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Precis of Incentives, Routines, and Self-Command*

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Virtue, then, being of two kinds, intellectual and moral, intellectual virtue in the main owes both its birth and its growth to teaching ... while moral virtue comes about as a result of habit, whence also its name ($\eta\theta\upsilon\kappa\eta$) is one that is formed by a slight variation from the word $\epsilon\theta\omega\varsigma$ (habit)...

Of all the things that come to us by nature we first acquire the potentiality and later exhibit the activity ... but the virtues we get by first exercising them. ... men become builders by building and lyre-players by playing the lyre; so too we become just by doing just acts, temperate by doing temperate acts, brave by doing brave acts.

This is confirmed by what happens in states; for legislators make the citizens good by forming habits in them, and this is the wish of every legislator, and those who do not effect it miss their mark, and it is in this that a good constitution differs from a bad one.

Aristotle, *Nicomachean Ethics*, 1103^a15 – 1103^b5

What is the source of the value added by organization? The two leading explanations are coordination of specialized efforts and control of opportunistic behavior. Both classes of explanation focus on the problems caused by the need for effective cooperation. The primary contribution of these views is to explain the use of hierarchy, as opposed to arms-length market exchanges, as a method for governing transactions. However, there is a large range of organizational properties that remain unreached by these frameworks. In particular, little headway has been made in understanding the internal workings of organizations. Among the fundamental questions to which fully satisfying answers have yet to be given are these:

1. Why is organizational change so difficult? In particular, why is it so difficult for firms to imitate best practice even after it has been recognized for a considerable time?
2. Why do organizations rely on such a preponderance of supervision and review mechanisms rather than on incentives?
3. Why do organizations create so many rules, policies, and routines rather than more general instructions to maximize objectives or achieve goals?

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In this paper we argue that one promising path to progress in understanding internal organization is to reformulate the efficiency question in the light of a more complex model of man. A close look at the origins of capitalist institutions such as the factory and the white-collar business bureaucracy points to the centrality of a particular feature of human behavior not encompassed by current “rational” and boundedly-rational models: impulsiveness and the consequent mechanisms of impulse control. Simply put, on a moment-by-moment basis, individuals have trouble taking those actions they believe are in their own long-term interest. They procrastinate, they let anger “get the better of them,” they incur unsupportable debts, they daydream, they sleep late, they don’t show up for work. A key feature of organization is that it provides external controls which help individuals reduce such deviations from their own best interests.

In addition to impulsiveness, the model we propose also assumes the existence of automatic thought and behavior. By automatic thought and behavior we mean that much of what people do and think, and especially what they do with greatest efficiency, is not under immediate conscious direction. Our model of *impulsive man*, however, expands the role of management to encompass the design and operation of a wide range of routines and practices designed to aid impulse control, provide cues and reminders about goals and priorities, embody best practice in repetitive procedures, help employees unlearn old dysfunctional habits and learn new more functional habits, and cultivate the moral sentiments necessary to support cooperation.

There is very little prior work linking these ideas to the structure of organizations. The notable exception is Akerlof’s [1991] recent lecture on procrastination. Akerlof’s model of procrastination is elegant and he offers a valuable treatment of the organizational implications of impulsiveness. He argues, as we do, that “a major function of management is to set schedules and monitor accomplishment so as to prevent procrastination” [Akerlof, 1991: 7].

Impulsiveness and Impulse-Control

In October of 1950, U.S. forces had pushed the North Korean army out of the south and captured Pyongyang, the capital of North Korea, but on November 26, Chinese forces unexpectedly intervened. During the next forty days, U.S. forces retreated south, suffering terrible losses. During this period, many units of the U.S. 8th Army were declared “combat ineffective,” having ceased to function with any cohesion. By contrast, the 1st Marine Division’s epic retreat from the Chosin Reservoir was marked by continued cohesion and the maintenance of combat effectiveness despite heavy casualties inflicted both by China’s 9th Army Group and by the bitterly cold winter.

According to military analysts, one of the main sources of this difference in performance between the 8th Army and the Marines was the differential enforcement of basic routines and field discipline. S. L. A. Marshall [1953: 19], the noted military historian, described Baker Company of the 8th Army’s 2nd Infantry Division, just before it became the first unit to experience the surprise Chinese attack, in this way:

For all its heaviness of spirit, Baker was remarkably light of foot on that particular morning. In fact, it was much too light. . . . All but twelve men had thrown away their steel helmets. . . . The grenade load averaged less than one per man. . . . About one half of the company had dispensed with intrenching tools. . . . only a

few men bothered to carry tinned rations on the march. Bedrolls and overcoats had been left behind.

These practices had serious consequences for Baker Company. With regard to the grenade loads, Marshall's history shows institutional accommodation to poor field discipline:

From long experience, the 8th had ceased issuing grenades to its individuals except as an emergency arose. When pressure slackened, the men tended to discard grenades into the unit trucks. Movement shook the pins loose, and equipment had been lost because of this carelessness [Marshall, 1953: 251].

Analyzing the source of the 8th Army's breakdown, Cohen and Gooch [1990: 185] observe that the critical problems arose at the unit level:

[The retreat] is the story of units who have no cleaning supplies for their weapons, who get into their sleeping bags for the night without digging in, who give up trying to establish communications with units on their left or right because they run out of field telephone wire.

By contrast, in the 1st Marine Division

discipline never broke. Battalion commanders checked that troops had dug foxholes before turning in, even though they had to chip away at half a foot of frozen dirt. Company commanders watched each man perform the painful but necessary ritual of changing his sweat-soaked socks every evening despite the howling cold, to prevent frostbite. . . . By enforcing such drudgery the marines retained their fighting effectiveness [Cohen and Gooch, 1990: 187].

