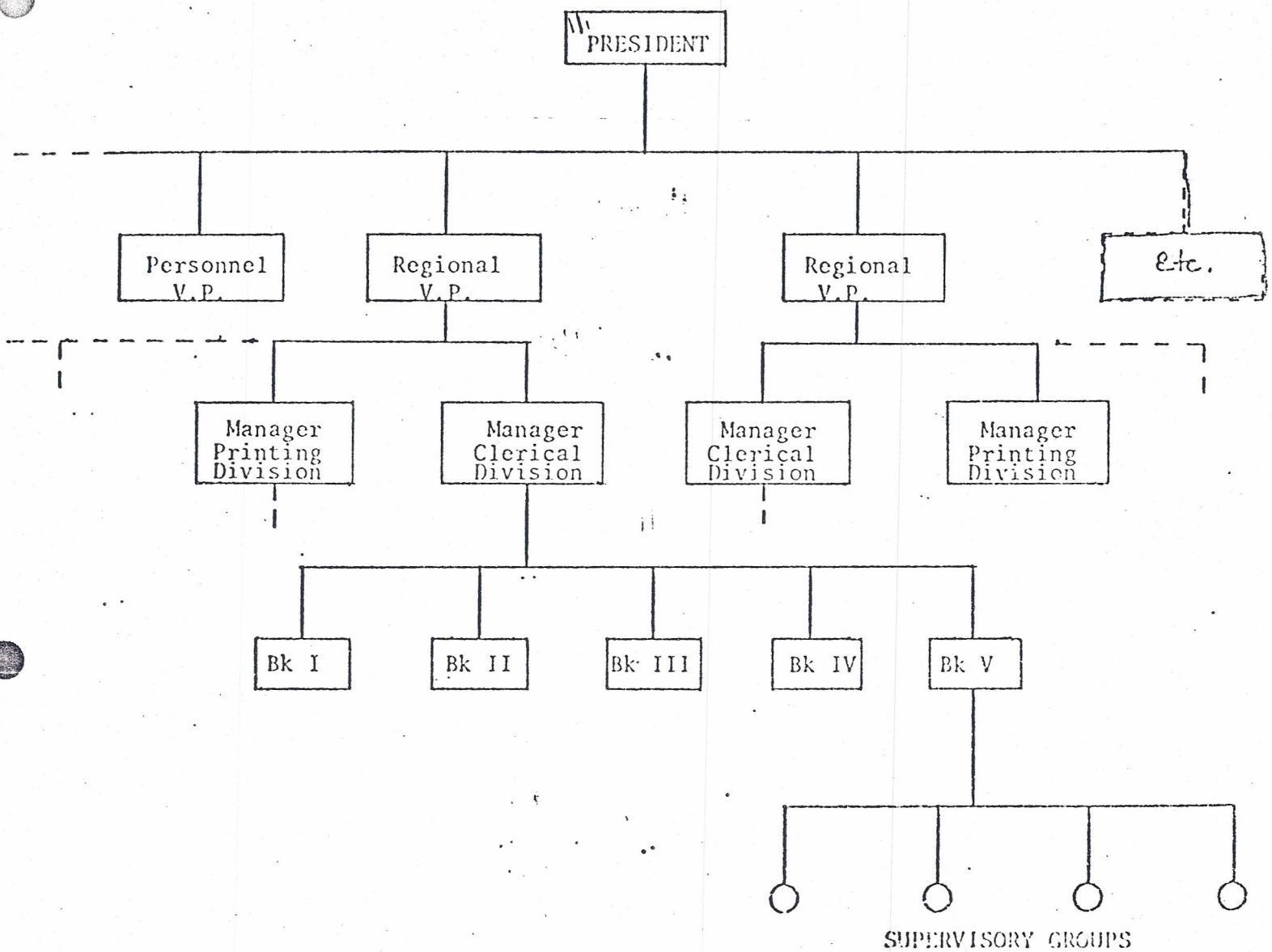
also finds little to support the claim for other spurious sources of variance -- except one: different procedures. He discovers that the general procedures used by the Georgia Division are different, and clearly inferior. And Book IV, he finds out, has even more inefficient variations on these procedures.

Clearly the greatest and most important PIP is divisional -- one division is downright incompetent. When Roby suggests to his client that perhaps they ought to begin by improving divisional management rather than first-line supervisors, the client responds with dismay.

"But that's not what we were asked to do. We're responsible for clerical and supervisory training."

It seems a shame to Roby that a company that has so many troubles should pursue some will-o-the-wisp called human relations training. The really poor conditions for production in the Georgia Division, in his opinion, generate more poor human relationships than a dozen tactless supervisors.

