# A Control Theory View of Human Performance in the Workplace

## People as "Living Control Systems"

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**1/27/2013**

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*This document presents a view of human performance in the workplace that is based on Perceptual Control Theory as articulated by William T. Powers. That view is captured in what is called the GAP-ACT Model of Human Behavior and Performance, also known as The Target Model. The model is presented and explained. Implications for managing and improving human performance in the workplace are also presented and discussed. Suggestions for making use of the model and its underlying concepts are presented.*

## Purpose

In the first part of this paper I will present a view of human performance that is rooted in control theory as articulated by William T. Powers in his seminal work, *Behavior: The Control of Perception* and as elaborated upon in later publications[1]. In the second part of this paper I will use this control theory view to provide insights into the nature of human performance in the workplace and to draw attention to the challenges this view presents to those who wish to engineer or manage the performance of others.

## Why?

Why write a paper about yet another view of human performance? In particular, why write one from a control theory perspective? The simple answer is that current views are inadequate and, more important, incorrect, which means they are misleading and counter-productive; in a word, they are dysfunctional. Generally speaking, the current view of human performance is that it can be engineered, that it can be managed, and that it can be engineered and managed by people other than the performer(s) in question (e.g., by industrial engineers on the one hand and by managers and executives on the other). The current view is clearly valid in situations in which performance consists of producing well-defined, tangible results using predetermined tools, methods and techniques. It is less valid in situations in which the performer must configure or tailor his or her response to the situation at hand, especially when the situation itself is in a state of flux. Something else is required for these situations. In my opinion, that "something else" is a control theory view of human performance. Such a view has implications for performance and performance management. Because it is clearly the case that the chief means of realizing human performance is human behavior, let us begin there, with a control theory view of human behavior.

## Living Control Systems

People are "living control systems" to use William T. Powers' term; that is, they act to control certain aspects of the world about them. All that any of us know of the world about us we know via our perceptions. What we in fact act to control, then, are our perceptions of certain aspects of the world about us. Hence, Powers' view that behavior is the control of perception.

Control is always against some standard, a reference, a goal. In Figure 1 below, the concept of a goal, a standard, a preferred or required condition, is represented by G. In the technical parlance of control theory, this is known as the reference condition or reference signal, but we will use simpler, everyday language here.

Our goals or reference conditions are compared with our perceptions of those things to which our goals or reference conditions apply. In the workplace, a goal or reference condition (i.e., some aspect of our world that we are attempting to control) might relate to cost and our goal or reference condition might be to reduce cost by some percentage. We can compare reports and calculations of actual costs with our goal or reference condition. In an engineered control system, a comparator performs this function; in a living control system, the comparator is the human being at its center, the performer.

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[1] See the Recommended Reading section at the end of this paper.

In Figure 1, the small black circle on the left, where G and P come together, represents the comparator or the function of comparing perceived conditions (P) with goal (G) or reference conditions. Any difference between the goal condition and the perceived condition constitutes a gap or discrepancy. In Figure 1, this gap or discrepancy is represented by the letter *d*. In control theory, any difference between the reference condition and the perceived condition constitutes an error. In ordinary conversation, "error" has certain negative connotations and might be misleading in situations in which the discrepancy constitutes better than hoped for results instead of worse than hoped for results. For example, if the goal were to reduce costs by 15% and current conditions indicate they have been reduced by 20%, it is difficult to view that as an "error" except in the strict sense of control theory.

So, for our purposes, we will refer to differences between goal conditions and perceived conditions as "discrepancies," not as "errors." A lower-case d on the line leading into A is used to indicate a discrepancy.