It is a commonplace in the military that without "discipline," soldiers may fail to perform the basic functions necessary to maintain their effectiveness.¹ Yet why should this be so? In the case just presented, whatever their interest in the strategic outcome of the war, individual soldiers surely had a keen interest in their unit's ability to resist attack, and certainly in their own protection against gunfire and cold. Why should it be necessary for the organization to enforce basic "hygiene" rituals that are clearly in each soldier's best interest to perform?

"Rational man" never fails to act in his own self-interest and even "boundedly rational man" should not make easily predictable errors in this regard. Yet the Battalion commanders of the 1st Marines foresaw that some men would need forcible reminders to avoid frostbite by changing wet socks for dry. They anticipated that although the soldiers "knew" they should change socks and dig foxholes, they would also be tired and afraid, and experience powerful drives to rest and not move at all. The tension between these modes of thought is the familiar battle for self-control.

From the perspective of microeconomics, the impulse to neglect basic hygiene is irrational, even childish. But suppose that is our nature; suppose that people have two sources of "value," one impulsive and short-term oriented and another more rational and capable of looking ahead to the longer-term consequences of action or inaction. This phenomenon is

¹Military analysts place great weight on the maintenance of routine in assessing the potential effectiveness of troops. For example, writing during the first week of the Persian-Gulf War, Col. D. H. Hackworth's [1991: 32] negative appraisal of Iraqi capability was largely based on a Kuwaiti military officer's observations of Iraqi Republican Guard units in Kuwait: "during the four months that he was with them he 'never saw them perform maintenance on the vehicles or tanks' . . . Nor did they train or do battle drill. . . . Throughout the time this position was occupied, no one dug in, laid the guns, camouflaged, performed maintenance, or trained."

sometimes experienced as “being of two minds.” Then, what must be judged for rationality is not just the urge, but the equilibrium between urges and controls, both internal and external. Soldiers may expect that their future impulses to neglect key tasks will be countered by watchful commanders (troops who can maintain discipline without commanders are termed “elite forces”). In the 1st Marine Division, that expectation was fulfilled, the predictable impulses of the soldiers being countered by the maintenance of field discipline. However, in the 8th Army, the stress of battle and the inexperience of many commanders disrupted the equilibrium and cohesion was lost. *We argue that an important function of organization is to give aid and strength to people in their struggles for self-control.*

Theory of Impulsiveness

In a pioneering paper, Strotz [1956] explored the conditions under which utility maximizing plans would actually be carried out. He showed that such consistency was guaranteed only for *time-invariant exponential discounting*. Time-varying discount rates could explain “(1) spendthriftiness; (2) the deliberate regimenting of one’s future economic behavior—even at a cost; and (3) thrift” [Strotz, 1956: 165]. Thus, if people are “hard-wired” with non-constant discount rates, then their plans about future choices will not be consistent with the choices actually made when the future arrives. If one knows that one’s future desires will not be those one currently has about the future, which set of preferences will hold sway? It is possible that the psychology of the divided self is simply the self-awareness of one’s own time-varying discount rates.

To make these issues explicit, consider the dieter. The dieter is unhappy with his weight and wishes to lose thirty pounds by restricting food intake over the next four months. The dieter announces his goal to friends and family, reads books on health and diet, and begins to keep a record of intake and weight. The dieter knows he must attend social functions frequently, but vows to avoid the rich foods and fancy desserts offered at these functions. However, at the first social occasion he is presented with an extremely rich dessert. The impulse to eat the dessert is strong and the dieter gives in, perhaps reasoning as follows: “If I eat this dessert now, it will add an extra few days to my diet. Adding a few days to the end of my four month diet is a reasonable price to pay for this treat.” The next day the dieter realizes that his diet will fail if he keeps behaving in this way. Recognizing his weakness, he acts to strengthen his will. Among his options are actions such as (1) putting funds in “escrow” with a friend that he wins back if he attains his weight loss goal, (2) calling hosts and hostesses in advance to request alternative desserts, and (3) sacrificing attendance at the social functions.

Note that the dieter is not just “myopic;” if the dieter simply had a high discount rate, he would have never chosen to diet in the first place. He fully intended to abstain and nothing unexpected happened, yet he did not abstain when the crucial moment actually arose. Nor can a high discount rate begin to explain the third decision, to constrain or limit his own future actions. However, a rapidly declining discount rate reconciles these decisions.

To be concrete, let the utility at time T for payoff x received with delay t (i.e., at time $T + t$) be

$$U(x, t, T) = u(x)\lambda(t) \tag{1}$$

That is, the utility function is separable and independent of the date T . Here u is the static utility of the payoff and $\lambda(t)$ is the discount due to deferral. By convention, $\lambda(0) = 1$, and we assume that λ is positive, differentiable, and decreasing in t . Consequently, there is a positive

function $\rho(t) = -d \log(\lambda)/dt$ such that

$$\lambda(t) = e^{-\int_0^t \rho(\tau) d\tau}. \quad (2)$$

The function $\rho(t)$ is the “instantaneous discount rate” at delay t . If $\rho(t) \equiv \rho_0$, then $\lambda(t) = e^{-\rho_0 t}$, the classic exponential case.

There are two rewards: L and S , with $u(L) > u(S)$, so that L is “larger” than S when they are directly compared. However, receipt of L is delayed by d as compared with S . Finally, we assume that $u(S) > u(L)\lambda(d)$, so that the decision-maker prefers getting the smaller reward immediately to waiting d for the larger payoff. When these conditions hold we say that S *proximity dominates* L : though smaller, it is preferred because it is received sooner.

The preference for S over L can be time-consistent or it can be *impulsive*, or in Ainslie’s [1975] terms, *specious*. The test is whether or not the preference for S over L is reversed if both payoffs are additionally deferred. If the additional perspective gained by deferring both rewards causes a reversal of preference in favor of L , then the original preference for S was specious.