When Roby examines the organization table of Waldo, Inc., he gets a new idea about where to attribute some of the large PIP. Here's what he finds:



If you study this organizational table, you will see that the lowest level of Waldo's management that could be responsible for common divisional practices is the president of the company, Monty Bloomfield himself. Thus if one wanted to change anybody's performance in order to accomplish common divisional clerical procedures, that person would be the head of the company. When Roby reports this to his client, the response is immediate.

"Me go to Monty Bloomfield? Not on your life! I don't even get to see my own vice president."

The PIP can lead us to unexpected placed, once we endeavor to trace it to its true source.

Of course, PIPs can be inflated by spurious factors. The exemplar of insurance sales may live in a place where people just naturally love to buy insurance; the high PIP chewing gum factory may be located in an area where the humidity makes it hard to package gum. Such factors need to be taken into account, but when they are, the analyst of competence will usually discover that the major sources of the PIP are the much more easily controllable human factors that impinge directly on performance. An exemplar may have luck going for him, but luck is more even-handed than we would like to admit. Far more likely, the exemplar is simply doing something right, and if we are not afraid of acknowledging his existence, we can find out what that is.

THE PERFORMANCE TABLE

I present the PIP here only as a conceptual device. The technology involved in actual PIP measurements is considerable and can't be described in a single paper. This technology has developed out of the unpleasant and inexcusable fact that few organizations have available desirable data on performance -- so PIPs and their sources are usually not simple to develop, and can be gotten at in many different ways. Whatever the method, however, the basic concept remains the same: competence is measured by focusing on performance, not on behavior, and by setting exemplary standards.

My colleagues and I use a variety of worksheets I call Performance Tables to assist in evaluating our measures of competence and to help us target performance problems. An example will serve to illustrate the power of a Performance

Table.

David Wise is asked by the Northernmost Gas Company (a utility known locally as No Gas) to develop a training course for upgrading the skills of the people who sell residential gas-fired air conditioning for No Gas. It seems that the company is losing money on airconditioning and the management assumes that salesmen are the culprits. Wise sagely convinces the management to let him look first at the performance of the company as a whole. His subsequent analysis reveals an unusually low sales PIP of only 1.1 -- meaning that sales performance could be increased by 10 percent if all salesmen could do as well as the exemplar. Many other observations confirm Wise's suspicion that the problem lies elsewhere and that No Gas salesmen are; as a group, exceptionally competent. He takes a clue from these salesmen, who say that builders and homeowners are buying less because they can't get satisfactory service. So Wise makes an analysis of air conditioning servicemen.

To help him with his analysis, David Wise seeks the exemplary serviceman, who turns out to be the only woman on the service force. Marilyn Blue is, according to all known measures and opinions, by far the best serviceman. The local mythology is that she is smarter than the men -- and, after all, she is the only service employee with substantial college credits. Had she not been a woman, she would doubtless be in management.

Wise constructs a Performance Table (substantially the same device used by Woody Woodwell) to examine service at the first (departmental or policy) level of analysis -- asking how well the service mission is performed as a whole. Table IV* summarizes this analysis beginning with the primary accomplishment of the service department, and describing exemplary performance as a standard.

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*Table IV is a somewhat simplified version. The reader can laboriously track through the computations if he wishes to.

TABLE IV PERFORMANCE TABLE

FIRST LEVEL ANALYSIS: CENTRAL HOME AIR CONDITIONING SERVICE PERFORMANCE

ACCOMPLISHMENTS	STANDARDS		IMPACT OF PIP	ACTUAL (VALUE) (COST)				PIP	VALUE OF CORRECTING PIP
	REQUIREMENT	EXEMPLAR		TYPICAL PERFORMANCE	UNIT (VALUE) (COST)	NO.	TOTAL		
Operating Central Home Air Conditioning	Number of service calls (productivity)	1,500 calls per yr.	Excess labor costs etc.	900 per yr.	$17.78 per call	70 servicemen	$1,120,000	1.67 = 1500/900	$448,000
	Minimum replacement or AC Units (quality)	Only one replacement in five yrs. (0.2/yr.)	Cost of equip.	0.5 per yr.	$2,500 per AC Unit	70	87,500	2.5 = .05/.02	52,500
	Minimum call-backs (quality)	20 per year	Excess labor costs, etc.	30 per yr.	$17.78	70	37,338	1.5 = 30/20	12,446
etc. ↓									

He finds three areas of service with economic potential:

1. Productivity -- or the number of service calls made a year. Marilyn Blue makes 1,500 compared to an average of 900 -- a PIP of 1.67. If the typical serviceman could perform as well as Blue, a theoretical savings of $448,000 per year is possible.
2. Quality, so that units don't have to be replaced. The larger PIP of 2.5 is impressive, but doesn't translate into as much money. Only $52,500 could be saved by making the department exemplary.
3. Quality, by decreasing call-backs because the job wasn't done right the first time. Here, a PIP of 1.5 translates into only $12,446 annually -- which is surprising since NO Gas management had said that this was the significant area in which service could be improved.

