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1) Sponsor Technical Contact: Joseph L. Young; NSF Program Official; National Science Foundation; Washington, D.C. 20550 Phone (202) 357-9898

2) Sponsor Admin./Contractual Contact: Idele Kruithoff, NSF Grants Official; Division of Grants and Contracts, Directorate for Administration; National Science Foundation; Washington, D.C. 20550 202-357-9653

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M50-642

Resource Allocation with Sunk Costs: A Behavioral Approach

Progress Report
For Grant No. BNS-8016275
Covering the Period
5-1-81 to 4-30-82

Edward J. Conlon, Georgia Institute of Technology

Gerrit E. Wolf, University of Arizona

This report summarizes the work performed on grant number BNS - 8016275 from May 1, 1981 until April 30, 1982. The main body of the report simply reviews the activities of the investigators and briefly reports results and proposed future actions. A more detailed compilation of the results of our work to date may be found in the working papers provided as Appendices A and B.

Scope of the Work

The focus of this research is the behavioral analysis of financial allocations to projects when those projects have a sunk cost. The issue is of interest because case studies and casual reports of managers and consultants indicate that allocators, in practice, may not follow the financially rational strategy of ignoring sunk costs. Previous laboratory studies of escalation and commitment in resource allocation decisions (see Staw, 1981) suggest that sunk costs alone and in conjunction with various social-psychological phenomena may produce committment to a project that can cause an allocation to extend more support than he/she should. The present research proposed to examine such phenomena in more ecologically valid ways and was proposed in three phases. Phase one has been completed and the investigators are presently working on phase two and preparing for phase three.

Phase One

This phase, as proposed, was to conduct interviews with small groups of managers in which they would describe, both generically and specifically,

situations in which allocations were made to projects for which there was a history of sunk costs. The objectives were (1) to gather information that would be valuable for constructing case scenarious which could be presented to managerial samples in order to better investigate the impact of various factors on responses to sunk costs and (2) to identify what some of those factors might be.

At this point, phase one is essentially complete. During this phase the investigators conducted focus group interviews with managers from a convenience sample of nine corporations. This sample included four corporations devoted essentially to the manufacturing, marketing and delivery of hard goods, four corporations devoted to the marketing and delivering of essential non-financial services and one financial service organization. All of these were private sector firms. With the exception of the financial corporation and one of the manufacturing firms, interviews were held with small groups of top level managers who were deemed by our various contacts in these organizations to be or have been centrally, involved in financial allocation decisions. In the financial corporation, two focus groups interviews were held, one with corporate controllers and the other with credit managers. In one manufacturing firm, one-on-one interviews were held with three senior executives regarding a particular product which was removed from the market partly because of sunk costs. In all cases, interviews were conducted at corporate headquarters with groups where at least one member was a senior level (i.e., Vice-Presidential or above) executive. Group sizes varied from two to six.

The format used for the interviews was extremely non-directive. There were basically three phases to each interview. The first phase was devoted

to having the managers define "sunk costs" and talk about how they are perceived and treated. The second phase asked managers to recall cases of decisions that involved sunk costs. The interviewers in this stage attempted to get the managers to describe what created the sunk cost, to estimate its magnitude and implications, to describe the various action alternatives available and/or taken in response to the sunk cost and finally the results of those actions. The last phase asked the interviewers to summarize those factors which may have caused an allocator to consider sunk costs when making allocations.

The results of these interviews will be presented in two ways. First, we shall present a tabulation, and second, a set of general observations about the nature of the sunk cost cases.

A total of 16 cases were identified. The investigators, for purposes of this tabulation, did not attempt to evaluate whether each case was a bona fide instance of decision making with sunk costs, but left that judgement to the interviewers who presented the case. These cases are tabulated in Table 1 and are subdivided by allocations into four basic types: Mergers and Acquisitions, New Products, New Plant, Equipment and Processes and, finally, Normal Operations.

Mergers and Acquisitions are attempts by a firm to secure a new operating company. They are acquisitions of ongoing businesses which may or may not be similar to the acquiring firm's ongoing business. New Products are allocations made to cover the costs of bringing new products or services market and more specifically, may cover development costs, costs of establishing new technology for production and the costs of establishing new markets. New Plant, Equipment or Processes are allocations to acquire new

capital or establishing new processes in order to continue or become more effective in the ongoing business. Normal Operations are expenditures made to cover every-day costs.

The cases are described according to the type of business in which the case originated, a brief description of the allocation, a brief description of the setback and why it occurred and the current disposition of the product or project for which the allocation was made. These are largely self explanatory.

Content of the Cases. A review of the content of the 16 cases revealed a number of things about sunk costs. First, it was clear that nearly all of the managers interviewed preferred to view all allocations as, in some way recoverable and that allocations became "sunk" when they were no longer recoverable. The most common circumstance leading to nonrecoverability was start-up costs, particularly for projects or programs about which the firm was relatively unfamiliar. It also appeared that sunk costs generally involved an underestimation of costs or the time that would pass before returns would accrue. Secondly, the perception of managers that a cost was "sunk" depended greatly on their initial expectations regarding the likely efficiency of resource expenditures. A non-recoverable expenditure that was anticipated a priori was not generally classified as a "sunk cost" by the managers. Thirdly, the cases revealed that the impact of sunk costs on subsequent decision making depended on the exact nature of the interdependency that linked decisions together into what Staw has called a course of actions. Our cases indicated at least six types of interdependency: financial, environment and market, technological, strategic resource utilization, corporate strategy and personal. The impact

of a sunk cost early-on in a sequence of actions seems to depend on the nature of the interdependency.

Other Phase I Activities. In addition to conducting and analyzing the focus group interviews, the investigators also intensely examined the financial decision making literature concerning sunk costs. This literature, which is primarily devoted to modeling allocation decisions according to a normative criterion of economic rationality, is quite clear about its treatment of sunk costs. Specifically, at the point of a decision the presence or absence of past allocations to a project are not, of themselves, relevant to the present decision. This does not deny that the assets created by previous allocations can impact the expectations about future cash flows, but suggests that the effect of the previous allocations operates only through future cash flows.

The applicability of the normative models to the previous research, "The A & S Financial Decision Case" (Staw, 1976; Staw and Fox, 1977; Fox and Staw, 1979) and "The World Bank Study" (Staw and Ross, 1978) was examined. It was found that because of limitations in the information provided by these scenarios, decision makers would be unable to adhere to rational models without making assumptions about costs, times, assets values and cash flows. It is also possible that the results of the previous studies may have been affected by the impact of the various experimental manipulations on such assumptions. The present investigators feel that the scenarios used in the prior studies should be restructured to provide sufficient information for using the normative model and some of the experimental manipulations should be replicated.

One result of investigating the normative financial models was the realization that for many, perhaps most, allocation situations the nature of cost and revenue functions make withdrawal from an ongoing project financially unwise. More specifically, projects where start up costs are high relative to later costs or where significant costs accrue before revenues are generated it is highly unlikely that withdrawal could even be financially rational prior to significant depreciation of assets (see appendix B).

The Yield of Phase I. Phase I has contributed greatly to the investigators' understanding of what sunk costs are, how they are perceived by managers, the kinds of allocations in which they occur, the appropriate normative treatment of those costs and the classes of interdependencies which may cause decision makers to deviate from the rational track. More importantly, the results of the focus group interviews further illuminate the meaning of a course of action as it applies to sequential decision making. Staw (1981), we feel, is not particularly clear about what distinguishes a course of action from any set of temporally related decisions. For example, Staw provides, as illustrations of courses of actions, the Chicago Sewer Authority's "Deep Tunnel" project as well as the case of an investor who must decide whether or not to purchase additional stock in a company in which he already owns shares of stock purchased at a price significantly above its current market value (i.e. he has suffered losses). In the Deep Tunnel example, allocation decisions are linked in several ways. First, there is a financial interdependency in which prior expenditures create assets which may increase or make possible the returns that will accrue from additional allocations, there is a strategy

interdependency in which each allocation holds a unique place in a sequence leading to overall goal attainment, there is a resource utilization interdependency in which unique resources which may benefit the city in a number of ways are acquired and there is an environment interdependency in terms of a commitment to the community involving the delivery of services, the elimination of drainage problems and the employment of residents. The stock purchase case provides a marked contrast. In this case, there are no interdependencies among the decisions except for those which might be cognitively imposed by the investor. The decisions are financially independent because the expected yield of a share purchased now is unrelated to whether or not the investor already owns shares. Unlike the Deep Tunnel case, there are no environmental, strategic resource or obvious strategy interdependencies. Yet it is possible that the decision maker may, because of how the perceives and categorizes stock purchases, view these as decisions as interdependent. One instance of this might be his thinking about the stocks from a single company as a portfolio so that instead of evaluating each purchase strictly on its own merit, it is evaluated in terms of its impact on the performance of the entire portfolio. This, of course, would not be financially rational according to present value criteria.

These examples, when discussed according to the interdependencies they imply within sequences of decisions, illustrate that courses of action are a series of actions (i.e. decisions) which are linked together by one or more interdependencies. It is probable that the degree to which a decision maker believes a course of action exists and the extent that decisions influence one-another depends on the nature and number of interdependencies present in

the sequence. His commitment to the sequence may also vary according to those interdependencies.