The conditions for *impulsive preference reversal* are that there be a t^* such that $S \succ L$ for $t < t^*$ and $S \prec L$ for $t > t^*$. In terms of the utility function (1) these conditions are

$$u(S)\lambda(t) > u(L)\lambda(t+d), \quad t < t^* \quad (3)$$

and

$$u(S)\lambda(t) < u(L)\lambda(t+d), \quad t > t^*. \quad (4)$$

Clearly, t^* solves $\lambda(t+d)/\lambda(t) = u(S)/u(L)$. Furthermore, t^* will be unique, the above inequalities will hold, and the opposite sort of preference reversals will be ruled out if and only if $\lambda(t+d)/\lambda(t)$ is non-increasing and is decreasing at t^* . The corresponding conditions on $\rho(\tau)$ are that it is non-increasing and that $\rho(t^*) > \rho(t^* + d)$. These arguments and observations lead to the following propositions:

1. If $\rho(t)$ is constant ($\lambda(t)$ is exponential), then preference for S over L is never specious.
2. If ρ is decreasing at some t , values of S , L , and d can always be selected which will exhibit impulsive preference reversal. Conversely, impulsive preference reversal implies that ρ is somewhere decreasing.
3. If ρ is always decreasing, then proximity domination is always specious.

Research on Impulsiveness

The idea that a declining instantaneous discount rate can induce impulsive behavior is elegant, parsimonious, and simpler than the reasoning lying behind the great body of psychoanalytic writings on unconscious urges.² More importantly, empirical work by psychologists has provided laboratory evidence bearing on all three of the key features of the theory: decreasing

²Thaler and Shefrin [1981] model impulsiveness by splitting the unitary decision maker into two conflicting “selves.” In their model an individual is an amalgam of a far-sighted “planner” and a myopic “doer.” Using an agency-theory approach, they are able to develop results on pension and savings behavior. Although their model preserves constant discount rates, it introduces complexities regarding which “self” is in control on any given issue. It is also worth noting that the weighted average of two constant-rate discount functions produces a decreasing discount-rate function.

discount rates, impulsive preference reversal, and the use of commitments to strategically alter one's own behavior.

These studies have their root in Herrnstein's [1961] *matching law* which summarized the results of a number of animal studies. The matching law states that the relative time spent on a behavior is proportional to the amount and rate of reward, and inversely proportional to the delay of the reward. Taken literally, this law suggests that $\lambda(t)$ is proportional to $1/t$, known in the psychology literature as the *hyperbolic discount function*. More recently, Herrnstein [1981] and Mazur [1987] have suggested a modified form (defined for $t = 0$) which better accounts for individual variability: $\lambda(t) = 1/(1 + bt)$, where b is a measure of an individual's impatience. The implied instantaneous discount rate is $\rho(t) = b/(1 + bt)$, which falls from b towards 0 as t increases from zero. By Proposition 3 (above), with this discount function, proximity dominance is always specious. A variety of studies have verified the basic predictions of the matching law in simple repetitive situations facing both animals and human subjects.

Both Thaler [1981] and Benzion, Rapoport, and Yagil [1989] aimed at estimating discount rates as a function of time delay. Both asked students questions about choice situations involving money and both found that discount rates fell dramatically with the amount of time delay. In the study by Benzion, Rapoport, and Yagil, the discount rates implied in choices involving future (positive) payments were (approximately) 29% per annum for a 6 month delay, 21% for a 1 year delay, 17% for a 2 year delay and 16% for a 3 year delay. These average results are consistent with $\rho = 0.29$ for the first 6 months of delay, and $\rho = 0.13$ thereafter. In addition, they found that gains were discounted more sharply than losses and small amounts more sharply than large amounts.

Most telling are the results on impulsive preference reversal in both animals and humans. The paradigm-setting experiments were carried out by Ainslie [1974] and by Rachlin and Green [1972] on pigeons. In Ainslie's experiment a red-lit key signaled a choice: if the bird pecked the red-lit key it received food immediately, otherwise it received twice as much food 3 seconds later. The birds all chose to peck the red-lit key and receive the smaller sooner reward. Ainslie then introduced a green signal that lit 12 seconds before the red signal. A peck in response to the green signal cancelled the red signal, guaranteeing receipt of the larger later reward. Some of the birds learned to use the green signal, thus countering the effect of their impulsive responses to the red signal. Use of the green signal declined when it was made functionless or when it acted to enable the red signal. Apparently, these birds learned to use the green signal to forestall future impulsive choices, a result which cannot be explained by simple learning theories. Ainslie hypothesized that only some of the birds behaved this way because of the complexity of the learning task and, perhaps, because of individual differences in preference.

Rachlin and Green [1972] offered pigeons two keys (say A and B). Pecks on A induced a T second delay followed by the presentation of two keys, one providing food immediately (reward S), and the other providing twice as much food 4 seconds later (reward L). Pecks on B induced the same T second delay, followed by the presentation of a single key which provided only reward L . Faced with S and L , almost all birds chose S (proximity dominance). However, as T was increased (from less than 1 second to 16 seconds), three of the five birds began to choose the B key, blocking the availability of S . Reductions in T restored the former situation.

Working with undergraduate students, Solnick et al. [1980] asked subjects to solve math problems while being distracted by white noise, claiming the experiment was about noise pollution. Subjects could press either of two buttons, the first leading to an immediate,

though short, cessation of the noise (reward S) and the other leading to a longer, though delayed, cessation (reward L). Most subjects chose the S button, but when an additional 15 second delay was added to both rewards, a majority altered their choice to the L button. This is a clear example of specious preference being reversed by the perspective provided by delay.

Controlling Impulsive Behavior

Faced with knowledge of one's own temporally changing preferences, how should one behave? The basic strategies are³ (1) to arrange external restraints on future decisions, (2) to cultivate emotional responses that counter impulses, (3) to divert, restrict, or focus attention, (4) to develop principles or rules of behavior that help guide action, and (5) to develop habits or routines that guide behavior.