So, Wise concludes that priority attention should be given to speedy service. Why is Marilyn Blue so much more productive than other servicement? The service manager and the personnel V.P. agree on two reasons:

1. She is smarter.
2. She takes more pride in her work.

Wise considers these typical behavior cultisms as nonsense. If such explanations are valid, the cause is lost, because its just too hard to make people smarter and prouder than they are. Management agrees, and asks him to reconsider sales training.

But Wise goes to the second (or strategic) level* of analysis -- looking at the major accomplishments of the service job. Table V summarizes a Performance Table describing two of the major outputs of a serviceman:

1. Trouble Diagnosis
2. Trouble Correction

If you study the Table, it becomes obvious that the major reason Marilyn Blue is more productive is because she diagnosis problems faster (not more accurately) than other people. It takes her 20 minutes to find out what's wrong with an air conditioner, while the average serviceman spends 70 minutes at it. This has a potential worth of $424,000 a year to No Gas -- or roughly 40% of its service costs. Speed of correcting a problem, once it is diagnosed, is not a big factor.

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*For a discussion of different levels of analysis, see Gilbert, T.F, Levels of Performance Analysis, Praxis Technical Publications, No. 1, Morristown, N.J., 1974.

TABLE V PERFORMANCE TABLE

SECOND LEVEL ANALYSIS: CENTRAL AIR CONDITIONING SERVICE PERFORMANCE

ACCOMPLISHMENTS	STANDARDS		IMPACT OF PIP	ACTUAL (VALUE) (COST)				PIP	VALUE OF CORRECTING PIP
	REQUIREMENT	EXEMPLAR		TYPICAL PERFORMANCE	UNIT (VALUE) (COST)	NO.	TOTAL		
AC Equipment Trouble Diagnosis	Accuracy of diagnosis	98.6% (20 callbacks per year)	Trouble not corrected (callbacks necessary	96.7% (30 callbacks per year)	$17.78	70 men	$37,338	1.5	$12,446
	Speed of diagnosis	Averages 20 min. for diagnosis (37% of each call)	Increased service time	Average 70 min. for diagnosis (53% of each call)	53% of $17.78 = $9.42	70 men X 900 calls	$593,674	3.5	$424,052
Trouble Correction	Accuracy	99%	Callbacks	99%	-	-	-	1.0	-
	Speed	Average 60 min. to repair	Increase labor time	Average 63 min. to repair (47% each call	47% of $17.78 = $8.36	70 X 900	$526,680	1.05	$25,080
Equipment in Maintenance Condition									

Why, David wonders, is Marilyn Blue faster at diagnosis?

"She has a real feel for the equipment," the service manager says. "Its uncanny -- not something you can teach people."

"Behavior-cult mythology," Wise says to himself, and proceeds in his analysis to the third (tactical) level, looking at the component tasks of each job accomplishment (see Table VI). He finds that Marilyn Blue does three things to diagnose problems. She (and every other serviceman) inserts thermometers into seven wells in the air conditioner and takes their readings, and She then records these readings on a company form (because the manufacturer requires this). She ~~then~~ next interprets the relationships between these seven temperatures and can tell within two minutes, with 100 percent accuracy, what is wrong with the air conditioner. finally, she performs several tests to obtain a confirmation of the diagnosis.

"If we just kept the thermometer in the wells and asked the customer to give us the readings on the phone, I could diagnose the problem without even looking at the equipment," Marilyn says. "~~The~~ Half the time the customer could correct the problem himself."

TABLE VI PERFORMANCE TABLE

THIRD LEVEL ANALYSIS: CENTRAL AIR CONDITIONING SERVICE PERFORMANCE

ACCOMPLISHMENTS	STANDARDS		IMPACT OF PIP	ACTUAL (VALUE) (COST)				PIP	VALUE OF CORRECTING PIP
	REQUIREMENT	EXEMPLAR		TYPICAL PERFORMANCE	UNIT (VALUE) (COST)	NO.	TOTAL		
1 AC Temperature Readings	b Accuracy	100%	-	100%	-	-	-	1	-
	b Speed	3 min.	-	3 min.	-	-	-	1	-
2 AC Temperature Interpretations	a Accuracy	100%	Speed up diagnosis	0% not done					
	b Speed	2 min.	-	not done -	cause of problem 3b				
3 Confirmation Tests	a Accuracy	100%	-	100%	-	-	-	1	-
	b Speed	15 min.		67 min.	53% of each call = $9.42			8.67	424,052

So, anytime something isn't right, the temperatures inside the air conditioner change in a way consistent with the problem. Wise finds it remarkable that no other serviceman in the company even knows this -- and he therefore must use the confirmation tests, trial-and-error, fashion, to find out what's wrong. Thus Wise has located the source of the problem. Indeed, the only reason Marilyn Blue makes confirmation tests, thus wasting an additional 15 minutes, is because the company requires the results be recorded on a form.