Control theory tells us that errors, or discrepancies between goal or reference conditions and perceived conditions, produce action (A). Effective action, in turn, affects that which we are attempting to control. In reducing costs, substituting less expensive materials, reducing or eliminating waste and making processes more efficient are all actions that will have the desired effect on costs.
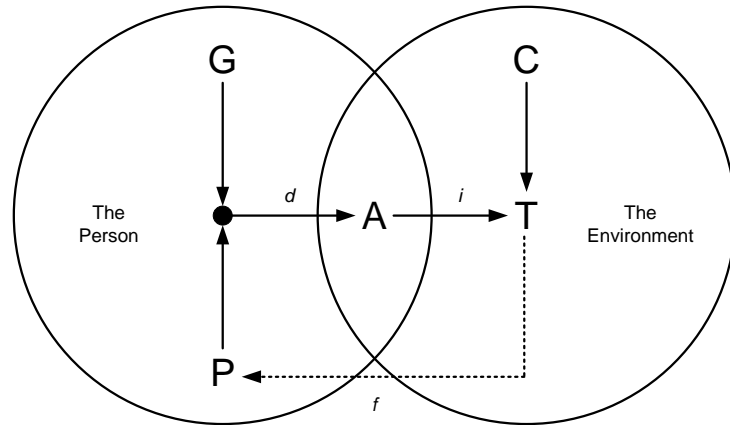


**Figure 1:**

**A Control Theory View of Human Behavior and Performance**

**(The GAP-ACT Model)**

But we, and those targeted variables (T) we seek to control, whether they are cost or revenue or productivity or whatever, do not exist in isolation. There are other actors and factors at work. There are other influences operating on the same variables we seek to control. Suppliers raise their prices; the cost of material goes up. Union negotiations result in pay raises and the cost of production goes up (and goes right down again as the result of layoffs, reengineering, and certain process improvements). In control theory, these other influences are called "disturbances," meaning they disturb the value of the variables we are trying to control. For our purposes we will simply refer to them as conditions, represented in Figure 1 by the letter C.

In general, then, the model in Figure 1 suggests that behavior, in the context of workplace performance, operates as follows:

- As performers, we seek to control the value of some variable in the workplace (T). That might be cost, productivity level, sales volume or any of innumerable other variables. At any point in time, the variable we seek to control has some current value and we refer to this as the "current condition."

- What we know of this targeted or "controlled variable (CV)" to use the proper term from control theory, we know through our perceptions and it is this "perceived condition" (P) that we compare with our goal (G) or reference condition.

- Discrepancies between our goal or reference conditions for a variable and the condition we perceive lead to action (A).

- Our actions are helped or hindered by other conditions (C), to a greater or lesser degree, and the effects of our actions on the controlled variable are the sum of our actions and these other conditions. Our actions are also part of us and part of the situation in which and on which we are acting. This is reflected in the overlapping of the circles in Figure 1.

We human beings are by nature goal seeking organisms, "living control systems," to use Powers' term. We act to control certain aspects of the world about us and, at the same time, other actors and factor are often acting to control those same aspects of our world, often in ways and directions that are at odds with our intentions. Enter management.

### *Management Implications of a Control Theory View of Human Performance*

The structure of the diagram in Figure 1 suggests some obvious leverage points and likely strategies regarding performance management. A brief discussion of these is next.

### Distinguish between Behavior and Performance

Perhaps the most important thing to do as part of any effort to manage performance is to draw a distinction between behavior and performance. Behavior refers to the activity of the performer; performance refers to the effects or outcomes of that activity. To illustrate, consider the tracking task that is frequently cited in discussions of perceptual control theory. In this task a person is given a joystick that controls the movement of a cursor on a screen. Also on the screen is a target symbol, one that moves about. The task requires the subject to keep the cursor aligned with the target. The subject's observable behavior consists mainly of moving the joystick; the performance is the alignment between the cursor and the target. Were you to ask from a behavioral perspective, "What is this person doing?" you might well answer, "Moving the joystick." But from a performance perspective the answer would be, "Keeping the cursor and the target aligned." It is well to keep in mind that the aim of performance management is not the control of human behavior but the reliable attainment of results and this depends on making a distinction between behavior and performance.