Phase Two. This phase, as proposed, involved the construction and classification of sunk cost cases that could be used to study allocations with managers as subjects. The research has now entered this phase and is approaching the problem of case construction in a serial manner. The results of phase one suggested that several reasonably basic issues should be resolved prior to investigating factors which impact sunk cost behavior. It is not clear from the previous literature whether allocators were behaving rationally or irrationally. Our first step will be to construct case stimuli and experiments that permit the solution of allocation problems according to basic financial principles. If allocators can be shown to behave according to these principles, then these stimuli can be embellished to examine a variety of additional issues. If allocators do not adhere to economically rational strategies, then a logical research tactic would be to examine why using in-depth process-tracing techniques.

Expected Yield of Phase Two. This phase is expected to result in a set of cases for which a economically rational allocation can be determined and, therefore, deviations from those allocations can be studied. Following phase one (and the original proposal) we hypothesize that adherence to economic rationality will depend on a variety of factors including, but not limited to, ego involvement and external visibility. Among these would be factors related to the interdependencies implied by a sequence of actions including the retention of critical resources, adherence to an overall corporate strategy, commitments to external constituencies and cognitive phenomena such as "portfolio thinking".

Phase Three. This phase, as proposed, involved the application of the cases developed in phase two to samples of working managers. This phase, which will commence in Fall, 1982, has not changed in intention except that managerial samples are now available through the Universities of Arizona and Iowa.

Overall Yield of The Research. We feel that phase one, alone, has significantly contributed to our understanding of sunk costs and their relevance to courses of actions. There are many ways in which the results of prior decisions, success or failures, in interaction with the nature of an action sequence and the task environment might impact subsequent decisions. Financial rationality, as it is described in economic theory, cannot totally explain the behavior of managers in real-world allocation settings. The results of phase one suggest that the relevance of economic criteria to a decision may systematically vary depending not only on the ability of allocators to evaluate and calculate, but on the circumstances surrounding an action sequence. Some of these circumstances may create social-psychological commitment as it has been framed by Staw, but other phenomena may also be operating. This research has already yielded clues to how some of the previously studied commitment phenomena are exhibited in real organizational contexts. We expect that these are additional phenomena will be indicated and better understood through the remainder of this project.

TABLE 1

A Tabulation of the Sunk Cost Cases

ergers and Acquisitions

Firm Type	Brief Description	Cause of Setback	Current Disposition
Manufacturing-high technology	Overseas acquisition Firm buys former overseas licensee	*Continual local labor problems *Weak Markets	Still holding
Business Services	Bought a small firm in a new business thought compatible with existing resources.	*Could not compete using existing labor resources. *Regulatory environment changed.	Paid 300,000 to divest
Financial Services	Bought a small bank.	*Underestimated start up costs overpaid.	Still holding. Bank is still profitable when ignore start up costs.

ew Products

Firm Type	Brief Description	Cause of Setback	Current Disposition
Manufacturing high technology	Entered new emerging market with new products.	*Entered market 5 years too early carrying costs not recouped.	*Very successful product line. Large market share.
Manufacturing-Transportation	Designed new product for a certain large customer's use.	*Customer did not provide the anticipated market. Development costs not recouped.	*Product is not activity marketed, but could easily be ressurected.
Manufacturing	Designed, assembled and marketed a new product that would serve a new market for the firm.	*Encountered problems with the software for the prototype installation. Experienced excessive carrying costs due to marketing expenses with no established product.	*No longer marketing or producing the product looking to sell the concept.

TABLE 1
(Continued)

ew Plant Equipment or Processes

	Firm Type	Brief Description	Cause of Setback	Current Disposition
.	Manufacturing-heavy equipment	Plants devoted to certain unprofitable products needed to be closed	*Weak markets	*Closed one plant, reallocated others to differedt divisions
.	Manufacturing-heavy equipment	Manufacturing equipment obsoleted prior to full	*Rapid change in technology	*Write off old machines and bought new ones immediately.
.	Business Services	Firm opened branch office expecting to lose 5 million over	*Competitive market with high start up costs.	*Now in 3rd year, losing as expected.
.	Transportation Services	Old engine parts obsoleted by more efficient new	*Rapid technological change spurred on by fuel costs	*Phasing-in new assemblys while trying to deplete existing parts inventory.
.	Transportation Services	Purchse 900,000 dollar piece of equipment to make engine repairs rather than make costly assembly replacement.	*High start up and carrying costs because of time lage due to (1) perfecting processing and (2) satisfying regulatory bodies.	*Nearly gave up and sold machine. Process was saved by 11th hour approval.
	Light Manufacturing	Obsoleted machines occasionally replaced	*Technology change.	*Immediate write-off and purchase.
	Light Manufacturing	Firm purchased a computer to eliminate an large, labor intensive sequence of tasks. Were dis-satisfied with progress and price of implementation.	*Large carrying costs due to slow development, delivery and vendor monopoly.	*Fired vendor, took on the development and implementation in house.

(Continued)

Normal Operations

	Firm Type	Brief Description	Cause of Setback	Current Disposition
1.	Construction	Firm spent $25,000 preparing an invited bid on a very large project, then declined to bid.	*Last minute learning about unusual construct-ion regulations--felt unfamiliar with the type of project.	*Did not bid.
2.	Lodging	Firm spent a large amount on an advertising campaign built on double entendre that backfired.	*Did not anticipate adverse public response	*Discontinued campaign. Lost use of the concept being promoted.
3.	Light Manufacturing	Firm periodically eliminates old product designs and introduces new ones.	*Some designs may never recoup development cost.	*Accept that risk and take loses on such items.

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Appendix A

Conducting Ecologically and Internally Valid Decision Making Studies: A Case of Sunk Cost and Commitment Experiments

Edward J. Conlon
Georgia Institute of Techology

Gerrit Wolf
University of Arizona

Marya Leatherwood
Georgia Institute of Technology

CONDUCTING ECOLOGICALLY AND INTERNALLY VALID DECISION MAKING STUDIES: A CASE OF SUNK COST AND COMMITMENT EXPERIMENTS

Few areas in the social and behavioral sciences have experienced the amount of growth and acceptance evident in the area of behavioral decision theory in the last 15 years (see Einhorn and Hogarth, 1981 for a review). In spite of this, however, relatively few attempts (e.g. Hogarth, 1980) have been made to extend such research and theory to particular task contexts such as prototypic types of managerial decisions. More specifically, the empirical research designs in behavioral decision theory have been predominately laboratory based and theory driven with less concern for ecological validity or the nature of situations to which many decisions actually occur. A major lesson from research on human problem solving is that the task environment, which is loosely defined as all those factors external to the individual which impact the information processing involved in task performance, is critical to understanding the quality of outcomes (Newell and Simon 1972).

One exception to this trend are the recent studies on escalating commitment in allocation decisions which result from sunk costs (i.e. failure experiences) (e.g. Staw, 1976; Staw and Fox, 1977; Staw and Ross, 1978, Conlon and Wolf, 1980). Although these studies are also predominately theory driven, they attend to important considerations which commonly appear in organizational contexts. Among these are the interdependency of present decisions with those of the past, the contribution of social and policy concerns to decision maker preferences and the role of setbacks and feedback in sequential decisions. Although this area of research has generated some interesting results and theory, it has two important shortcomings. Firstly, unlike mainstream behavioral decision research,

it ignores the normative models that have been developed for making allocation decisions that are now part of formal training in management. Secondly, in spite of its contextual theme, it remains rather naive of context. In this paper we use an examination of normative, financial decision models, the results of focus group interviews with managers to collect cases of decisions with sunk costs and an examination of prior research on commitment and escalation to assess the ecological and internal validity of the prior research. We also provide suggestions and an agenda for future studies.

The Prototypic Sunk Cost Situation

In the eyes of managers, sunk costs are resources, previously committed, which are no longer recoverable regardless of any action taken by an allocator. Sunk costs are a staple in most introductory accounting texts because, as will be discussed below, they are to be ignored in any economically based decision model.

The prototypical situation concerns at least two allocations, one at time one and one at time two, where the time two decision is of central interest. The time one decision together with subsequent events create the sunk cost. For example, suppose that an allocator has committed 50 million dollars to build a hydroelectric dam in Nigeria. It has been estimated that this allocation would complete the dam. After two years, the 50 million is spent and the dam is only 4/5 completed because certain corrupt local officials have skimmed 10 million dollars. Construction experts estimate that the dam may be completed at a cost of 10 million more. At time two, the allocator must decide whether or not to allocate an additional amount to the dam project.

The exact magnitude of the prior allocation forgone depends on the allocator's choice of alternatives. If the allocator decides to finish the dam, there will always be an economic sunk cost which will be exhibited as a decreased return on investment over the useful life of the dam. At minimum, this would be the cash value of the ten million over the life of the dam. Suppose however, that a local mining company was willing to buy the 4/5 completed dam at some price? Depending on the price and the original allocator's opportunity costs for that 50 million over the two years of construction, the sunk costs could vary from $0 to $50 million plus opportunity costs minus the price paid. In most cases, unless the prospective buyer has an internal rate of return on the asset greatly in excess of the seller's rate or places a high value on the seller's learning (i.e. is willing to absorb the 10 million as the cost of information about corruption), he would not be willing to compensate the seller for the loss and there would be a sunk cost. The normative model suggests that the allocator should choose the alternative that minimizes the cost.