Thus, through the careful analysis of PIPs, level-by-level ~~through-performance~~, Wise targets the principal service problem of No Gas. Why does Marilyn Blue know how to interpret temperatures?

"Well, it tells you how to do it in an appendix in the back of the service manual. I guess I just like to read things like that. I used to look it up in the manual, but I finally memorized it."

I won't insult the reader's intelligence by describing the utterly simple solution to the main problems of No Gas service. Suffice it to say that it costs a total of about $5,000 to ~~desing~~ devise and print a guide for all the servicemen to use. Also -- it is significant -- the paper work on the confirmation tests was not abandoned. Management PIPs are not that easy to correct.

Thus, the Performance Tables led No Gas away from a request to retrain salesmen to a simple job aid for troubleshooting equipment. This rather surprising (to No Gas) turn of focus is characteristic of the kinds of disclosures performance analysis leads to. Seldom does the Performance Table verify management's hunches about where their problems lie. We have used Performance Tables in the analysis of everything from manufacturing automobiles to teaching history; from the design of training materials to medical diagnosis. Surprise has been the rule, not the exception.

Performance Tables simplify analysis and, indeed, would make it routine except for one unfortunate circumstance. Management seldom has readily available sensible information about performance -- not because it is difficult to obtain, but because management, unfortunately, doesn't think this way as much as it should. Profit-and-Loss statements don't tell you much about human performance. Not that data isn't plentiful, because it usually is. But data is not information until it tells you something.

I call this kind of analysis a Performance Audit. But this should not imply that the precision of accountants is required; ~~it is not~~ that's because we are pursuing opportunity, not misplaced nickles and dimes. If you work with data that require accounting or statistical precision to reveal reliable variances, you

usually are looking in the wrong direction. The potential for improving human competence is ample enough, and it requires no microscope to find it. If the Performance Audit is conducted in the proper fashion, opportunity will leap out at you. How then, do we seize these opportunities? We must, of course, look to behavior.

THE PERFORMANCE ENGINEERING MODEL

All of behavior is an on going transaction involving both environment and person. The only reason to separate out parts of the transaction is to gain better understanding of what we can most economically manipulate to achieve the behavior we wish. A sale is a transaction involving seller, goods, and buyer -- and with any of these missing there is no sale. But we can focus on the parts of this transaction separately in order to know what we must do to increase the probability of the sale. Is the seller making the wrong pitch? Are the goods defective? Does the buyer need them? Similarly with behavior. We can ask is the defect we can best correct in the environment or in the person? And, in either case, is it in the stimulus (information), in the response or in the reinforcement (motivation).

To see the manipulable properties of behavior transactions lets look at the

simple behavior of answering the telephone. Figure 1 will illustrate stimulus, response, and reinforcement and the six different ways we can look at this unitary bit of behavior:*

INSERT FIGURE 1 ABOUT HERE

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* The symbols, $S^D \rightarrow R \cdot S_R$ is simply a convenient shorthand to represent behavior. The behavior of answering a phone (or any other behavior):

S^D (RING) $\longrightarrow$ R (ANSWERS) $\cdot$ S_R (VOICE of caller)

1. The S^D (discriminative stimulus) requires incoming data and the ability to discriminate it.
2. The R (response) requires an instrument and the capacity to use it.
3. The S_R (reinforcement) requires an incentive and the motive to appreciate it ("want" it).

1. (S^D) STIMULUS (INFORMATION)

2. (R) RESPONSE

3. (S_r) REINFORCEMENT (MOTIVATION)