### Focus on the Goal State

A moment's reflection will make clear that, except by chance, it would be impossible for an employee – a performer – to perform as expected unless the employee holds in mind the proper goal. More important, "holding" this goal entails more than merely comprehending it. For a goal to be operative at least five conditions must be met:

1. *Clarity*. The performer must have a clear understanding of the goal; a murky, muddy, fuzzy grasp of what is expected or required won't lead to attainment of the required results. Obviously, two-way communication is called for.

2. *Consistency*. The performer's understanding of the goal must be consistent with the expectations of management regarding the goal; otherwise, some other result is likely to be achieved. Again, two-way communication is essential.

3.  ***Consequences***.  The consequences of success should be such that the performer has reason to pursue the goal and the consequences of failure should provide the same incentive.  Two types of consequences are of interest here: natural, and contrived.  The natural consequences are those inherent in achieving the goal, be they viewed as positive or negative by the performer.  Contrived consequences are those established by management as a way of inducing the performer to pursue this or that goal.  The wise manager understands that the real task of managing consequences isn't one of simply imposing contrived consequences but, instead, is a matter of mitigating the natural consequences.  To be sure, contrived consequences can play a role but a manager should never lose sight of the natural consequences of actions and should always view contrived consequences in light of their interplay with those natural consequences.  Failure to integrate the two can result in situations in which the natural and contrived consequences of action do little except nullify one another.  Incentive structures, then, must always consider not just the balance of positive and negative consequences but the balance of natural and contrived consequences as well.

4.  ***Conflict***.  Closely related to the issue of consequences is the issue of goal conflict.  Rare is the situation in which a performer pursues a single goal.  Most people in organizations have several goals and objectives "on their plate" so to speak.  People are often asked to pursue goals that they see as conflicting; reduce costs and improve productivity; effect a staff cut and improve staff morale; improve quality and assign your best people to special projects.  Some of this conflict is imagined or attributable to a limited view of the means available for obtaining the ends in question but some of it is very real.  It is part of the manager's responsibility to minimize conflict between and among the goals a given performer is expected to achieve.

5.  ***Commitment***.  In the last analysis, the issues above coalesce into a single issue: the performer's commitment to the goal in question.  Without this commitment on the part of the performer, achievement of the goal is doubtful.  The issues above, then, should be viewed as checkpoints in working toward that commitment.

## Ensure Accurate, Timely Perceptions of the Current Condition

The diagram shown in Figure 1 is essentially a closed-loop, negative-feedback model.  As actions take effect and are perceived as closing any gap between the goal state and perceived condition, the need for action is reduced.  Once the gap has been closed or the result achieved, efforts shift from acquisition to maintenance, from closing the gap to keeping it closed.  It follows that the performer's perceptions of the current state are a critical component of any performance management system and that it is essential for the performer to have timely, accurate information about the current state of the condition he or she is attempting to control.  This means measurement and communication.  Few things are more frustrating than to saddle a performer with the responsibility for reducing costs in an operation and then withholding information about costs.  Absurd as that might sound, it happens.  Worse, to reduce costs almost always entails examining what is referred to as the cost structure of the operation; that is, how costs are distributed and incurred.  This information is also often withheld – on the basis of being "too sensitive" for sharing.  Most important, that kind of information is essential to formulating actions that will have the desired effects.  With that in mind, let us move on to what many will view as the central issue: actions.

## Distinguish between Prefigured and Configured Actions

At the extremes, there are two kinds of performances expected of people in organizations: (1) those in which the results of interest are direct and immediate (e.g., as in the case of someone assembling electronic components into a finished product such as a personal computer) and (2) those in which the results of interest are indirect and delayed (e.g., as in the case of a manager attempting to turn around a failing division or department). In the first case, because the desired results are essentially the direct and immediate effects of observable behavior, the management of performance is mainly a matter of paying attention to the basics of what might be termed "Performance Management 101":

- Clearly communicate expectations of performance to the performer;
- Provide appropriate incentives (and be sure to remove any inappropriate disincentives);
- Select, train and develop the performer so as to be able to perform as expected
- Provide timely feedback regarding actual performance in relation to expected performance;
- Remove obstacles and barriers (i.e., those "other influences") that impede or prevent performing as expected.