An auditor's analysis of the situation would carefully assess the opportunity and transaction cost in determining any losses associated with the allocator's actions. In a sense, this is the closest one may get to a purely objective or economic assessment of the sunk costs. From a behavioral perspective, however, an allocator may or may not agree with an auditor's view. It is particularly important how the allocator frames the loss for understanding his/her future behavior. For example, the allocator may frame the 10 million as the cost of finding out about corruption (i.e. learning) where such learning is viewed as an asset. In another scenario, suppose the expected return on the dam was well above that of all other alternative investments and, even with the 10 million loss, compares favorably with those alternatives.

The allocator, again, may not regard the event as a loss. A behavioral analysis must be concerned with two issues. When from an objective (i.e. auditing) perspective a prior allocation is sunk (i.e. not recoverable), (1) what factors affect an allocator's perceptions and sentiments about that loss and (2) how do those perceptions and sentiments affect future allocations?

Behavioral Models of Allocation Decisions

The most complete behavioral analysis of sunk cost allocations is provided by Staw (1981). A key distinction in his analysis concerns the allocators primary motivations at time two which can be classified into three types. The prospectively focused allocator allocates according to the normative model; that is, he/she assesses the likelihood of all outcomes that might accrue from each decision alternative, the utilities associated with those alternatives and chooses the one that maximizes utility (i.e. the SEU model). This view is consistent with the normative model as long as the perceptions of the allocator about the likelihood and validity of outcomes are in agreement with the objective criteria (i.e. the auditor's view). Staw suggests, however, that an allocator's perceptions of the likelihood and utilities could be biased by sunk costs, making it hard to separate the perspective focus from other foci. When biases don't occur, however, the impact of the sunk cost on future decisions is simply through learning; that is, the allocator's expectations are altered based on past events.

A retrospectively focused allocator "seeks to appear competent in previous as opposed to future actions" (Staw, 1981 p. 583). In the sunk cost context, the allocator's time two actions are designed to justify the sunk cost in some way (by definition, the cost cannot be eliminated). Recent research on escalating commitment in response to failure (e.g. Staw, 1976; Staw and Fox, 1977; Staw and Ross, 1978) has examined the escalation of future allocations

as one possible outcome of the need to justify past actions. Staw (1981, p. 581) states that ". . .motivation to justify decisions can be seen as a function of responsibility for negative consequences (i.e. sunk costs) as well as both internal and external demands for competence." The internal justification esteem in situations of failure by behaving consistently, even when negative consequences result. The external justification process is a product of the need to appear competent in the eyes of others. By escalating, one may demonstrate to others one's beliefs in the correctness of the earlier decision in spite of the setback.

The last motivation affecting allocations is a norm supporting consistency. Staw has argued that managers, either implicitly or explicitly, are subject to norms supporting consistent action; that is, they believe that consistency in action is an appropriate form of managerial behavior. For that reason they may tend to continue to allocate in a way that is consistent with past action.

In summary, Staw's model relies heavily on cognitive consistency and social influence factors which are related to individual competency motivation in order to explain the persistence of allocators in the face of failures.

Financial Models of Allocations

From a financial perspective, resources are always allocated with the expectation of a return. All normative models of financial allocations contain at least two common components: (1) a valuation of the return and (2) a likelihood estimate on the return. This is, of course, the essence of the expected value (E.V.) model. Even acknowledging that financial models may be far more complex than the basic E.V. model, it is true that all of them share its essentials.

As we have already suggested, sunk costs are created when allocations fail to obtain the expected or required return and nothing can be done about it. Because there is no remedy for sunk costs, financial models of allocations rightly exclude such costs from consideration because they can have no impact on future returns except that an allocator may, because of the loss, revise his estimates of the values and likelihood of the outcomes associated with the previously chosen alternative.

Tax implications and the volatility of the economic value of outcomes lead to some important distinctions among types of resource allocations. Most critical to the creation of sunk costs is the distinction between allocations that create assets and those which are treated as expenses.

Asset Creating Allocations-- Many economic allocations are made in order to acquire tangible items whose economic value is known or estimable with reasonable certainty. Examples are the purschasing of plant and equipment or the acquisition of patent rights and exclusive licenses. Generally accepted accounting principles are unambiguous about how such assets are to be valued and depreciated. Another class of assets, however, are called intangibles. Intangibles occur most frequently in the acquisition of enterprises whose price exceeds the value of their tangible assets. In such cases, the difference between the price paid and the value of tangible assets is allocated to an accounting category called "goodwill". Presumably, this excess payment is justified by the anticipation of a premium return which could result from certain advantages such as brand loyalty, market share, unique technologies and locations.

The distiction between tangibles and intangibles is important for two reasons: volatility and depreciation. The value of tangible assets should be less volatile than intangibles because the price paid for a tangible asset should reflect some ascetainable market value. (In the absence of unexpected obsolesence or other economic catastrophes, the price paid for a tangible asset should always be at least partially recoverable through use, tax depreciation and/or sale. Generally speaking, standard assets such as real estate, generic equipment, warehouse space and so forth are relatively immune to becoming sunk costs. Product specific assets such as special tooling, patents and licenses are somewhat more exposed to risk because their value rests specifically on the fate of a single product. Either type of tangible asset is more certain both in internal value and value over time than are intangible assets. By definition, goodwill is determined by whatever a firm will pay for an acquisition in excess of its real asset value. In a competitive environment with many buyers and sellers, price should accurately reflect real value, hence goodwill should be recoverable by resale. To the extent that acquisitions are not always made on a price competitive basis, the goodwill paid may reflect a particular idiosyncracy rather than a market value, hence the "right price" is less certifiable for goodwill than for tangible assets. Secondly, the value of goodwill over time need not behave in a regular fashion as would wear and tear on a tangible asset. It may increase or decrease very quickly. For example, the goodwill associated with the Chevrolet Corvair evaporated quickly with the publication of Ralph Nader's Unsafe at any Speed just as the market value of recordings of Ravel's Bolero increased with the release of the movie "10".

The tax advantage of depreciation also distinguishes tangibles from intangibles. By tax law, all tangible assets have a useful life over which most of their value (i.e. price) may be depreciated for tax purposes. Hence excluding catastrophe, at least a portion of the value is always recoverable

(i.e. any sunk cost resulting from a tangible will be less than its price). Depreciation on intangibles is not tax deductible and must be charged directly against revenue over a specified period of time. For example, goodwill must be amortized over a maximum of 40 years.

In summary, allocations that create assets may create sunk costs in two circumstances. First, the value of the asset may suddenly change in terms of its resale value and return on investment. For tangible assets such a change would probably signify a catastrophe such as the unexpected obsolescence of the item being produced by the asset. In the case of intangibles, it could signify mismanagement or changes in consumer preferences. Second, a firm may have overpaid for the asset to begin with (i.e. the price was not justified by the returns). This is not likely for tangible assets whose value is certifiable in the market, but can occur for idiosyncratic tangible or intangible assets. In the case of all assets, sunk costs may generally be spread out over time and, hence, need not be reflected in the performance of a firm for a single period.

Expensed Allocations--Certain allocations are not regarded as creating assets and must be expensed (i.e. charge against revenues) in the reporting period over in which they occur. Prime examples are R & D expenditures and training costs. By their nature, the expected return on these expenditures is far less certain and therefore riskier than for assets which, at the very least, typically retain a salvage value. In the case of training, for example, a manager on whom a firm has spent $10,000 in training may suddenly decide to leave the firm. In the case of R & D, the information and products generaged may never yield a return to the firm. Their cost, therefore, is sunk immediately and may not be distributed over time.

Implications--Several implications may be drawn from the tax and accounting differences among allocation types. First, the impact of a sunk cost on the immediate financial performance of a firm or its sub-units will differ by allocation types. To the extent that managerial performance is frequently evaluated based, in part, on financial data, managers may be particularly sensitive to the treatment of losses. Because expensed allocations constrain the decision maker to a single period and are not buffered by depreciation, the effect of a mistake here is probably most profound. Our hypothesis is that managers will prefer losses that can be written off over time to those which must be expensed immediately. This preference could have two effects. First, decision makers will be more risk-averse when making decisions regarding non-asset creating expenditures. Secondly, they will be more highly motivated to justify sunk costs that must be expensed. Several possible contingencies should be noted, however. Non-asset creating expenditures such as R & D have the characteristic of high risk, hence organizations in their performance appraisals of managers may be more accepting of "mistakes" in that realm. Thirdly, the time frame in which R & D or training generate returns may be quite long. In fact, it is often not possible to evaluate the specific returns of such allocations. Again, organizations might avoid using these factors to evaluate managers.

A second implication of the tax and accounting distinction concerns the flexibility afforded the allocator in covering his loss. Losses that may be spread over time afford several strategic advantages. First, in environments where career movement and managerial succession occur rapidly (e.g. the military), losses spread over time permit the decision maker to pass part of his sunk costs on to his successor. Related to this observation is a tendency for new managers to write off such losses quickly upon taking over.