External Restraints. In Ainslie's [1974] experiment, some pigeons learned to use the green signal to nullify their own future impulsive behavior. Similarly, an academic who keeps putting off a project might agree to prepare a paper for a conference one year hence because the promise acts to sharply increase the costs of procrastination.

Moral Sentiments. The emotions that counter impulse are what Adam Smith called moral sentiments. An unsocialized person who knows that stealing might lead to punishment, may be at the mercy of a non-exponential time-preference. However, if the impulse to steal is also met with an immediate feeling of guilt and shame, then the internal battle is not between the salient now and the distant future, but rather between two concurrent values. Capacity to feel moral sentiments appears to be innate; the strength and content is dependent upon upbringing and other socializing experiences.

Distraction. The strength of an impulse may be reduced by simply distracting attention away from it. Waiting is easier if one thinks about something other than what is awaited; everyone knows that focusing on an appetite only serves to arouse it.

Rules. The most intriguing method of self-management is the creation of rules or principles to guide one's own behavior. For example, authors sometimes follow a rule of writing so many pages each day and an executive may have a rule that all incoming mail be answered that day. Many mountaineers follow a rule of pausing to rest only once each hour. Splitting the weekly pay into separate packets for food, clothing, rent, and savings is a time-honored self-imposed rule that foreshadows the routines of corporate budgeting.

Note that self-imposed rules are a tactic that may not work; if the tactic were usually effective, there would be no real problem of self-control to discuss! Ainslie [1975] views rules as "side-bets," with one's self-image as part of the stakes. The trick in this intrapsychic reputation game is to equate the impulse to eat the dessert with an immediate collapse in one's ability to follow the diet and, therefore, in the expected loss of all of the future rewards of the diet, not just its delay. If the immediate gain from the dessert exceeds the total discounted reward from weight loss, this trick will not work. However, the dieter can bundle this issue with another, "betting" all the losses he might experience were his will-power to fail against each temptation.

Learned Habit. The idea that one might learn to resist impulses by developing good "habits" is as old as philosophy: Aristotle strongly emphasized the importance of repetition in forming the habit of countering impulses, equating character with good habits. The mechanism in question is *learning* and the proposition is that the self-reward of overcoming impulses can act as a reinforcer. The source of the self-reward is more difficult to pin down, although

³Ainslie [1986] describes the first four; the fifth might be considered to be a subclass of the third.

it is clearly associated with social norms or reduced cognitive dissonance with respect to internalized models of behavior.

The habits of moral philosophy are habits of cognition and guide conscious choice. However, the term habit also refers to routine or even unconscious behavior, and it too can be a source of impulse control. By virtually eliminating choice, habits render unpleasant action easier. For example, one of the authors increased his use of automobile seatbelts from occasional to always in order to set an example for his young daughter. After many years, the habit of fastening seatbelts was established, and he did not revert to his old ways. Acquiring the habit of buckling up dramatically reduced the cost of buckling up—he no longer had to allocate attention to consider the issue.⁴

Habitual Routines

A “habit” is a behavior that becomes easier or more rewarding with repetition. A “habitual routine” is a habit that consists of a sequence of actions and responses that, once initiated or triggered, proceeds with little or no conscious deliberation. In this section we examine the critical role played by habitual routines in organizational behavior, focusing on the connections between routines and impulse control.

Wedgewood

The central role of habitual routine is evident in Langton’s [1984] treatment of Josiah Wedgewood’s development of factory-based pottery production in England during the last half of the 18th century. Langton’s argument centered on the changed behavior of the potters. Wedgewood’s strategy was to bring newly emerging factory practices to the pottery industry and thereby to produce a large volume of high-quality chinaware that could be sold to the growing middle-class. Wedgewood hired traditional country pottery workers and used operant conditioning, selectively rewarding and punishing various behaviors, to indoctrinate them in his new work methods. Langton relied on several careful histories of the region and industry, and it is worth quoting from him and his sources at length [Langton, 1984: 343-45]:

Wedgewood began his firm with employees whose customs and attitudes were all, from a bureaucratic and capitalistic perspective, egregious vices. These workers were used to drinking on the job; they were used to working on a wide range of different tasks, more or less at their own discretion and without regard to overall coordination; and they were used to working flexible hours and taking time off for “St. Monday” and every wake and fair. When traditional potters did get down to business, “they worked by rule of thumb; their methods of production were careless and uneconomical; and their working arrangements arbitrary, slipshod and unscientific: For they regarded dirt, the inefficiency and inevitable waste, which their methods involved, as the natural companions of pot making” (McKendrick, 1961: 38)...

⁴Note that the habits of moral philosophy, those *guiding* choice, are seen as primarily useful in helping to resist alluring temptations, and the habits of automatic behavior, those *eliminating* choice, are most useful in helping to take otherwise distasteful actions.

Wedgewood wanted to change all this. . . . He obviously could not create the kind of work force he desired overnight, and he could not do it by the simple expedient of firing all those who failed to shape up immediately, since this would have left him with no help at all. To develop the kind of staff he desired, to give it a new culture, Wedgewood devised a remarkably sophisticated and astute program of behavior modification, based on an intricate mixture of rewards and punishments. . . .

To suppress the customary vices of the potters in his employ, Wedgewood published an incredibly detailed set of rules governing both production methods and conduct. He punished violations with stiff fines, deducted from wages. For example, “Any workman conveying ale or liquor into the manufactory in working hours” knew he would forfeit 2 shillings . . . Violations of certain rules, such as that against “striking or otherwise abusing an overlooker,” were punished by dismissal. . . . Wedgewood also applied this ultimate bureaucratic sanction to those workers who simply would not shape up, who habitually violated his “Potters’ Instructions. . . .”