These basics of performance management are reasonably well known and, at first glance, compatible with a control theory view of human performance. As a matter of fact they work reasonably well with the first kind of performance. This is because the performance in question is both observable and repetitive. The necessary actions can be studied over time and reduced to a prefigured routine. The fabled "one best way" can be determined. However, attempting to apply this approach to the second kind of performance is rife with risk and fraught with failure. Instead of thinking primarily in terms of the performer's observable behavior or immediate actions, think instead in terms of those actions as initiating interventions. Here's why

When the results sought (i.e., the conditions intended to be controlled) are indirect and delayed, the observable behaviors or overt actions of the performer in question do not by themselves account for those results. Instead, the performer's actions are best viewed as *interventions* in the structure of the situation at hand.[2] Moreover, these actions are taken in various places at various times and their effects are felt in other places at other times. In other words, the direct and immediate effects of actions taken by the performer must "ripple through" the structure of the situation, making themselves felt elsewhere.

From the preceding, three requirements for successful intervention can be identified:

1. ***Point(s) of Evaluation***. The "elsewhere" mentioned above must be identified. Just where is it (and when is it) that the desired results are to be gauged? Where, when and how will the goal state be assessed?

2. ***Structure***. As used here, this term refers to the elements, connections and relationships between and among those elements that define the structure of the situation in which performance is to be manifested. In which ones must change must be effected and felt? What are the paths by which changes will "ripple through" this structure, making themselves felt at the appropriate points?

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[2] By "intervention" I mean patterned, purposeful actions, actions taken with an outcome in mind.

3. ***Point(s) of Intervention***. Which of these elements and relationships are accessible and subject to manipulation by the means available to the performer? Which can be changed in ways that produce the desired effects (without any off-setting side effects)? What is the "solution path" (i.e., the path from the points of intervention through the structure of the situation to the points of evaluation)?

When it comes to the second kind of performance, the kind that requires the performer to configure his or her response, it is far more important from a managerial perspective to focus on helping the performer frame and carry out effective interventions than on trying to control the behavior of the performer. (Presumably, although this is by no means a safe assumption, managers have a broader, deeper understanding of the structures in which interventions must be effected in order to achieve the desired organizational results.)

It is worth mentioning at this point that Powers' "living control systems" are also profitably viewed as continuous problem solvers. They close gaps and they keep them closed. Said a little differently, people regularly engineer solutions to a wide array of constantly changing problems on an ongoing basis. In other words, they configure their actions instead of simply carrying out prefigured routines. When attempting to manage performance, you must make a clear distinction between performances that hinge on prefigured routines and those that depend on configured routines because your approach to performance management will be very different.

### Manage Those "Other Influences"

Just as the best-laid plans can go astray, the best-framed interventions can fail to produce the desired results. There are other influences at work. In the case of the comparatively simple, prefigured assembly line work routine mentioned earlier, performance can be disrupted in many ways; by a missing tool or part, by a malfunctioning piece of test equipment, by a disruption up the line and by uncontrolled, unmanaged interruptions and other "disturbances." Again, owing to their visibility and immediacy, these kinds of disturbances or disruptions are far more manageable than the kinds of "other influences" that come into play with configured actions or interventions.