Secondly, the allocator may have an opportunity to "bury" his loss in future periods of favorable revenues. These alternative actions are important since they represent options available to the allocator in lieu of having to "justify" the sunk cost to others.

A final implication, not independent of the others, concerns the representation of sunk costs. The existing literature on sunk costs leads us to think of them as immediate feedback which, contiguous with the decision, force the allocator to take actions which justify or remedy the past. This conception may be ecologically valid only in a limited set of circumstances where costs are reported immediately (i.e. expensed) and future payoffs or changes in their likelihood may be rapidly assessed. The accounting literature suggest that such cases are more the exception than the rule.

MANAGERIAL DESCRIPTIONS OF SUNK COST EXPERIENCES

In an attempt to learn more about the development and treatment of sunk costs in real allocation contexts, the investigators conducted focus group interviews with managers from a convenience sample of nine corporations. This sample included four corporations devoted essentially to the manufacturing, marketing and delivery of hard goods, four corporations devoted to the marketing and delivering of essential non-financial services and one financial service organization. All of these were private sector firms. With the exception of the financial corporation and one of the manufacturing firms, interviews were held with small groups of top level managers who were deemed by our various contacts in these organizations to be or to have been centrally involved in financial allocation decisions. In the financial corporation, two focus groups interviews were held, one with corporate controllers and the other with credit managers. In one manufacturing firm, one-on-one interviews were held with three senior executives regarding a particular product which was removed from the market partly because of sunk costs. In all cases, interviews were conducted at corporate headquarters with groups where at least one member was a senior level (i.e., Vice Presidential or above) executive. Group sizes varied from two to six.

The format used for the interviews was extremely non-directive. There were basically three phases to each interview. The first phase was devoted to having the managers define "sunk costs" and talk about how they are perceived and treated. The second phase asked managers to recall cases of decisions that involved sunk costs. The interviewers in this stage attempted to get the managers to describe what created the sunk cost, to

estimate its magnitude and implications, to describe the various action alternatives available and/or taken in response to the sunk cost and finally the results of those actions. The last phase asked the interviewers to summarize those factors which may have caused an allocator to consider sunk costs when making allocations.

The results of these interviews will be presented in two ways. First, we shall present a tabulation, and second, a set of general observations about the nature of the sunk cost cases.

Tabulation of the Cases

Audio tapes were used to record the focus group interviews. The discussions fluctuated between general observations about decision making and descriptions of specific case episodes. These case episodes were easy to identify on the tapes because they were generally given as responses to the investigators' requests for specific examples of sunk cost decisions.

A total of 16 cases were identified. The investigators, for purposes of this tabulation, did not attempt to evaluate whether each case was a bona fide instance of decision making with sunk costs, but left that judgement to the interviewers who presented the case. These cases are tabulated in Table 1 and are subdivided by allocations into four basic types: Mergers and Acquisitions, New Products, New Plant, Equipment or Processes and, finally, Normal Operations.

Mergers and Acquisitions are attempts by a firm to secure a new operating company. They are acquisitions of ongoing businesses which may or may not be similar to the acquiring firm's ongoing business. New Products are allocations made to cover the costs of bringing new products or services

to market and, more specifically, may cover development costs, costs of establishing new technology for production and the costs of establishing new markets. New Plant, Equipment or Processes are allocations to acquire new capital or establishing new processes in order to continue or become more effective in the ongoing business. Normal Operations are expenditures made to cover everyday costs.

The cases are described according to the type of business in which the case originated, a brief description of the allocation, a brief description of the setback and why it occured and the current disposition of the product or project for which the allocation was made. These are largely self explanatory.

General Observations from the Cases

Although the cases quite obviously differ in the types of allocations made, the types of setbacks that occured and the reasons for the setbacks, several themes emerged which appeared to be common across situations. These themes tended to involve three issues: How and why do sunk costs emerge, how are they detectable and how they may affect decisions.

Emergence--The first observation concerns the emergence of sunk costs. There were several themes that arose regarding emergence. First, it was clear that nearly all of the managers preferred to view all allocations as in some way recoverable; that is, one should always be able to recover one's initial investment through sale or use. Sunk costs, therefore, were allocations which were no longer perceived as recoverable. Secondly, if we accept our set of cases as representative of the universe of sunk cost experiences, such (i.e., nonrecoverability) situations emerge when a firm allocates funds to a project with which it is comparatively unfamiliar (i.e., not a standard business activity). At least eight of our 16 cases represented situations where a firm was either doing something for the first time or entering a domain (e.g., market, technology, region, etc.) with which it had no prior experience. For example, three of these involved the acquisition of subsidiaries where (1) the firm had never acquired a subsidiary before or (2) the subsidiary operated in a substantially different technology or environment than the acquiring firm. In the former category was a large bank which, with the institution of statewide banking, acquired its first bank and although it was able to anticipate revenues, underestimated the "start-up-costs" associated with acquisition. In the

latter category, a firm acquired an overseas subsidiary which had previously been a licensed distributor of the acquiring firm's products. The acquiring firm failed to anticipate a variety of labor problems indiginous to the country in which the subisidiary was located and its ability to effectively change the way that things were being done in that firm. These problems were all attributed to some degree of naiveté about the new work population. A third observation was that sunk costs generally involved underestimation of costs rather than overestimation of returns. This underestimation of costs often involved an underestimation of the amount of time and/or effort necessary to initiate a new project. In one case, an entire sales team was hired and sent out to sell a new machine a year before its prototype was even operating. This resulted in a profit and loss statement which showed all costs and no revenues resulting from that selling effort. This was sufficient justification for the firm to discharge the sales force and remove the product from the market.

To summarize the emergence issue, sunk costs appeared to be defined as non-recoverable expenditures. It was not always clear whether recoverability was defined by managers with a consideration of the time value of money. Sunk costs tended to result from situations where an important parameter in the decision involved a domain with which the firm had little or no experience such as a new market, a new politico-economic environment or a new technology. Finally, sunk costs often resulted not from an error in estimating the operations returns from an investment, but from the start-up costs associated with making an asset operational.

Detection--The second observation concerns when and how sunk costs are detected by managers in organizations. There are two aspects of detection.

First, what constitutes a "cost"(?), and second, when is that cost deemed non-recoverable (?). These issues may appear to be simple but, in fact, they are quite problematic. From an accounting standpoint, one may wish to equate the term "cost" with a loss; that is, the degree to which an investment fails to return its expected value is its cost. In fact, if we relax the term "expected value" to pertain to the expected returns of the allocator, we obtain a good definition of sunk cost. To illustrate, one of the cases obtained in our interviews concerned a firm's opening a branch office for a particular operating subsidiary in a city where the firm, a purveyor of services to business clients, provided services similar to but not the same as those of the operating subsidiary. The rationale for opening this office was that many of the firm's largest clients were headquartered in the city and that the subsidiary needed a "presence" there in order to retain those clients as well as to bolster the parent company's image as a purveyor of a full line of services. Because of stiff competition in the subsidiary's particular service, it was anticipated that the office would lose five million dollars over the first five years. This expectation, in fact, was externalized in the business plan. This loss was legitimized by the allocators in three ways. First, it was expected that the office would eventually be profitable. Secondly, it was thought that the office was essential to keeping certain key clients. Lastly, it was felt that the office would enhance the visibility and profitability of the firm's other operations in the city and, although these benefits could not be transferred by formal accounting, they would be attributable to the office. It was clear on probing the managers that any loss less than the anticipated five million would be perceived as a "gain". The inference to

be drawn from this example, and similar other reports from the interviews, was that costs (and benefits) are identified relative to expectations that are often formalized in a business plan.

The recoverability aspect of sunk costs is even more troublesome. The issue of exactly how managers deem expenditures to be non-recoverable probably cannot be answered in simplistic or even generalizable terms. From our cases, it appears that a multitude of factors including forecasted costs and revenues, the centrality of an investment in a long range plan and, sometimes, managerial politics may affect the perception or labeling of an investment as non-recoverable. For example, in the case of the bank acquisition, it was clear after the experiencing of the acquisition and start-up costs, that using even the smallest reasonable discount rate, the acquisition would not recover those costs. It was interesting that these costs are now omitted from periodic performance assessments. In this case, normal accounting was indicative of sunk costs. In the case of the branch office, recoverability was largely a matter of faith in (1) the long-term viability of the office and (2) the "spill-over" effects to other divisions which, under normal accounting, could not be verified. The potential role of politics in determining recoverability is evident in the case of the product which was marketed one full year before its prototype was fully debugged and operational. In this case, there was sufficient evidence that the product, once ready, would likely be the most profitable (in terms of mark-up) of any in the company. The profit and loss statement for that one year, however, served to legitimize its removal. More important in the decision to remove, however, was the lack of fit of this product with the

existing product line and markets served by the firm and the absence of a top-level advocate for the product.

In summary, the detectability of sunk costs depends on the difference between the allocator's perceptions of the returns accruing from an allocation and his/her expectations with regard to those returns. It is also important that the allocator view those losses as permanent (i.e., non-recoverable). The determinantion of when costs become sunk is problematical because recoverability depends on expectations of future performance. In our interviews, we encountered both instances where patience in the face of losses was a vice and those where it was a virtue. Perhaps the best statement to make about detection is that costs are deemed "sunk" when, for some reason, a consensus is reached about the advisability of not attempting their recovery. The degree to which this decision may be supported by formal analyses depends both on the extent to which costs and benefits are reducable to monetary terms and the extent to which the management involved desire such verification.