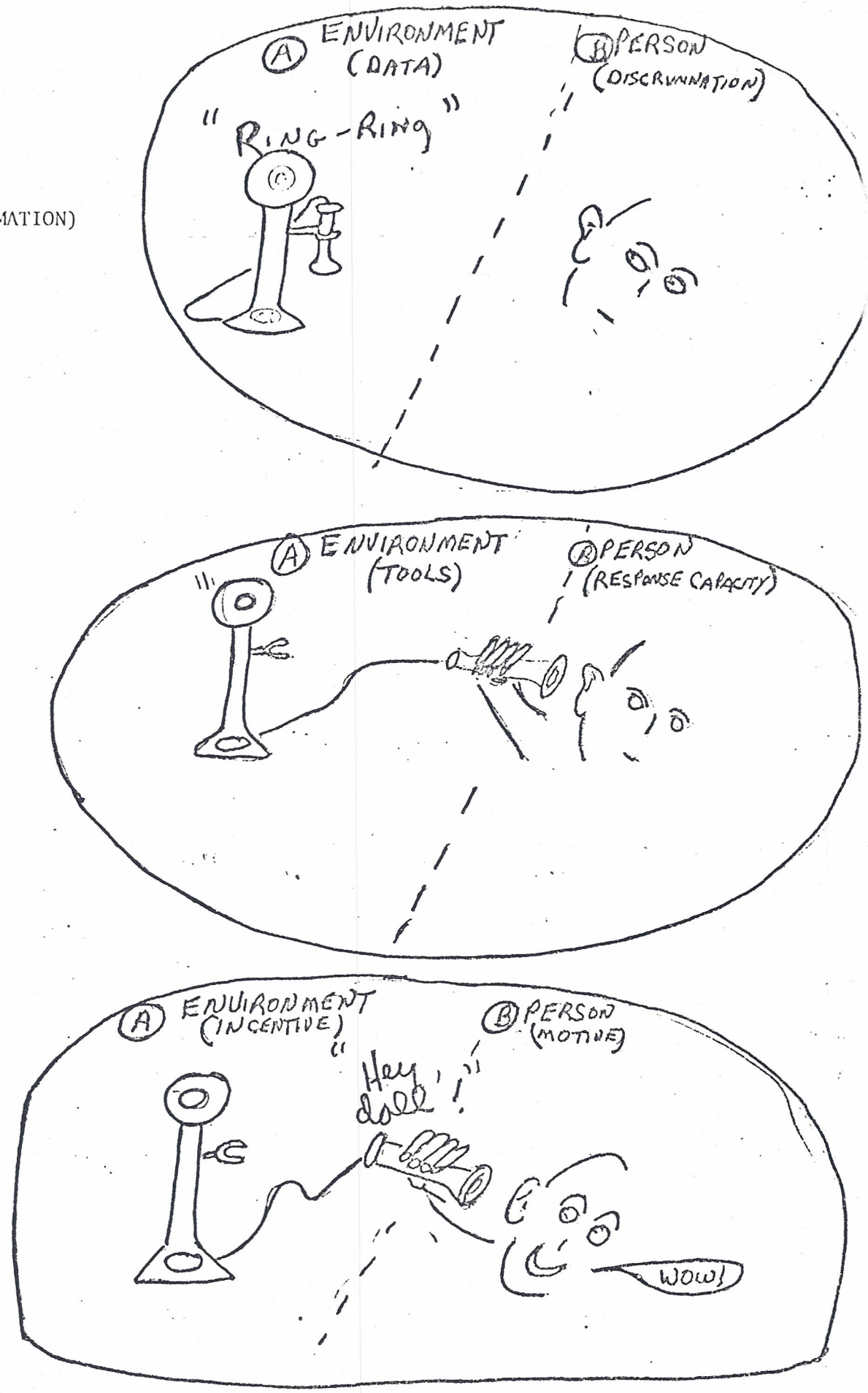

FIGURE 1

BEHAVIOR FROM SIX POINTS OF VIEW

It should be clear from this illustration that we can get rid of telephone answering behavior in any one of six ways -- Table VII illustrates:

TABLE VII

SIX WAYS TO CHANGE BEHAVIOR

	S^D INFORMATION	R RESPONSE	S_r MOTIVATION
ENVIRONMENTAL SUPPORTS	1. Data Fix the phone so it doesn't ring loud enough	2. Tools Fix the receiver so it can't be removed	3. Incentive Arrange for the calling party to be shut off
PERSON'S REPERTORY OF BEHAVIOR	4. Knowledge Interfere with the ability of the person to hear the ring	5. Capacity Interfere with the ability to reach for the phone	6. Motive Make it so that the person hates to talk to people on the phone

If I do any one of these things outlined in Table VII, I will lose the behavior. Many tactics for doing these things are available to me, of course -- but they can all be pigion-holed in these six categories. For example, I can arrange for no one but a wrong number to call (incentive), or make the receiver so hot that no one wants to touch it (tools). Or I can change the ring so it sounds like the doorbell (data) or break the person's arms so he can't reach the receiver (response capacity). I can train the person to think the telephone ring is a door bell (knowledge), or I can see to it that he hates to talk on the phone (motive).

