HYPOTHETICAL CONSEQUENCES
OF CUMULATIVE BENEFITS
FROM A SMALL
INTERVENTION EFFECT

Cumulatively Large Benefits
of Incrementally Small Intervention Effects:
Costing Metacontingencies
of Chronic Absenteeism

Thomas C. Mawhinney

ABSTRACT. Metacontingencies are relations among practices within
an organizational culture and their molar environmental consequences
for the culture. They can be summarized by the ratio of all revenues
from operations (or budgets received) to all expenses paid for opera-
tions. Rates of attendance/absenteeism have consequences in terms of
effects on a culture's ratio of revenues received (budgets funded) to
expense payments that appear as profits (losses) or budget surpluses
(deficits) over some time interval. For a host of reasons OB research-
ers place a premium on identifying and adopting practices that result in
large immediate effects on behavior and performance in the short run.
However, some practices created by OB interventionists can have small
short-term effects and appreciably larger cumulative effects on revenue

Correspondence concerning this article should be addressed to Thomas C. Ma-
whinney, College of Business, University of Detroit-Mercy, 4001 West McNichols
Road, P.O. Box 1900, Detroit, MI 48219-0900.

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foreclosures contingencies responsible for the rates of various behaviors that occur among working people within their organizational cultures (Mawhinney, 1992a; Parsons, 1952). The means by which they do this can be called institutional or managerial practices (Handlin, 1992). These practices are aimed at instigating and maintaining or extinguishing work-related behavior or task-related practices among other organizational members. For example, when Henry Ford introduced assembly line methods to workers in his factor-

ety, many task-related practices at the factory floor level were changed, not the least of which was the behavior required of working people within the factory. The new methods reduced skill requirements among workers and replaced them with the requirement that workers engage in a high rate of repetitive task activity. Turnover among workers subsequently rose to 300 percent. Faced with the requirement of recruiting more than 1000 new workers and a high turnover rate, Ford introduced the now-famous organizational practice of paying a $5 per day wage (Hallerstam, 1986). Ford was then swamped with applicants seeking work on his assembly line. Without a sufficient labor force, the Ford Motor Company would have had insufficient outputs to survive; it would have perished. And, its death could be attributed to effects of assembly line methods on an organizational metacognition that included recruiting and keeping a sufficient number of well-motivated workers.

Absenteism, however, remains a chronic occurrence among all U.S. industries in spite of good wage levels. Absence rates in 1993 were highest, 6.7%, among service occupations and within the mining industry, 6.1%, even though miners earned the highest average wage of all workers, $14.66 per Hour (Bureau of Labor Statistics, 1994). The Lincoln Electric Company, on the other hand, is reputed to have the highest-paid factory workers in the world and the lowest absence rate. What distinguishes the Lincoln Electric Company culture from others is not that Lincoln's tasks have been "enlarged" or "enriched" or that the factory is brighter and cleaner "looking" than others. The difference is the degree to which a contingency exists among quality and quantity of work output of every individual worker and that individual's earnings. Individual earnings throughout the year and a share of a bonus pool from sales revenues divided among all workers at the end of the year depend relatively directly on the individual's daily level of work output and quality (Handlin, 1992). The metacontingencies of the Lincoln Electric Company culture have, for many years, resulted in rising worker efficiency (more sales revenue per unit of labor cost paid) and rising incomes among workers, managers, and other members of the culture.

Rates of absenteeism among a culture's members provide prima facie evidence regarding effectiveness of its institutional practices as they relate to aggregate strength of contingencies that reinforce members for attending work each day. The idea that contingent contingencies of reinforcement = $\pi$ tip the balance in favor of attendance over absence arose among OBM and
A Sketch of the Original Study

Establishing operations are experiences of an individual that change the individual in ways that make otherwise potential reinforcers of behavior not effective and leads to a state oflearned helplessness. (Kubany, 1979). The current study was designed to examine the effects of learned helplessness on the behavior of workers in a manufacturing setting. The study involved a comparison of two groups of workers, Group A and Group B. Group A received no intervention, while Group B received a brief intervention designed to increase their sense of control over their work environment. The intervention involved the introduction of a new policy that allowed workers more control over the pace and duration of their work. The results of the study showed that the intervention group demonstrated a significant decrease in absenteeism and an increase in productivity compared to the control group.
contingencies function as discriminative stimuli and otherwise neutral consequences function as reinforcers (Michael, 1993). My work on this reanalysis of the Pedalino and Gamboa data set arose from an establishing operation. It occurred when a reputable applied behavior analyst, during my presentation concerning effects of data analytic methods on analysts’ responses to data, asked a question something like the following: "Why be concerned with small intervention effects like those produced by Pedalino and Gamboa (1972)? What you are talking about is a small absence rate, maybe three or four people absent, while fully 96 to 97 people out of 100 are attending each day." The data that prompted that question appear in Figure 1.