Impact on Decisions--A final observation concerns the manner in which sunk costs impact future decisions. Viewing this from Staw's "course of action" perspective, a sunk cost is a failed allocation in some interdependent sequence of actions. The impact of these failures on subsequent decisions depends on the nature of the interdependency. Six types of interdependency can be identified in the cases.

The most frequent form of interdependency was financial. Even failures can create assets and the existence of ready assets may affect subsequent decisions. An example of this from our cases was a firm that because it had a full inventory of parts devoted to old engines, delayed the replacement of

the old engines with new, more efficient ones even though the cost-effectiveness of the delay could be questioned. The major issue is that large, immediate write-offs can have an important impact on the confidence that investors, suppliers and clients may hold toward a firm. In Staw and Ross's (197) World Bank case, financial assets are also created which have an important impact on the return on investments associated with future allocations to the failed project.

A second type of interdependence concerns environment and market. Resource allocations can sometimes constitute commitments to constituencies external to a firm. One firm gave the example of two unprofitable plants, one located in a major urban center, the other in a semi-rural community. The firm closed down its urban facility, but reallocated its rural facility to a more profitable operating division. The reason was that in the small town, the firm was a major employer and had a felt commitment to the community. A somewhat different example was a firm's retaining certain unprofitable product lines because of either believed interdependencies with other profitable products (e. g., the ability to sell a complete system) or felt prior commitments to clients that they would continue to carry a product.

A third type of interdependency concerns technological considerations. One firm gave an example of resurrecting and modifying an old prototype in bidding on new business to fit the needs of new potential clients. The reasons for this were two-fold. First, the development costs associated with the new bid would probably be lower, but it was also the case that the felt risk of the bidding firm was also less. Stated a bit differently, the bidders felt that because all of the necessary steps through producing a

prototype had already been taken, many of the uncertainties involved in product pricing, especially those involving start-up costs, had already been eliminated. In a way, these are really "sunk benefits". We have labeled such considerations technological, because they involve the impact of prior allocations, even failures, on learning how to do things and the contingencies that ultimately affect success and/or failure. Generally speaking, the more complex the technology or process that is being dealt with, the more likely will be the sunk benefits of prior experience.

A fourth form of interdependency involved strategic resource utilization. These interdependencies would be most likely in contexts where state-of-the-art technologies create areas of special expertise which cannot easily be bought in the labor market. In such cases, a firm might continue a failing project and incurr further costs just to have something for key personnel to do before a new project is initiated. One firm gave the example of a project from which the management never expects to directly benefit, that is periodically resurrected to keep strategically important teams of engineers and designers busy.

A fifth and extremely interesting interdependency involved corporate strategy. Strategy produces interdependency by (1) creating general themes, policy or plans that place particular allocations in some sequence of intended actions and (2) providing institutional support and justification for actions. The most obvious forms such strategies take are the long-term business plan and statement of corporate policy and objectives. In these forms, the jointly defined strategies of top management become externalized and give the appearance of consensus on "where a company is going". Consequently, such plans are potentially powerful tools for justifying

actions. In our cases, we saw an instance of corporate strategy, in part, justifying a five year loss in the branch office case, and strategy, in part, justifying the removal of a product whose per unit profit potential was greater than any other in the firm. The interesting aspect of this process is that the economic wisdom of a given strategy (i.e., compared to alternatives) is generally more difficult to objectively ascertain and verify than that of any single investment decision and, therefore, the use of a plan to justify a particular decision is not necessarily economically rational. Nonetheless, strategy appears to be an important force in determining the persistence of allocators in the face of successes or failures.

The sixth and final type of interdependence is personal. This type of interdependency has been Staw's major focus and refers to individual beliefs that decisions are somehow linked with regard to their implications for the person. For example, an attempt to "recover" sunk costs by allocating additional funds may be motivated by self-justification or justification to others. Both of these are attempts to protect one's self-image or reputation, hence this concern for image becomes a personal factor linking two or more decisions. This factor was noted explicitly in one of our cases where a losing subsidiary was retained because of the corporate president's involvement in its acquisition. The decision to retain was, importantly, made against the loud protest of corporate comptrollers and strategists. The idea of ego protection was also noted in two other interviews.

In summary, the interviews served to identify and illustrate six ways in which decisions may be interdependent. These were: financial, environmental, technological, strategic resource utilization, strategic and

personal interdependency. An important distinction among these, we believe, is the degree to which these interdependencies are objectifiable. At one end of a continuum are financial interdependencies which are generally objectifiable through standard accounting procedures. At the other end are personal interdependencies which may be quite idiosyncratic and, therefore, difficult to objectify. Objectification may be related to justification. Specifically, we propose that objectified interdependencies are useful as external justifications. For example, if one can show that the most economically rational use of ten million dollars is to complete a partially finished project that has been beset by past failure, one's present actions are fairly well protected from criticism and perhaps, one's past failures become fairly well buffered. In contrast, one's ideosyncracies and need to protect ego are not typically viable external justifications when evaluated against norms for rationality.

PROBLEMS WITH THE EXISTING PARADIGM

Two case scenarios, "The A & S Financial Decision Case" (Staw, 1976; Staw & Fox, 1977; Fox and Staw, 1979 and "The World Bank Study" (Staw and Ross, 1978), have been used in the previous research on escalation behavior. For both cases, students, acting as financial allocation officers, were asked to select from among several alternative projects the one deserving of a fixed amount of resource funding. Subsequent to this decision, feedback was provided to subjects indicating (either the success of) a setback to the chosen project. Following this feedback, subjects were instructed to make a decision concerning the financial amount to be allocated to the previously funded project or to an alternative project. In all studies the dependent variable of interest was the dollar amount allocated during this second

phase of the previously funded project. Two independent variables were manipulated: a) the responsiblity for an initial decision that b) resulted in a positive/negative outcome.

A number of problems exist, in these case scenarios. First, the ecological validity of each study is suspect. Although the cases attempted to simulate the types of decisions faced by allocators, the amount of information presented in the studies did not allow the use of a normative model for financial calculations. Second, the absence of this information may have lead decision makers to base their decisions upon certain assumptions which they formed in order to act in the normative fashion. Third, due to bounds on the information presented in the scenarios and the consequent assumptions which were not controlled for by explicit data pertaining to expected value; a number of alternative explanations exist creating potential problems with internal validity. Thus, interpretation of the literature on commitment is problematic.

The A & S Financial Decision Case

The A & S Financial Decision Case was based on ten years of historical data for sales and earnings of two R & D divisions. Subjects, serving in the role of Financial Vice President, were asked to allocate $10 million dollars to one of the two divisions. This historical data (for each division) indicated that although sales had increased in a somewhat linear fashion, earnings had decreased in a similar linear fashion. Both divisions now reported losses in earnings varying between .63 and .80 million dollars.

Feedback provided after the initial allocation was in the form of five additional years of historical financial information. For the manipulated improvement condition, sales increased significantly in the 5 year period

and earnings had returned to profitable levels. For the manipulated decline condition, although sales had increased a lower rate than in the immediately preceeding 5 years, earnings had suffered a deepening decline. At this time, subjects were instructed to make a second allocation based upon the potential for future earnings. Their task was to divide $20 million dollars between the two R & D divisions.

From the limited information provided in the case scenario, it appears that subjects were expected to perceive a linkage between previous R & D funding and financial performance over the intervening 5 year period. As no information was provided regarding future earnings or sales, however, calculation of either the likelihood of returns or the valuation of these returns would be based on assumptions that an increase in earnings would be solely a function of R & D expenditures.

Although this may have been the case, a more reasonable explanation is that subjects experienced uncertainty due to the limited information available. As a result, an experimenting strategy may have been utilized in an attempt to gain additional information.

In addition, the original $10 million dollars was budgeted by the company's directors who (according to the case) had concluded that the additional sum should be made available to major operating divisions. After the initial allocation was made and feedback provided, subjects were told that "the management of the company is convinced that there is an even greater need for expenditure on research and development". Therefore, as a result of funding being budgeted and explicityly supported by top management, allocators in the A & S Financial Decision Case may have

perceived less responsibility on their part for any negative consequences that might result.

Considering the results obtained in a followup study by Staw and Fox (1977) which examined these results over an additional time period, it appears that information gained by observed outcomes (e.g. negative consequences) may have played the more important role in decisions to continue allocations. That is, subjects receiving negative feedback under conditions of high responsibility (e.g. choice) after the second funding decision, allocated significantly lower amounts at time three. This behavior, suggesting reactance (Brehm, 1966), points to limitations to inferences that justification served to direct the effects of allocation behaviors.

The World Bank Study

In contrast to the A & S Financial Decision Case where subjects made decisions concerning R & D expenditures, the world bank case required financial decisions regarding an industrial complex in an overseas nation.