The Telephone Company goes to a great length to engineer telephone-answering behavior by manipulating three of these variables, all of them environmental. It has done much research to get the right tone and loudness of ring (data), to make the receiver easy to handle (tools), and to promote good telephone manners -- and especially to see that obscene or threatening calls are minimized (incentives). The Company generally avoids manipulating people directly -- with the exception of commerical messages about the glories of the telephone, designed to heighten our motive for using it. In concentrating on environmental variables rather than on our behavior repertories, the Telephone Company shows good sense -- it has learned that the environment is easier to manipulate than people. It could have designed complex rings (data) and made an effort to teach us to discriminate their meanings (knowledge), or they might have made

the receiver difficult to handle (tools) and provided us with prosthetic devices or exercise programs to shape our ability to use it (response capacity) and they could have made the instrument with loud, crackling, painful noises (incentives) and spent billions promoting the importance of taking the punishment (motive). Though these tactics seem absurd in this example, they are nonetheless frequently adopted elsewhere -- even by the Telephone Company. For example, the new computerized telephone operator system relies heavily on training and motive techniques to get operators to perform well. The keyboard system is far from ideal in present data to operators, or in making their responses simple, and it doesn't render much in the way of incentive for outstanding performance. But, by and large, it is an efficient system compared to many of the efforts in industry that make behavior requirements unnecessarily complex, difficult, and unrewarding. Lets examine our six-celled table again to see what management can do to make behavior inefficient, then ask yourself if these things aren't often done, almost as if there were a conspiracy to create incompetence. Table VIII outlines six performance tactics commonly used to engineer incompetent performance.

TABLE VIII

A PERFORMANCE ENGINEERING MODEL FOR CREATING INCOMPETENCE

S^D INFORMATION	R RESPONSE	S_r MOTIVATION
DATA	TOOLS	INCENTIVES
1. Don't let people know how well they are performing. 2. Give people misleading information about how well they are performing. 3. Hide from people what is expected of them. 4. Give people little guidance about how to perform well.	1. Design the tools of work without ever consulting the people who use them. Keep the engineers away from people who use the tools.	1. Make sure that poor performers get paid as well as good ones. 2. See that good performance gets punished in some way. 3. Don't use non-monetary incentives.
KNOWLEDGE	CAPACITY	MOTIVE
1. Leave training to chance. 2. Put training in the hands of supervisors who are too incompetent to do their own jobs well. or 3. Make training difficult. 4. Make training irrelevant to the students purposes.	1. Fail to provide proper safety devices. 2. Use I.Q. test to select people for jobs requiring physical adroitness. 3. Don't provide response aids (e.g., magnification of difficult visual stimuli).	1. Design the job so that it has no future. 2. Avoid finding out what working conditions employees would find more pleasant. 3. Give pep talks when you should be doing something else.

ENVIRONMENTAL SUPPORTS

PERSONS' REPERTORY OF BEHAVIOR

Anyone who studies Table VIII and doesn't wee that most of these tactics are the rule, not the exception -- and that at least one of them is employed by almost every place of work or school in the world -- simply hasn't much experience.

By reversing the tactics in Table VIII, we can arrive at a suitable Performance Engineering Model against which a manager -- or a teacher -- can compare his own methods of managing other people's performance. Table IX is a generalized description of the performance Engineering Model since, I think, it identifies all the kinds of things we might do to achieve greater competence.

Any job that could be characterized by the descriptions in Table IX would surely carry a guarantee of high competence -- provided, of course, the management was so structured to really deliver these things and had a clear focus on the mission of the job in the first place. Similarly, any school that could be characterized by these descriptions would have few drop-outs and a great market for its graduates.

But, you might say, behavior costs money. And programs to obtain more efficient behavior can also cost money. The question is, then, will these programs pay for themselves? The anser is a decisive yes -- and not just in most cases.

TABLE IX

THE PERFORMANCE ENGINEERING MODEL

S^D INFORMATION	R RESPONSE	S_r MOTIVATION
1. Data a. Relevant and frequent feedback about the adequacy of performance. b. Clear and relevant guides toadequate performance. c. Descriptions of th expected	2. Tools Tools and materials of work designed scientifically to match human factors	3. Incentives a. Adequate financial incentives made contingent upon performance. b. Non-monetary incentive made available. c. Career development opportunities.
4. Knowledge Scientifically designed training that matches the requirements of exemplary performance.	5. Response Capacity Safety devices, prosthesis, and medical support.	6. Motive a. Assessment of people's motives to work. b. Recruitment and placement of people to match the realities of the situation.

VIRONMENTAL
PPORTS

RSONS'
PERTORY
OF
HAVIOR

First, the costs of these programs, as you will see, is -- with one exception -- ridiculously small. The exception is training, which can be very expensive. But, as you shall see, the greater part of the cost of training will have to be borne whether it is carefully designed to match the situation or not. This being the case, Table IX represents six kinds of small investments that can yield great returns in improved performance.

Obviously, not all six kinds of programs will pay off equally well -- nor do all of them always require improvement. Which one or more of these programs is useful in any given situation obviously requires analysis. And that analysis is simply a matter of diagnosing why deficiencies in performance occur in the first place. Why is typical performance less than exemplary. What behavioral defect causes the PIP? When we have a deficiency in performance, we clearly have a deficiency in behavior -- in either its environmental supports or in a person's behavior repertory, or in both. Where do we look to find out? The Performance Engineering Model will help us answer this question.