The size of the intervention effect appears small in this graphical representation as it would if it occurred within an SPC X-Bar Chart. The size of the effect would appear even smaller if it was plotted within one of Og Lindsay’s standard celeration charts (Lindsay, 1997). The data as they would appear in an SPC chart with sigma limits derived from the baseline of N = 32 data points appear in Figure 2. The same data in logs similar to celeration charts appear in Figure 3.

The data appear different to the eye when plotted as cumulative person days absent from work compared to cumulative absences that would occur using mean baseline absence rate. To create the cumulative absence data

**FIGURE 1.** Graph of time series data from 1 - 70 observations of absence rates the author obtained from personal correspondence with Victor Gamboa.
plotted in Figure 4, one simply multiplies the number of workers by days of the week (5 × 215) by weekly absence rates and then adds each week's accumulation upon the preceding week's accumulation. To construct the projection of cumulative absence rates based on the mean baseline rate the same procedure is followed but the weekly actual absence rates are replaced with the constant value of the baseline mean absence rate. When the baseline cumulative absences and its projection beyond the baseline are plotted in the same graph with the actual cumulative absence rates, the plots reveal a growing difference between the two cumulative absence plots throughout the intervention phase of the study. This difference in cumulative absences is readily apparent even to the unaided eye. And this occurs in spite of the fact the effect seems quantitatively small when stated as a 0.55% or one half of one percent reduction in absence rate (from 3.01% to 2.46%) during the intervention. In the case of Figure 4, the eye does not deceive. By the end of the intervention, the cumulative person days of absence projected from baseline absence rate is 1542 compared to the actual cumulative person days of absence of 1458 or a difference of 84 person days. Although the number 84 appears larger than the 0.55% difference depicted in Figure 1, this may or may not represent a practically significant effect in terms of the organization’s metacontingency. As noted above, significance at this level of analysis is revealed by the ratio of benefits to costs of the intervention or a change in organizational practice and its economic consequences.

**BENEFITS AND COSTS ANALYSIS**

I estimated that the hourly cost of benefits would be $1.25 per hour or $10 per person day absent. This is a conservative estimate since by union/management contract, workers in this setting were entitled to six paid sick days per year. This daily cost per employee accrues whether the employee attends work or not. Thus, an invalid sick day taken would cost about $39 in wages and $10 in benefits. In addition, every absence would involve additional costs in terms of supervisory activities associated with documentation, rescheduling or reassigning workstations, and, perhaps, even providing for a back-up supply of workers. (Although not presented here, my computations of estimated costs of the Pedalino and Gamboa (1974) intervention suggested it was marginally cost effective and would have been highly cost effective if it were not for the floor effect described below.)

The absence rate for comparison group 2 was approximately 7.97% and the group size was N = 370 compared to the smaller experimental group, N = 215. Estimated cumulative costs of absences for comparison group 2, cumulative costs of absences for the comparison group less 0.55%, and the cumulative costs of absences for the experimental group appear in Figure 5. Sav-
FIGURE 5. Cumulative weekly estimated costs of absence for control group 2 and cumulative weekly estimated costs of absence to experimental group. Computations based on data provided in personal correspondence with Victor Gamboa.

and cumulative costs for that group assuming its absence rate matched that of the experimental group’s during intervention. The hypothetical result of this comparison is depicted in Figure 6. The hypothetical cost savings would amount to $45,710 for the year.

Evidently, other factors or systems (Mawhinney, 1992b) variables were responsible for the initially low absence rate in the experimental group. So an important question suggested by data such as those above is whether a small-size intervention effect will result in a much larger effect in the presence of a much larger PIP? If this assumption were found to be valid, then replicating the intervention in comparison group 2 would produce the hypothetical results depicted in Figure 6. Whether the hypothetical results will match reality, on the other hand, remains an empirical question. If that question is addressed and the answer is no, then attention would be directed to identifying the system variables in the experimental group responsible for its low absence rates during baseline and their introduction to the comparison group (Mawhinney, 1992b; Redmon & Mason, in press). If the answer is yes, this would imply that small effects resulting from interventions in systems near their floors (or ceilings) with respect to a dependent variable would underestimate the likely effects in other settings. That is, magnitude of intervention effects
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REFERENCES


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