While playing the role of financial officer in the World Bank, subjects made initial decisions on the selection of one of three regions in Nigeria to build a hydroelectric dam. Staw and Ross (1978) then provided negative feedback to one half of the subjects while the other half received positive feedback. This manipulation was conducted in order to create what the researchers termed a "history of success/failure". After completing this decision and receiving feedback, subjects then turned to a seond decision in the case packets concerning the establishment of an industrial complex in one of three locations in Kenya. After a region was selected for the site, all subjects received information that a setback had occurred. The feedback

outlined that although $70 million of the original $80 million allocated was spent a) the project was only 50% completed due to b) unexpected heavy rain or an expected cause endogenous to the region chosen for the complex. Subjects were then requested to make allocations ranging from 0 to $70 million with nonassigned funds remaining with the World Bank for expenditure in future development projects.

Although the information environment utilized in this scenario is only patially bounded, a number of issues arise with respect to the feedback provided to subjects. First, the subjects were told that the project was only 50% completed. Based on this data, subjects now were required to assume that either the same expenditure would complete the project (e.g. $60 million plus the remaining $10 million from the previous allocation) or that half of the original allocation would suffice (e.g. $30 million).

This calculation would be based upon assuptions/perceptions of subjects regarding the likelihood of the setback reoccuring. That is, it the cause of the setback was perceived as being persistent, then the larger amount should have been allocated. However, although these calculating strategies were available due to the partially structured nature of the case scenario, calculation is not guaranteed. Therefore an uncontrolled source of variance exists due to differnces in cognitive processing on the part of decision makers.

Third, subject may have formed different assumptions about the probability of altering the cause of the setback. This issue is particularly important when considering the three expected causes endogenous to the region chosen for the complex. Staw and Ross (1978) provided three endogenous/foreseeable causes for the setback. These included: corruption

of local officials, ineffective work incentives and illiteracy. Among the reported mean allocations for each of these three endogenous setbacks a large discrepancy exists when a prior history of failure existed (corruption = 16.5, work incentives = 21.7, illiteracy = 47.5). In addition, subject's self reports on the likelihood of the persistence of the problem and their beliefs that additional funding would alleviate the problem followed an expected pattern based on the above means. Specifically, in the condition of setbacks involving illiteracy where the highest allocations occurred among the endogenous causes, subjects reported a significantly lower belief in persistence of the problem and a significantly higher belief that the problem could be alleviated. If subjects calculate based upon the information provided in the scenario, the assumptions that they possess regarding the persistence/fixability of the setback could also interact with calculations to control allocations.

Finally, a point regarding the assumptions that subjects may have had with respect to recoverability of the investment warrant's discussion. As the decision to allocate funds in the World Bank Study were asset creating, decision makers may have assumed that these costs were not sunk as the future use or sale of the industrial complex would provide recoverability of the allocations to some degree. Because the subjects were undergraduates from the College of Commerce and Business Administration, they may have attended to the useful life aspect of the Nigerian industrial complex.

As a result of these problems-the ambiguous nature of the data, variance due to calculating/noncalculating strategies, a potential interaction of calculation and persistence/fixability of setbacks and possible assumptions regarding the creation of assets leading to

recoverability potential-the internal validity of this study is questionable.

In summary, previous scenarios as designed by Staw and his associates lack a normative information environment. Consequently, assumptions held by individuals attempting to act normatively may be the basis for variance in allocations behaviors. The feedback provided in the former study did not allow for calculation (A & S Financial Decision Case) while the information regarding the setback in the latter case permitted a more calculating strategy (The World Bank Study). In the first study, uncertainty due to lack of a normative information may have directed subjects to experiments with allocations in hopes of gaining additional information. On the other hand, the causes for the setback presented in The World Bank Study may have been perceived and interpreted differently by subjects with respect to the persistence of the setbacks. Calculation may have interacted with perceptions of persistence. These issues pose threats to the internal validity of the results. Thus, any inference that justification is an explanation for escalation is tenuous given the scenarios utilized in these studies.

RESEARCH AGENDA

The information, observations and critiques presented above serve to suggest several directions that research and, ultimately, theorizing should take in the area of decision making with sunk costs. We suggest, here, an agenda which will first attempt to resolve some of the ambiguities associated with prior studies and then expand investigation.

Step One: Enabling Normative Models

We have attempted to show how the lack of sufficient information in the cases used in prior research threatens both their external and internal validity. Future research should be designed, like most behavioral decision making research, in a way that systematic deviations from normative behavior may be observed. In the case of financial allocations, that means designing cases and other stimuli that provide enough information for decision makers to utilize the decision models provided in the financial literature. These models, then, provide the normative benchmark against which actual allocations may be compared.

Once the normative benchmarks are developed, several classes of questions may be asked. The most obvious of these is how do the actual allocations made deviate from those which would be normatively prescribed? A similar strategy was used by Tversky and Kahneman (1974) in the discovery of common heuristics used by people in probability judgement tasks. Another question, however, concerns what people do when insufficient information is provided. For example, does a decision maker who wants to follow a normative model switch to some other model when information is insufficient,

or does he/she make guesses about the missing data to "fill in the blanks". If the latter is true, how are these guesses made? Are they systematically biased? Are they sensitive to situational cues and/or individual differences? It seems that such questions have both theoretical and practical importance.

Step Two: Broaden the Dependent Variable

The research to date on allocations has operationalized the dependent variable as an amount allocated from some a pool of available funds, sometimes with explicit opportunity costs and sometimes without them. It should be noted that in organizational resource allocations, the total size of the resource pie and the number and nature of allocation opportunities available may be important factors affecting allocation behavior. We suggest that future studies be sensitive to these factors and, in addition, recognize that allocations alone may not be particularly informative about decision behavior following sunk costs.

The Nigerian Dam example can be used to illustrate. Suppose that, following the first allocation, the dam is 4/5 completed and because local officials have stolen the other 1/5 those funds are not recoverable. Suppose further that construction costs have remained constant and that an allocation of ten million or 1/5 the original allocation without further corruption, would finish the dam. If the allocator spends 12.5 million, what can we assume about his behavior. Some possible inferences are: (1) He is so commited to the project because of prior responsibility inductions that he has allocated more than necessary (i.e., escalating commitments), (2) He assumes that local officials regularly skim 20%, so he has allocated

enough so that, with 20% skimmed, the project can be completed (i.e, learning without attempts to eliminate the setback), or (3) He has spent an additional 2.5 million to police the situation and hopefully capture and punish the corrupt officials (i.e., learning with attempts to remedy the setback). The standard methodology of obtaining only the allocation data provides no information for differentiating among these three response modes, although each may have very different theoretical implications.

One way to approach this problem is to collect, along with the actual allocation data, indicators of the allocator's rationale for making the allocation. A very good way to collect such data because it minimizes the possibility that the allocator's rationale is a post hoc rationalization of some other process, is to collect "thinking aloud" verbal protocals as the decision is being made. These protocols may then be examined, along with the actual allocation made, and used to test a priori hypotheses.

Step Three: Refine and Investigate the Course of Action Concept

The cases suggest a variety of ways in which a sequence of decisions may be interdependent. We suggest that these interdependencies create what Staw (1981) has labeled courses of action. It may be reasonable to ask how the nature of these interdependencies affects the allocation process. The potential importance of interdependencies may be shown by example.

Staw (1981) provides five examples of courses of action. A comparison of two of these illustrates why interdependencies are critical. One example is Chicago's "Deep Tunnel" project to improve its sewer and drainage system. The project is the largest public works project ever in the nation and involves digging 131 miles of tunnels, shafts, resevoirs and pumping stations. In Staw's example, the project is 10% complete and useless unless

totally finished. A second example is a stock purchased at $50/share whose price drops to $20/share. The decision maker buys more shares and the price drops further and the decision maker is faced with a sell, hold or buy decision.

These two situations differ greatly in the kind of interdependencies they create between decisions. In Deep Tunnel, all previous expenditures create an asset that, in effect, enhance the rate of return on the additional amount necessary to begin enjoying returns. For example, if six billion has been invested, and the project is expected to yield one billion per year in cost savings on a total investment of 11 billion, the annual non-discounted rate of return on the additional five billion to finish the project is 20%. We have labled this type of interdependency financial. The stock purchase situation has no such interdependency. From a financial viewpoint, the rate of return on additional stock purchased is totally unaffected by prior purchases. Any perceived interdependency present in the stock example must be created by factors other than financial considerations such as strategic or personal/ cognitive interdependencies. The notion that a decision maker may think of the entire sstock holding or portfolio in making his/her decision is a cognitive biasing factor which could ead to an economically incorrect decision.

The interdependency issue appears to be important for several reasons. Firstly, for financial interdependencies, a set of optimizing rules may apply which can assist the decision maker in making the decision justifying his/herself to self and others. In fact, as suggested above, the concept of justifiability may be a a factor deemed important by existing theory, on which all six forms of interdependencies can be systematically ordered.

Secondly, the form of interdependency may interact with other situational variables in its effect on allocations. For example, the visibility of an allocation may exacerbate the impact of a personal interdependency. Finally, there are important implications of the interdependency notion for the study of managerial policy and strategy. For example, if strategies can be used by managers to justify specific actions, are specific actions and/or their success or failure ever used to evaluate and justify strategy? Stated another way, some of the ideas found in Staw's courses of action notions and expanded through our cases carry implications for how effectively managers may learn from their decision making experiences. The entire issue of learning and the effect of success/failure on decision behavior over time would seem to be an important adjunct to this line of investigation.