But consider the head of a business unit, say a division, charged with improving the profitability of the division so as to enhance the return on equity (ROE) of the division. As just one example of the kinds of structures with which this person must concern himself (or herself) and in which he or she must intervene, take a look at Figure 2. It illustrates the mathematical-financial structure of the division's accounting system, particularly, its calculation of return on equity.[3]

The structure or system shown in Figure 2 ties in turn to numerous operating systems and structures and those tie in their turn to social and behavioral structures and systems involving people. Framing and executing successful interventions in this situation requires being able to map these three kinds of structures, including their linkages, determining appropriate points of evaluation, identifying suitable points of intervention and tracing the paths from the latter to the former. Now the kinds of disturbances or other influences are themselves much less direct and much less immediate. Political opposition to the proposed changes (overt and covert); failure to adequately map the structures and linkages so that actions taken have severe unintended consequences and generate backlashes and new problems; half-hearted cooperation versus energetic collaboration; corporate "snipers" waiting in the wings to do in the attempted changes (not to mention those attempting to effect them).

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[3] It should be pointed out that Figure 2 illustrates just one way of calculating ROI. Numerous variations exist and one should always be sure to use a model of the calculation actually in use.

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Gross Sales
    minus                        Net
Discounts, Allowances & Returns  Sales
                                              minus
                                                          Gross
    Materials Cost                                        Profit
Manufacturing Labor Cost         Cost of
    Production Overhead           Sales
                                                                              Net
                                                                              Profit
    Promotion
    Advertising                  Selling           minus
    Compensation                 Expense
                                              plus
    Rent & Utilities                                      Operating
    Office Supplies              Admin                    Expense
    Administration               Expense
                                              plus                                        Return
                                                                                          on
    Payroll Taxes                                                                         Equity
    Depreciation                 Other
    Insurance                    Expense


    Cash
    Inventory                    Current
    Receivables                  Assets
    Prepaid Expenses                          plus
                                                          Total
    Plant                                                 Assets
    Equipment                    Fixed
                                 Assets
                                              minus                           Equity
    Notes Payable
    Interest Payable             Current
    Accounts Payable             Liabilities
                                              plus
                                                          Total
    Mortgage                                              Liabilities
    Notes & Bonds                Fixed
                                 Liabilities
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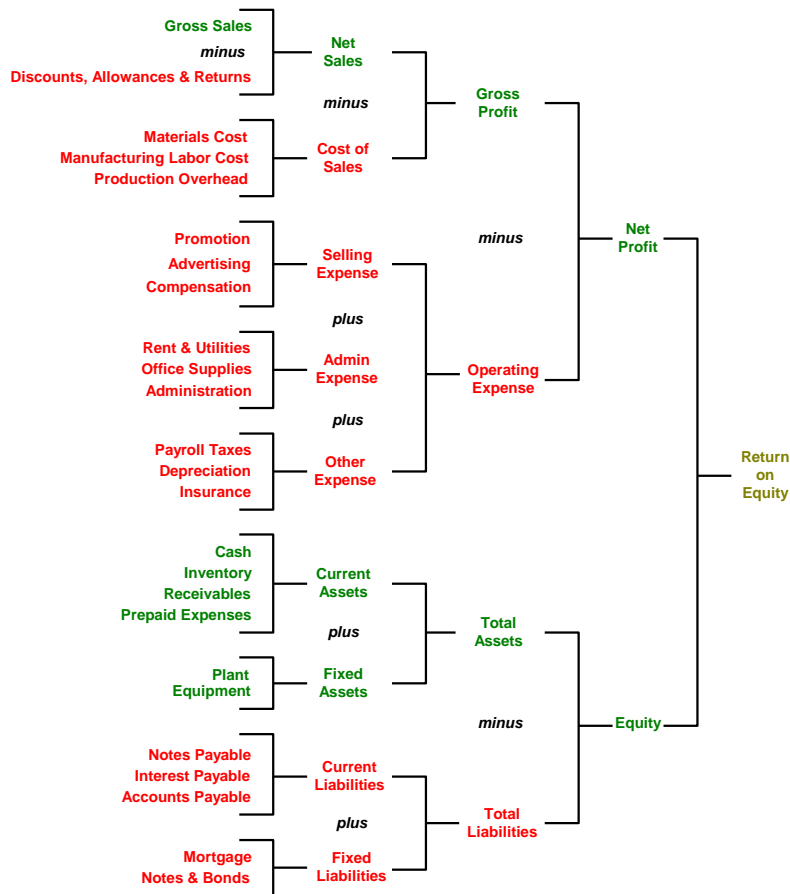
**Figure 2 - The Structure of Return on Equity (ROE)**