DIAGNOSING PERFORMANCE DEFICIENCIES

As I have noted before, the two most commonly attributed causes of poor performance are, in order, motive ("they don't give a damn") and capacity ("they're too dumb"). However, these are actually the last two places one should look for

causes of incompetence, simply because they rarely are the substantial problem. I make this assertion without hesitation, and it is empirically a sound one. I have no statistical data to "prove" the assertion, but I could devise some if they were not so useless. In careful studies of performance in hundreds of instances in the world-of-work I have yet to find either deficiencies of motive or capacity to be the prime cause of incompetence -- or the most fruitful place to work to correct performance problems. Except for a few strange individuals, people generally care a great deal about how they perform on the job or in school, and defects in capacity -- mental or physical -- are the exception, not the rule. Moreover, whatever defects in motive or capacity exist, their consequences can usually be minimized by careful attention to the other variables in the Performance Engineering Model. Improvements in training can do wonders for most people we consider slow-witted; better incentive policies and strategies can usually obliterate all evidence of defective motives.

The Performance Engineering Model, if we are to use it as a diagnostic tool, must be seen in perspective. First of all, no person or environment is likely to be perfectly designed for the accomplishments they are chosen for. So even under the best of circumstances, some improvement in behavior will be possible. Then the question becomes not whether we can improve this or that aspect of behavior -- but which strategies will yield the most worthy results: the greatest improvement in accomplishment with the least cost of behavior? I have no doubt that if

Woody Woodwell concerned himself exclusively with the motives of his stenographers, and spent many hours attending to them and many dollars on films and guest speakers designed to supply great inspiration, he would get some positive results. Perhaps one less letter would be mailed late each year, and doubtless some stenographers' productivity would increase a bit -- only to drop again once the inspiration inevitably faded. Would the transitory gains be worth the great effort? Of course not. The point is that all six kinds of the engineering programs can be made to have some results, however small, in almost any circumstance. So the question is, where is the greatest leverage? I am saying that most people -- almost all people -- have both sufficient motive and capacity for exemplary performance in almost all circumstances of work and school. Thus, only when we have exhausted other remedies need we look to these variables. If you have done a great job in correcting defects of information, tools, and incentives, and you still haven't obtained exemplary performance -- and if the PIP is still economically significant -- then you can sensibly worry about the selection of people who care more and have greater motive capacity. Athletics is, I think, the only significant exception to this rule. If I wanted to develop a fighter to win the world title, I would worry at the beginning about his natural physical endowments and his "killer" instincts. But in civilized endeavors outside of atheletics there is seldom a demand upon capacity and motive that most of us can't meet. I once new an exemplary medical photographer who was blind in one eye, had severe rotary nystagnus in the other, and was generally bored with his

profession. He could have succeeded at anything, I suppose, except, perhaps, at hitting a baseball well.

Unfortunately, athletics provides much of the model that managers use in coping with employees. Perhaps this goes a long way toward explaining the incompetence of management. Many managers see their jobs as fitting their concept of a football coach: it consists of careful selection of talent and "leadership," which usually means pep talks and tough stances that threaten punishment. Capacity and motive are the chief variables they have to work with. And such posturing appeals to others -- it gets heavily reinforced by other managers -- because it is behavior that we've come to equate with management. Attention to capacity and motive ("talent" and "attitude") fits comfortably in the mold of the Behavior Cult just as it leaves the manager a handy excuse for his own failures: "I gave them leadership, but they didn't follow. They just don't give a damn and most of them are too dumb to cut the mustard anyway."

Unfortunately for the athletic model, it doesn't hold up too well. I once became intimate with a great college football coach (American style) -- a man who is widely considered to be an exemplary athletic manager. Many sports writers tout him as the best. He has a national image as a man who puts the fear of God and a great desire to win into his players, and for shrewdly selecting the best of talent. But, both from my observations of his techniques, and from his

own descriptions of the variables he attends to, I can say that capacity and motive are low on his scale of considerations. Coach, as I shall call him, says (in private) that he does three things that account for his success. First is training (knowledge), the second is frequent and detailed reports to the player on his progress (data), and the third is to make certain that the players get rewarded both financially and otherwise (incentive).

"Hell's fire," Coach says, "if the boy don't want to play (motive), he quits anyhow -- and unless he's lame (response capacity), he can play football. I've even had some lame ones play pretty well."

In my observations, Coach never gave pep talks or went out of his way to be "inspirational." And he took all comers into his tryouts. He spent most of his time managing his assistant coaches as they viewed thousands of feet of film, reviewed the films with the players, and taught them how to block and tackle. The rest of his time he spent, as he said it, "in politics" -- keeping the alumni providing the incentives, both financial and otherwise. Doubtless, most of our managers who use football coaching as their management model, played on mediocre or losing teams.