Step 4: Expanding the Variable Set

The examination of the normative models and the cases presented here suggest a set of ecologically important factors which may be operationalized and investigated in future studies. Some of these have already been alluded to such as the interdependency concept, the presence of full information, and the resource scarcity and opportunity cost ideas. There are, however, a variety of additional concepts which should be examined. Among these are: (1) the impact of being able to spread losses over time, (2) the overall financial condition of the firm, (3) the size of allocations, (4) whether the allocation is an individual or group decision and (5) the stage in the life cycle of the entity at which the allocation is made.

These four steps are presented in a sequence that appears to be logical; that is, step one should be investigated prior to step two, because

the results of step one may have important implications for the design of step two studies. We in no way imply that this list represents an exhaustive set of the important research issues surrounding allocation decisions with sunk costs. This list represents those issues which appeared evident given the results of the focus group interviews and our examination of normative financial models.

Summary and Conclusions

We have attempted to demonstrate that the internal and ecological validity of those studies known as commitment and escalation research is suspect. The basis for arguement has been a comparison of the information provided in the case scenarios used in these studies with the information required by normative models of financial allocations. We have also used the results of case studies of sunk cost situations to identify common contextual variables which might be integrated into future research.

We can neither conclude that prior studies and resulting theorys are wrong or right. Our conclusion is simply that research can and should be designed to eliminate some of the difficulties with the previous research. Frankly, we expect that many of the conclusions from prior studies will prove valid. We believe, however, that the present analyses suggests issues and a direction that will provide a more accurate and unified theory of decision making with sunk costs than would a collection of studies modeled strictly on the previous research on the topic.

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TABLE 1

A Tabulation of the Sunk Cost Cases

rgers and Acquisitions

Firm Type	Brief Description	Cause of Setback	Current Disposition
Manufacturing-high technology	Overseas acquisition. Firm buys former overseas licensee	*Continual local labor problems *Weak Markets	Still holding
Business Services	Bought a small firm in a new business thought compatible with existing resources.	*Could not compete using existing labor resources. *Regulatory environment changed.	Paid 300,000 to divest
Financial Services	Bought a small bank.	*Underestimated start up costs, overpaid.	Still holding. Bank is still profitable when ignore start up costs.

Products

Firm Type	Brief Description	Cause of Setback	Current Disposition
Manufacturing high technology	Entered new emerging market with new products.	*Entered market 5 years too early, carrying costs not recouped.	*Very successful product line. Large market share.
Manufacturing-Transportation	Designed new product for a certain large customer's use.	*Customer did not provide the anticipated market. Development costs not recouped.	*Product is not actively marketed but could easily be ressurected.
Manufacturing	Designed, assembled and marketed a new product that would serve a new market for the firm.	*Encountered problems with the software for the prototype installation. Experienced excessive carrying costs due to marketing expenses with no established product.	*No longer marketing or producing the product, looking to sell the concept.

TABLE 1
(Continued)

Plant Equipment or Processes

Firm Type	Brief Description	Cause of Setback	Current Disposition
Manufacturing-heavy equipment	Plants devoted to certain unprofitable products needed to be closed.	*Weak markets	*Closed one plant, reallocated others to different divisions
Manufacturing-heavy equipment	Manufacturing equipment obsoleted prior to full depreciation.	*Rapid change in technology	*Write off old machines and bought new ones immediately.
Business Services	Firm opened branch office expecting to lose 5 million over 5 years.	*Competitive market with high start up costs.	*Now in 3rd year, losing as expected.
Transportation Services	Old engine parts obsoleted by more efficient new assemblys.	*Rapid technological change spurred on by fuel costs.	*Phasing-in new assemblys while trying to deplete existing parts inventory.
Transportation Services	Purchase 900,000 dollar piece of equipment to make engine repairs rather than make costly assembly replacement.	*High start up and carrying costs because of time lage due to (1) perfecting processes and (2) satisfying regulatory bodies.	*Nearly gave up and sold machine. Process was saved by 11th hour approval.
Light Manufacturing	Obsoleted machines occasionally replaced.	*Technological change.	*Immediate write-off and purchase.
Light Manufacturing	Firm purchased a computer to eliminate an large, labor intensive sequence of tasks. Were dis-satisfied with progress and price of implementation.	*Large carrying costs due to slow development, delivery and vendor monopoly.	*Fired vendor, took on the development and implementation in house.

TABLE 1
(Continued)

rmal Operations

Firm Type	Brief Description	Cause of Setback	Current Disposition
Construction	Firm spent $25,000 preparing an invited bid on a very large project, then declined to bid.	*Last minute learning about unusual construction regulations--felt unfamiliar with the type of project.	*Did not bid.
Lodging	Firm spent a large amount on an advertising campaign built on double entendre that backfired.	*Did not anticipate adverse public response	*Discontinued campaign. Lost use of the concept being promoted.
Light Manufacturing	Firm periodically eliminates old product designs and introduces new one.	*Some designs may never recoup development costs.	*Accept that risk and take losses on such items.

Appendix B

MAKING DOLLARS & SENSE OF SUNK COSTS

(or, When Might it be Rational to Throw Good Money After Bad)

Gregory B. Northcraft

Department of Management

University of Arizona

&

Gerrit Wolf

Department of Management

University of Arizona

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MAKING DOLLARS & SENSE OF SUNK COSTS

(or, When Might it be Rational

to Throw Good Money After Bad?)

In the eyes of managers, sunk costs are resources allocated which are not recoverable. In talking about sunk costs, it is useful to distinguish between expenses and investments of resources in projects. In any venture, resources allocated to a project are expected to be recovered by generating some form (monetary or otherwise) of revenue later in the project. But there are two quite different forms of resource recovery: resale and use. Resale is a matter of liquidation, so that resources are recovered directly from wherever allocated. This is the realm of investments. In real estate investment, for instance, a piece of land is purchased for $80,000, then later resold for $100,000. In between, the land may remain unused, but that is irrelevant to its role in generating revenue. Its ability to generate revenue occurs directly through its resale after appreciation. Contrast that with a piece of machinery (see Horngren, 1982). A piece of machinery may be purchased for $600,000, but have a salvage (or resale) value of only $70,000. But the resale value is irrelevant to the machinery's role in generating revenue. Its ability to generate revenue occurs indirectly through its use in turning raw materials into finished products, and thereby generating a revenue stream independent of its resale value. This is the realm of expenses.

The crucial differences between expenses and investments lies in (i) directness of resource recovery, and (ii) intentionality of loss. For an expense, resources are intentionally allocated where direct recovery is known to be a losing proposition, but where indirect recovery (through use) is believed to be profitable. In the above example, the company purchasing the $600,000 machinery accepts the direct loss of $530,000, fully anticipating an indirect recovery through use of at least $530,000. The land speculator does not invest in land intending to lose money directly on it, because there is no way for unused land to indirectly generate revenue. Land, of course, presents an exception that proves the rule. A rental property may be purchased for $80,000 and then later resold for $70,000, where the $10,000 loss is an expense. This would occur if the land generated rental income, and hence the revenue-generating role of the property were indirect (much like the machinery noted above.)

In the terms of this distinction, a "sunk cost" is an intentional direct loss of allocated resources (an expense) in anticipation of indirect recovery (through use.) Investments which are resold after depreciation or before appreciation simply generate losses. Expenses which are not recovered indirectly (through use) before a project is terminated also generate losses, but specifically <u>because of sunk costs</u>.

<u>Commitment and Sunk Costs</u>

The literature on decision-making has attempted to understand how sunk costs influence psychological commitment, and thereby the financial commitment of further resources in the face

of negative feedback on the initial investment decision (e.g., Staw, 1981). The underlying themes of this research have been that: (i) psychological commitment promotes further financial commitment in the face of negative feedback on initial investments, and (ii) this behavior is apparently irrational (throwing good money after bad, as it were.)

Perhaps the psychological appeal of such behavior lies in the notion of recovery through use. Faced with negative feedback (a certain loss through cost-overrun or revenue-shortfall,) the decision-maker may feel compelled to continue the project to its natural (albeit costly) conclusion, whereby recovery through use would be maximized, and loss through sunk costs minimized. Intuitively, this seems a rather appealing strategy. However, the behavior becomes irrational (as we shall see later) when the return-on-investment afforded through recovery through use is less than that afforded by competing investment opportunities.

However, as this paper will show, the fact that resources have been sunk (intentional direct loss) into a project and negative feedback received <u>does not</u> per se make further financial commitment either wise or unwise. In fact, the wisdom of further commitment of resources to a project in the face of negative feedback will be shown to depend upon four factors: (i) the type of return-on-investment curve associated with a project, (ii) the stage in a project's life-cycle at which point the decision is being made, (iii) the nature (magnitude) of the negative feedback received, and (iv) the process by which the resource allocator is evaluated.

<u>The type of return-on-investment curve</u>

A graphic representation of return-on-investment analysis for a project is shown in Figure I. The profit line corresponds to the expected return-on-investment for the entire project (EROI). If one assumes that a project is only started because the projected return-on-investment for the entire project is satisfactory, then the EROI constitutes a criterion for evaluating the goodness of any projected return-on-investment for the commitment of the remaining resources to a project, at any point in a project.