To be sure, these other actors and factors can be managed to some extent. Alliances can be made, sources of opposition can be defused or neutralized, known side effects can be compensated for and contingency measures established to deal with unforeseen side effects. But it is a far simpler task to ensure a supportive, relatively disturbance-free work environment for that electronic assembly line worker than it is for the head of a business unit or any other person whose work requires them to configure and carry out interventions into ongoing, dynamic structures.

## Support Performance Instead of Controlling the Performer's Behavior

Thus far, attention has centered mainly on the situation, on actions, other influences, and the effects of both on the current or controlled condition. Attention paid the performer has centered on establishing and developing commitment to the goal state. Let us now consider the performer.

Just as conventional performance management copes fairly well with prefigured performances, conventional practices with respect to the performer are well known, widely understood and reasonably productive. We know that the performer must have an appropriate repertoire or skill set; we know that getting the right person in the right slot is an important aspect of performance management; and we know that the selection, training and development of people can contribute greatly to improved performance. *Where we go astray is in not recognizing that the more the*

*results of interest are indirect and delayed with respect to the performer's actions, the more we must be concerned with the situation, not the performer.* Yet, we wrongly persist in applying tools, methods and techniques that work well with prefigured performances to configured performances where they are not only sure not to work but to be counter-productive as well.

I can, for example, prescribe a behavioral routine for many workers whose work performance yields direct, immediate results. I can also be reasonably confident in my ability to ensure compliance with such a prescription. I can get what I want at a tolerable cost. Chances are, I cannot successfully develop let alone impose a behavioral prescription for someone whose work performance produces indirect, delayed results. Further, attempting to do so is sure to engender serious conflict between me and the performer in question. I must take a different approach. I must enlist commitment to the organization's goals; I must assist the performer in framing and in carrying out effective interventions; I must ensure the availability of timely, accurate information about the results of actions taken; and I must manage those "other influences." In short, I must support the performer in pursuit of the desired performance instead of attempting to control the performer's behavior. You see, whenever I attempt to control another person's *behavior* I am interfering with the means by which that person attains *all* the ends he or she seeks, not just those that define the performance in question. Not only does conflict ensue, I am guilty of focusing on means instead of ends and that is often a fatal mistake in management, especially the management of performance.

## Conclusion

To manage performance requires that a distinction be made between behavior and performance. The former refers to the activity of the performer; the latter refers to the outcomes or effects of that activity. To manage performance also requires that managers focus on supporting the performer's pursuit of the desired results instead of simply trying to control the performer's behavior. People, after all, are living control systems and their behavior is the chief means by which they attain all the goals they seek, not just those that define the performance for which they are responsible. To support performance, several basic strategies should be used:

- Distinguish between behavior and performance
- Focus on defining and developing commitment to the goal state
- Ensure accurate, timely perceptions of current conditions
- Distinguish between prefigured and configured actions
- Think in terms of interventions
- Manage those "other influences"
- Support performance instead of controlling behavior

## References

1. Powers, W. T. (1973). *Behavior: The Control of Perception*. Aldine De Gruyter: New York, NY.

## Recommended Reading

1. Powers, W. T. (1989). *Living Control Systems: Selected Papers of William T. Powers*. The Control Systems Group: Gravel Switch, KY.
2. Marken, Richard S. (1995). *Mind Readings: Experimental Studies of Purpose*. New View Publications: Chapel Hill, NC.
3. Powers, W. T. (1998). *Making Sense of Behavior: The Meaning of Control*. Benchmark Publications: New Caanan, CT.

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