The intricate blend of rewards and punishments that Wedgewood used to convert traditional potters into rational, industrial functionaries is clearly manifested in the job description he devised for the position of clerk of the manufactory who was

to be at the works the first in the morning and settle the people to their business as they come in—to encourage those who come regularly to their time, letting them know their regularity is properly noticed, and distinguish them by repeated marks of approbation, from the less orderly part of the work people by presents or other marks suitable to their age, etc. Those who come later than the hour appointed should be noticed, and if after repeated marks of disapprobation, they do not come in due time, an account of the time they are deficient should be taken. . . . (McKendrick, 1961: 44)

Aided by the preaching of local evangelical pioneer John Wesley, Wedgewood’s program “certainly produced a team of workmen who were cleaner, soberer, healthier, more careful, more punctual, and more skillful and less wasteful than any other potter had produced before” [McKendrick, 1961: 46].

The example of Wedgewood’s pottery factory at the beginning of industrialization clarifies some of the issues. Presumably, an individual potter who followed the practices Wedgewood insisted upon—sobriety, cleanliness, industry, frugality, precision—could have raised his income substantially, selling a larger quantity of goods at higher prices and lower costs. Yet few potters behaved this way before joining Wedgewood’s factory. The hypothesis we advance is that Wedgewood’s factory provided a technology of behavior modification. The potters joined the factory in order to attain the tradeoff of slack for income that they were unable to accomplish on their own.

Note that the original dysfunctional behavior of the traditional potters is not “opportunism.” An opportunistic worker can be controlled by monitoring and by incentives tied to output; but workers who have bad habits or who are impulsive will not necessarily act functionally even when it is in their long-run best interest to do so. “Bad” habits, dysfunctional culture, and impulsive behavior must be treated with training, incentives aimed at instilling new habits, “moral” instruction (i.e., John Wesley), work routines that structure and cue

desired behavior, and, to be sure, monitoring. Our thesis is that much of the fine structure of organizations, especially the structure of incentives and design of routines, is responsive to the problem of impulsive behavior and the existence of habits, both functional and dysfunctional.

Organizations today struggle with problems similar in structure to those faced by Wedgewood. Richard Schonberger [1986: 26], an insightful consultant working on the Japanese-Western manufacturing gap, notes that

job shops tend to hire skilled machinists, tool-and-die makers, and other journeymen. The skilled tradesman often can read blueprints and should know how to gauge the output and adjust the tool. Since Western industry employs many skilled tradesmen, we may feel that process control in the skill areas should be in good hands.

In some cases it is. More often, neglect has set in. Gauges are often crude, poorly calibrated, rarely recalibrated, harshly thrown into tool kits, not kept clean, and misplaced. Hand tools and machine tools are in equally bad shape. Adjustment levers and cranks are broken off, shafts are bent, and work surfaces are dinged by a thousand hammer blows. . . .

My first trip to Japan included a visit to a refrigerator plant in the Matsushita family of companies. . . . As eye catching as anything on the tour were glass cases that contained gauges. . . . The glass was clean, the cases were under lock and key, and the gauges were displayed like jewels in a jewelry store. An operator or supervisor was holder of the key and in charge of keeping everything just right.

Habits and Efficiency

The efficiency properties of habits have long been understood. William James [1899: 114,122] wrote that “habit diminishes the conscious attention with which our acts are performed. . . . the more of the details of our daily life we can hand over to the effortless custody of automatism, the more our higher powers of mind will be set free for their own proper work.” In the same vein, Whitehead said

it is a profoundly erroneous truism, repeated by all copy-books and by eminent people making speeches, that we should cultivate the habit of thinking of what we are doing. The precise opposite is the case. Civilization advances by extending the number of operations which we can perform without thinking about them. Operations of thought are like cavalry charges in a battle—they are strictly limited in number, they require fresh horses, and must only be made at decisive moments.⁵

The power of routine is generated by several mechanisms: eliminating occasions for loss of self-control, reducing the psychic cost of action, focusing attention on important tasks, and facilitating skill development through repetitive practice. When engaged in a routine, deviations from programmed behavior are not even entertained, because of the high degree of automaticity involved in following the pattern. This suppression of considered choice prevents error. For example, looking over one’s shoulder before pulling into the passing lane is a subroutine of the habitual routine “pass the car in front.” If a driver were to deliberate about whether to look or not, sometimes she would fail to look. This could happen even if the driver accepted in principle that it was always better to look than not. By making the behavior habitual, the occasion for this type of error is avoided.

⁵Quoted without reference by Langer [1978: 40].

There is considerable evidence that as learned habits become more automatic, mental resources are freed. Shiffrin and Schneider [1977], for example, studied search tasks and identified two modes: automatic processing and controlled processing. As they varied the task difficulty, there was virtually no degradation in performance when automatic processing was being used. By contrast, performance fell off sharply with increases in task load when controlled processing was being used.

Even in activities where processing is not totally automatic, the role of routines in generating skill development through repetition is obvious, having been noted by everyone from Adam Smith to the Boston Consulting Group. Whether the task is cooking a duck, analyzing a real-estate project, doing algebra, or appraising a commercial loan application, learning habitual routines improves speed and accuracy and, perhaps most importantly, frees the individual to concentrate on refinements and strategic concerns. Just as there can be no strategy if tactical skills are not mastered, individuals and firms cannot undertake higher-order tasks until the habitual routines that support them are well set. Another factor is that routine ways of doing things are much easier to improve than are unstructured approaches. By attacking a problem in the same way over and over again, a record of outcomes can be kept so that the work process becomes a controlled experiment. When behavior is unstructured, pinning down the causes of outcome variation is much more difficult.