So where do we look for significant deficiencies in behavior -- those that account for the PIP? We look first to the environmental variables, because it is there

that we are most likely to find powerful strategies that cost very little to implement. From my own experience I have concluded that the order in which we should look diagnostically to behavior is given by the Performance Engineering Model itself.

Begin with data -- ask if it is a sufficient, informative, and reliable guide both to how one should perform and to how well one has performed. Improper guidance and feedback is the single largest contributor to incompetence in the world-of-work, and a principal culprit at school.

Next, look at the tools and materials people have to work with. If they can be improved, much training might be saved. The manager who seriously examines the tools of the jobs he manages doesn't look as much like the Behavior Cult tells us a manger should appear -- but he's doubtless doing a better job of managing.

Next, look to incentives -- how can they be improved and made more directly contingent upon good performance? This most fundamental and simple concept of engineering competence seems to have been virtually abandoned, even in the most capitalistic of cultures. The athletic analogy tells us that "winning is its own reward" -- but Coach doesn't attribute his success to such a concept (though he publicly promotes it).

Finally -- though not least importantly -- look to training as a means to achieve greater competence. It often is a powerful strategy -- but you should look last to it because it is usually the most expensive. It is well to be sure you don't end up training people to use tools that could be re-designed, or to remember data they don't need to remember, or to perform to standards they are already capable of if they only new what the standards were. If, after you have tried manipulating the environmental variables, and the PIP is still large, then you can conclude that you have a knowledge problem, and that perhaps improvement in training will be worth it.

TROUBLESHOOTING PERFORMANCE

In defining worthy performance as a function of the ratio of accomplishment to behavior, I have treated behavior as the costly investment we must make to achieve competence in the people we manage or teach. But when the PIPs are large, and we want to realize their economic potential, how do we proceed to make the investment wisely? People we call managers manage human performance -- not machines (the people who manage machines are almost invariably called technicians). Thus the manager is held accountable (or should be) not only for the value of the accomplishments of his organization, but also for the wisdom of his investments in costly behavior. The fundamental measure of his own competence is like that of the people he manages. Worthy management performance is a function of value

(accomplishments) over cost (behavior):

$$W = f\ (\frac{V}{C})$$

When a manager steps into a new situation -- say, into a department that isn't performing well -- his competence as a performance engineer (e) is presumably judged by the ratio of changes (Δ) in the value of the organization's accomplishments to the cost of the changes he makes in behavior:

$$W_e = f\ (\frac{\Delta V}{\Delta C})$$

The cost of behavior, as we have seen, is a function of three separate costs: people's repertories of behavior (P), the supporting environment (E), and the management costs themselves (M). The manager, if he is to improve performance, has only these three variables to manipulate. If the cook isn't producing good meals, the manager will either have to improve the cook (P), or the conditions under which the cook works (E) -- or both. In any event, he also is investing management effort (M).

The Third Leisurely Theorem (I call it the Management Theorem) states that:

> A deficiency in performance has as its immediate cause a deficiency either in the behavior repertory or in the environment that supports it, or in both. But its ultimate cause will be found in a deficiency of the management system.

This simple theorem, if taken seriously, makes irrevocable manager's and teacher's responsibilities for engineering human competence, and removes resort to the common excuses ("they don't care and they're too dumb"). Behaviorists in their animal laboratories -- good behaviorists -- have learned to blame only themselves for failures to train their animals. As B.F. Skinner has put it, "the animal never fails, only the animal trainer." The road to exemplary management and teaching will become a great deal more direct once we accept a similar view of the people who are paid to be performance engineers. The stakes are great, and I am confident that, with a system to help them, managers will eventually accept this responsibility. The stakes are no less than leisure, which is time and opportunity. Not money, nor sunsets, nor poetry mean more to people than time and opportunity.

This system of engineering human competence I call teleonomics (from the Greeks, "tele," meaning "end" and "nomos," meaning "study of"), simply because the system is useful enough to have a name, and the name is apt. To summarize teleonomics, we can say that the engineering of human competence consists of six principal accomplishments:

1. Identification of the accomplishments expected of performance at all levels of an organization (policy, strategy and tactics).
2. Establishment of requirements and exemplary standards of performance.

3. Development of a data system that supplies relevant information about performance.

4. Identification of the potential for improving performance (PIPs), and its economic assessment.

5. Diagnosis of the behavioral causes of the PIPs, beginning with deficiencies of people, if there are any.

6. Development of programs that have the greatest leverage for realizing the potential for improving performance.

Like any true technology, the worksheets and procedures of teleonomics grow more complex each year we practice it. But its ultimate success depends upon the acceptance, by management, of the fundamental leisurely theorems, and the belief that time and opportunity are finer rewards than great effort, vast knowledge, and eagerness to work.