Investment in Habitual Routines

Habitual routines, once established, reduce impulsive behavior. However, the establishment of a habitual routine is itself subject to impulsiveness. Because the formation of a functional habit has the character of an investment decision, impulsiveness may prevent the actions necessary to form the habit. Consider, for example, the gain and effort patterns associated with learning to use a computer word processor. Here the level of perceived effort barely changes over time, but the level of performance increases dramatically with practice. Nevertheless, the net benefit pattern is negative at the beginning and only turns positive with practice. Thus, some people will truly desire to learn word-processing but be unable to get started unless they join a training group or are forced to learn by an employer.⁶

Certain types of impulse control problems must be self-managed with the methods discussed in the previous section. In the case of habit development, it is common to employ external constraints and cues—this, after all, is what school is about. Think of a child struggling with his piano lessons. The need for constant repetition and practice before achieving the ability to play in rewarding ways induces many to give up without attaining competence. Parents and teachers can help the learning process by reminding the flagging student of the need for practice, by setting aside certain times of the day for practice, by setting up attainable intermediate goals whose achievement will encourage the student, and by delivering rewards for serious practice efforts. These interim reinforcements and cues help to solve a problem of self-control. Without these aids the student may want to know how to play the piano, and may believe that the learning costs are more than made up for by the eventual rewards, but nevertheless find these intentions overwhelmed by the real-time unpleasantness of practice.

⁶Much of the competition in microcomputer software in the past eight years has focused on adjusting the “power curve”: designing software that is powerful enough to warrant investment but which is not daunting to a beginner.

Investment in Changing Routines

We have noted that an individual who is learning a new routine experiences aversive feelings of discomfort and frustration. This aversion is magnified if the new routine replaces an old familiar habit, in part because the new routine leads to a temporary performance degradation, adding to the individual's frustration. Thus, organizational change, which involves unlearning old routines and learning new ones, can be more difficult and costly than creating a new organization.

Shiffrin and Schneider [1977] provide evidence on this issue. They studied the accuracy with which subjects performed a visual search-detection task as the number of repetitions increased. Accuracy rates rose from 56 percent in the first few trials to over 90 percent after 1500 repetitions. Subjects began the task using controlled (conscious) search, but gradually shifted to automatic processes. These subjects were then given a new search task in which the classes of target and background symbols were reversed; a control group worked on the tasks in the opposite order. Subjects found relearning the new task more difficult than learning the original task. On the relearning task, accuracy on the first few trials was only about 30 percent and rose to 90 percent only after about 2000 trials.

The implication is that there are potentially greater problems in impulse control with respect to changing routines than with learning new routines. This hysteresis in the costs of learning may help explain why change is so difficult. Even an entrepreneur like Wedgewood, starting with a fresh business concept, had to deal with conflicting habitual routines that were endemic among country potters, exclaiming "it is very strange how long workmen are in quitting a habit they have been long accustomed to" [McKendrick, 1961: 44]. The challenge of managing processes of learning and unlearning routines remains a key fact of organizational life. For example, F. Kenneth Iverson, chief executive officer at Nucor Corp., the leading steel minimill firm in the United States, told an interviewer that a major impediment to hiring senior executives from the steel industry was their "bad habits":

we've not had any success with older management [hired from old-line integrated steel companies]. Now we can hire a fellow who is 40 or under and that will work out OK, because over a period of time we can change him. But older than that we've found that we will never be able to change him. . . . Anyone who has worked a certain way . . . for years has very ingrained habits. It's very hard to break loose from that [Iverson, 1986: 42].

Organizations, Incentives, and Impulse Control

The impulse-control framework provides a parsimonious explanation for many problematic features of organizations. In this section we discuss how impulse-control theory can provide insights into the design of incentives, monitoring, indoctrination, planning, and problem solving.

Incentives

The economic theory of organizations presumes that individual behavior is responsive to incentives. But incentives are not preferences, and there may be distortions in the transformation of incentives into preferences and, thence, into behavior.

The proposition that giving the “correct” long-run incentives is not sufficient to induce the desired managerial behavior is a powerful adjustment to economic views of managerial work. The experience of ABC Supply Co., detailed in an interview with its founder, provides an especially clear example of the fine structure of incentive, review, and exhortation required to change managerial habits. ABC Supply is a rapidly growing wholesaler of roofing and building supplies with 1990 sales of \$350 million. Kenneth Hendricks, the company’s founder and chief executive officer, has generated its rapid and profitable expansion through a strategy of buying troubled roofing supplies distributors and correcting their managerial practices. Hendricks’ basic theory is that these troubled firms suffer from two problems: lack of character and wasteful practices. His solution to the former issue is exhortation backed by termination:

When managers don’t work out, it’s usually because of character problems. Of the ones that get fired, I’d say that 80% just plain don’t care about anybody else. For example, they would not love their customers; they wanted to screw their customers. When employees see that, it destroys the character of the business [Hendricks, 1991: 36].

Just as Wedgewood found that he had to terminate workers who could not control their urges to steal, drink, and use violence, Hendricks is looking for managers with well-developed moral sentiments that inhibit short-term opportunism.

Hendricks’ approach to the waste problem is to train his managers to use specific waste-reducing practices and to meet or surpass ABC Supply’s numerical cost standards. The problem for these managers is to learn good habits and unlearn bad ones:

They’re in a failure culture, which we have to destroy and build a new one in its place. . . . [In our culture] we don’t buy anything new. We buy used trucks, used buildings, used computers, and we make them work better than new. [Our] culture is. . . . getting rid of waste. These businesses are filled with waste, which is why they’re failing. . . . That’s true of most businesses. People don’t see the waste because there are no standards [Hendricks, 1991: 36].

At ABC Supply, the process of unlearning bad habits and acquiring good ones is driven by four elements: standards, feedback, advice, and incentives. Standards are the first step in managerial behavior modification:

the guy in this failing business hasn’t ever had a standard . . . to go by. He might be working with three employees at \$150,000 per employee, which means he has two too many. . . . We give them a standards sheet that runs down the company-wide P&L for the previous year. It shows the percentage of sales represented by each line on the P&L. You can compare those percentages with your own and get a pretty good idea of how you’re doing.

Feedback is generated by delivering a monthly profit and loss statement for each store and showing it to all store employees. This statement shows line-item comparisons for the same month in the previous year and a contribution report that shows how much annual bonus the store has earned so far that year. The P&L promptly and forcibly draws attention to problem areas and helps inculcate the routine of comparison of results to the standard.

Advice consists of training in how to interpret the standards, information (and exhortation) on what practices have been shown to work, and cultivation of attention to detail. With a fast-growing company, many of ABC’s managers are new and have difficulty in reading

and understanding a P&L. The company trains them in this skill: it becomes a natural and automatic part of running their business. P&L consciousness in turn heightens the behavior-modifying effect of the monthly reports. Specific practices, such as buying used trucks and refurbishing them instead of purchasing new ones may seem unnatural (and unpleasant); Hendricks nags and preaches to make them habitual. This steady pressure helps the managers overcome their impulses to stick to old habits.

Incentives are the last part of ABC's behavior modification process. Employees at stores that beat the company standards receive annual bonuses, with 40 percent going to the manager and the rest distributed to the other store employees. These bonuses can amount to one-third or even one-half of an employee's base salary. The critical point is that these incentives do not automatically and immediately lead to better managerial performance; the failing managers do not instantly become winners when they are put under the bonus plan. Rather, the incentives act, in the first instance, as reinforcers to a learning process, a process that takes years. According to Hendricks [1991: 38-9]:

I want them to catch on on their own. I want them to start doing things I didn't think of. It's important for them to feel the business is theirs, and not mine. Sometimes that process takes two, three, even four years. But once they learn how to manage, they're there for life. . . . They see the bonus money, and their employees see the bonus money. Nobody really believes it, or gets it, until it happens. But once they ring the bell, everybody's on and things start falling into place.

The role of contingent payments at ABC Supply looms large, just as suggested by the economic theory of agency. What agency theory misses, however, is the overwhelming importance of reinforcement processes. Reinforcement enables an agent to leap the impulsive barrier that lies between a long-run preference for efficient behavior and current habitual routines.

Monitoring and Review

Supervision in organizations is normally much greater than can be explained by the need to control opportunism. In many work situations there are perfectly adequate measures of output, yet direct supervision is maintained. For example, office workers are frequently monitored continuously despite the fact that direct measures of productivity—forms processed—are available at the end of each day. Agency theory would try to explain this by supposing that some random, unobservable factor intervenes between worker effort and final output, so that output-contingent compensation is too risky for workers. In the context of office work this seems highly implausible. Impulse-control theory predicts that office workers know that there are objective measures of performance; nevertheless, they still might perform less well than they would like because of problems in self-discipline. Continuous supervision is a way of bringing into the present the reckoning at the end of the day.

Indoctrination

Firms often devote substantial resources to exhortations, slogans, symbolic acts, morale-building exercises, etc. We claim that the purpose of these activities is not to convey information. Rather, the purpose of activities such as sales meeting is to fortify the spirit of the salesperson with enthusiasm and confidence and to enable him to exert greater control over the impulse to shrink from the stresses of selling. The salesperson is to be inculcated with the moral sentiment that persistence and hustle are paramount virtues.

Planning and Problem Solving

There has always been a tension in management thinking between the need for planning and the systems for carrying it out. Planning is essentially future oriented problem solving;⁷ it necessarily involves consideration of non-routine actions (else it would be superfluous). Yet planning activities are themselves routine and necessarily occur in the present.

From an impulse-control perspective, the need for planning systems is obvious: habitual routines resist change throughout an organization and impulsive time-preferences induce procrastination with regard to the urgency for change. Thus, some overarching routine which cues the review of present routines is valuable. In simple terms planning systems aim to take potential future problems and transform them into current problems in order to garner attention.

Conclusions

We have argued that discipline is one of the sources of value provided by organization. In particular, we have proffered the idea that hierarchy acts to moderate and control impulsive behavior—a form of self-opportunism. As illustrated by our examples of Nucor and ABC Supply, long-term incentives may be insufficient to motivate individuals to behave in their own long-term best interest; short-term incentives, supervisory reminders, and inculcated habits are necessary, and individuals are usually cognizant of this fact.

It follows from this perspective that many elements of the fine structure of organizations are responsive to the problem of impulse control. Procedures for review and planning as well as the timing and context of rewards and punishments, may not be intelligible absent consideration of the types of impulses to which agents are subject, their efficiency consequences, and the best ways of controlling them. The structure and pattern of monitoring and short-term incentives is most properly seen as a tool for reinforcing functional habits and routines which, in turn, are instrumental in obtaining long-term rewards.

The more general research program we encourage is that of enriching efficiency views of economic organization with more realistic models of human behavior. We do not advocate the abandonment of rational models, but we do suggest that individual and organizational rationality are “engineered” outcomes, not natural endowments. The technologies of that engineering task are the proper subject of research in management.

⁷Planning also involves strong coordinative elements. Mintzberg [1979: 154] stresses this aspect, going so far as to define planning as “the means by which the non-routine decisions and actions of an entire organization . . . can be designed as an integrated system.” We have chosen to concentrate on the forward looking and non-routine aspects of planning.

References

- Akerlof, George A. "Procrastination and Obedience." *American Economic Review* **81** (1991): 1-19.
- Ainslie, George. "Beyond Microeconomics: Conflict Among Interests in a Multiple Self as a Determinant of Value." In *The Multiple Self*, ed. Jon Elster. 133-176. Cambridge: Cambridge University Press, 1986.
- Ainslie, George. "Impulse Control in Pigeons." *Journal of the Experimental Analysis of Behavior* **21** (1974): 485-89.
- Ainslie, George. "Specious Reward: A Behavioral Theory of Impulsiveness and Impulse Control." *Psychological Bulletin* **82** (July 1975): 463-496.
- Ainslie, George and V. Haendel. "The Motives of the Will." In *Etiology Aspects of Alcohol and Drug Abuse*, eds. A. T. Gottheil, A. T. McLellan and K. Druley. Springfield: Charles C. Thomas, 1983.
- Aristotle. *The Works of Aristotle*. Trans. W. D. Ross, ed. Robert Maynard Hutchins. 2 vols. Chicago: Encyclopaedia Britannica, 1952.
- Benzion, Uri, Amnon Rapoport and Joseph Yagil. "Discount Rates Inferred from Decisions: An Experimental Study." *Management Science* **35** (1989): 270-84.
- Cohen, Eliot A., Gooch, John. *Military Misfortunes: The Anatomy of Failure in War*. New York: The Free Press, 1990.
- Dews, P. B. "Maintenance of Behavior by 'Schedules': An Unfamiliar Contributor to the Maintenance of the Abuse of Substances and the Like." In *Substance Abuse, Habitual Behavior, and Self-Control*, AAAS Selected Symposium No. 59, ed. Peter K. Levison. Boulder: Westview Press, 1984, 49-80.
- Falk, John L. "Excessive Behavior and Drug-Taking: Environmental Generation and Self-Control." In *Substance Abuse, Habitual Behavior, and Self-Control*, AAAS Selected Symposium No. 59, ed. Peter K. Levison. Boulder: Westview Press, 1984, 81-117.
- Fisher, Irving. *The Theory of Interest*. New York: Macmillan, 1930.
- Hackworth, Col David H. "Mismatch in Kuwait." *Newsweek* (January 28, 1991): 32-33.
- Hausman, Jerry A. "Individual Discount Rates and the Purchase and Utilization of Energy-Using Durables." *Bell Journal of Economics* **10** (1979): 33-54.
- Herrnstein, Richard J. "Relative and Absolute Strengths of Response as a Function of Frequency of Reinforcement." *Journal of the Experimental Analysis of Animal Behavior* **4** (1961): 267-72.
- Herrnstein, Richard J. "Self Control as Response Strength." In *Quantification of Steady-State Operant Behavior*, eds. C. M. Bradshaw, E. Szabadi and C. F. Lowe. Amsterdam: Elsevier/North-Holland Biomedical Press, 1981.
- Herrnstein, Richard J. and Drazen Prelec. "Melioration: A Theory of Distributed Choice." *Journal of Economic Perspectives* **5** (1991): 1-20.
- Iverson, F. Kenneth. "Steel Man Iverson." Interview by George Gendron. *Inc* (April 1986): 41-48.

- Hendricks, Kenneth. "Waste Not, Want Not." Interview by George Gendron and Bo Burlingham. *Inc* (March 1991): 33-42.
- Holmstrom, Bengt. "Moral Hazard and Observability." *Bell Journal of Economics* **10** (1979): 74-91.
- James, William. *The Principles of Psychology*. New York: Henry Holt and Company, 1899.
- Langer, Ellen J. "Rethinking the Role of Thought in Social Interaction." In *New Directions in Attribution Research (Volume 2)*, eds. John H. Harvey, William Ickes and Robert F. Kidd. 35-58. Hillsdale, N.J.: Lawrence Erlbaum Associates, 1978.
- Langton, John. "The Ecological Theory of Bureaucracy: The Case of Josiah Wedgwood and the British Pottery Industry." *Administrative Science Quarterly* **29** (1984): 330-354.
- Marshall, S. L. A. *The River and the Gauntlet*. New York: William Morrow & Co., 1953.
- Mazur, James E. "An Adjusting Procedure for Studying Delayed Reinforcement." In *Quantitative Analyses of Behavior V: The Effects of Delay and of Intervening Events on Reinforcement*, eds. M. L. Commons. Hillsdale, N.J.: Lawrence Erlbaum Associates, 1987.
- McKendrick, Neil. "Josiah Wedgwood and Factory Discipline." *The Historical Journal* **4** (1961): 30-55.
- Mintzberg, Henry. *The Structuring of Organizations*. Englewood Cliffs, N.J.: Prentice-Hall, 1979.
- Oliver, Nick and Barry Wilkinson. *The Japanization of British Industry*. New York: Basic Books, 1988.
- Rachlin, H. and L. Green. "Commitment, Choice, and Self-Control." *Journal of the Experimental Analysis of Behavior* **17** (1972): 15-22.
- Reid, Peter C. *Well Made in America: Lessons from Harley-Davidson on Being the Best*. New York: McGraw-Hill, 1990.
- Rosenberg, Nathan, Birdzwell, L. E. *How the West Grew Rich: The Economic Transformation of the Industrial World*. New York: Basic Books, 1986.
- Schelling, Thomas C. "Enforcing Rules on Oneself." *Journal of Law, Economics, and Organization* **1** (1985): 357-374.
- Schonberger, Richard J. *World Class Manufacturing*. New York: The Free Press, 1986.
- Shiffrin, Richard M. and Walter Schneider. "Controlled and Automatic Human Information Processing: II. Perceptual Learning, Automatic Attending, and a General Theory." *Psychological Review* **84** (1977): 127-190.
- Simon, Herbert A. "Human Nature in Politics: The Dialogue of Psychology with Political Science." *The American Political Science Review* **79**, 2 (June 1985): 293-304.
- Solnick, Jay A. "An Experimental Analysis of Impulsivity and Impulse Control in Humans." *Learning and Motivation* **11** (1980): 61-77.
- Strotz, R. H. "Myopia and Inconsistency in Dynamic Utility Maximization." *Review of Economic Studies* **23** (1955-56): 165-180.
- Thaler, Richard H. "Some Empirical Evidence on Dynamic Inconsistency." *Economics Letters* **8** (1981): 201-207.

Thaler, Richard H. and H. M. Shefrin. "An Economic Theory of Self-Control." *Journal of Political Economy* **89**, 2 (1981): 392-406.

Webber, Ross A. *Management*. Homewood, Ill.: Irwin, 1979.