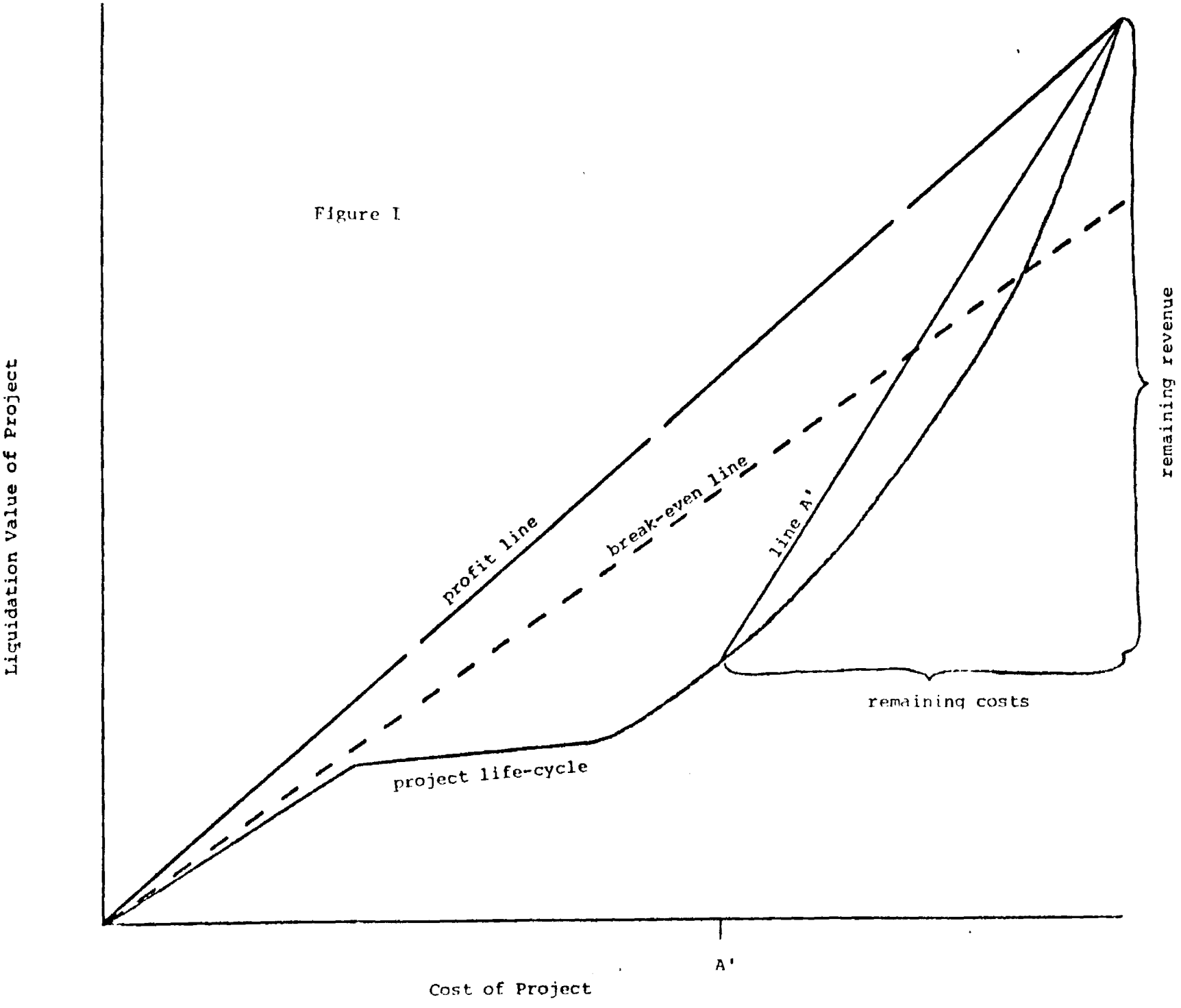
We can imagine four different kinds of return-on-investment curves for a project. These are derived from examining the changes in the projected return-on-investment for the commitment of further resources to a project, throughout the course of different projects. This projected return-on-further-investment (or PROFI) is of interest precisely because this rationally should be the measure by which to judge whether further resources should be committed. For instance, if competing available investment opportunities offer a 20% EROI, a PROFI of 21% for commitment of further resources to a partially completed project would be worth putting money into; a PROFI of 19% would not. Anytime the PROFI falls to a value which is less than the EROI, then return-on-investment for further resource commitment would be less than satisfactory, i.e. less that what is available through competing investment opportunities.

Graphically, this comparison of EROI and PROFI is quite simple to make. A PROFI line can be addded to the return-on-investment picture by drawing a line from the current point on the

project life-cycle curve to some point corresponding to further commitment of resources, such as the conclusion of the project. The resulting line (line A' in Figure I) will have a slope equal to the revenues obtained by further commitment of resources to the project, divided by the further resources committed. Whether further commitment of resources to a project is rational is then simply a matter of whether the slope of line A' is greater than or equal to the slope of the profit line (rational to commit further resources to the project,) or less than the slope of the profit line (rational to divert resources to other available investment opportunities.)

Three other features of these curves are worthy of note. First, the "break-even" line is irrelevant to return-on-investment decisions. Since the profit line represents the value of competing opportunities, it constitutes the only true "break-even" line. Only the profit line incorporates the opportunity costs of money into the break even notion. Second, liquidation value of a project is project external or market dependent. Anytime a PROFI is being calculated, the liquidation or salvage value of the project that counts is not what the managers of the project think the project is worth, but what it will bring on the market. After all, if a project is terminated prematurely, resource recovery will be in terms of what others are willing to pay. Finally, it should be noted that the preceeding discussion tacitly assumed that the value of competing available opportunities is a constant through the life-cycle of a project. This is clearly not always true. Therefore, when making graphic comparisons between PROFI and profit line slopes, one must be careful to use the profit

Figure I


Liquidation Value of Project
profit line
break-even line
line A'
remaining revenue
remaining costs
project life-cycle
A'
Cost of Project

line slope of the best available investment opportunity, rather than the profit line slope with which the project was begun.

The four types of return-on-investment curves are:

Type I: constant PROFI. Figure II shows a project life-cycle in which PROFI is constant throughout the entire life-cyclke of the project. An example of this would be a savings account, accruing interest daily on committed funds. Notice that there are not sunk costs in such a return-on-investment curve. At any point all committed resources can be recovered. Also notice that any PROFI for such a project is always equal to the profit line slope at any point in the project (assuming the profit line slope doesn't itself change) precisely because PROFI always falls on the profit line.

Type II: continuous variable PROFI. Figure III shows a project life-cycle in which PROFI varies over the life-cycle of the project. Specifically, there are sunk costs (intentional direct losses) at the beginning of the project (for instance, set-up costs, or equipment expenditures) which must be charged off against income received by the end of the project. Manufacturing presents good examples of this -- where materials and machines must be purchased, designs drawn up, and workers trained before any income is realized. Because income is not being generated while the sunk costs are being sunk (or perhaps income is not being generated at the rate sunk costs are being sunk,) the PROFI must be higher after the sunk costs are sunk than before, in order to recoup the sunk costs. Only if the PROFI is higher after sunk costs have been sunk than before can the return-on-investment for

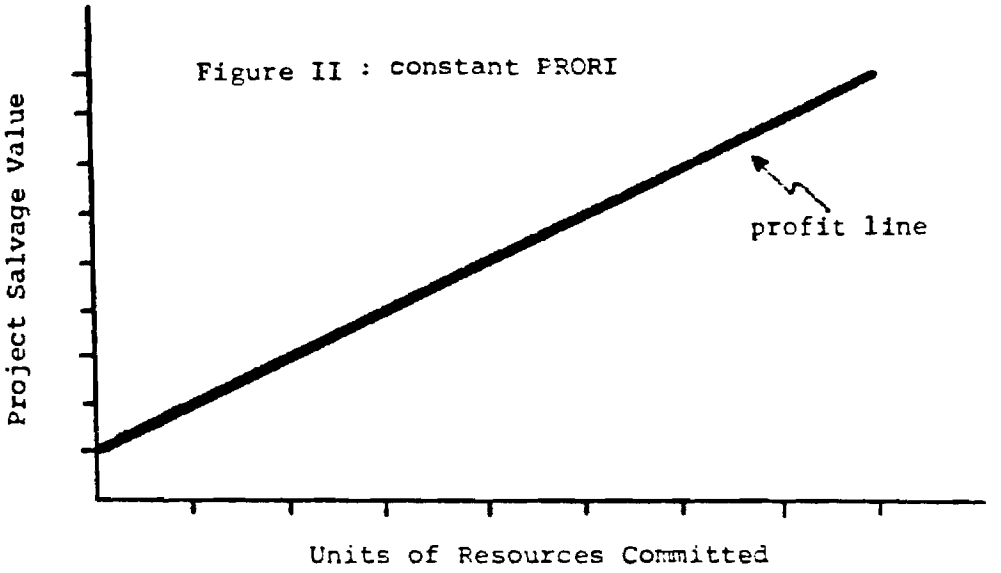


Figure II : constant PRORI
Project Salvage Value
profit line
Units of Resources Committed

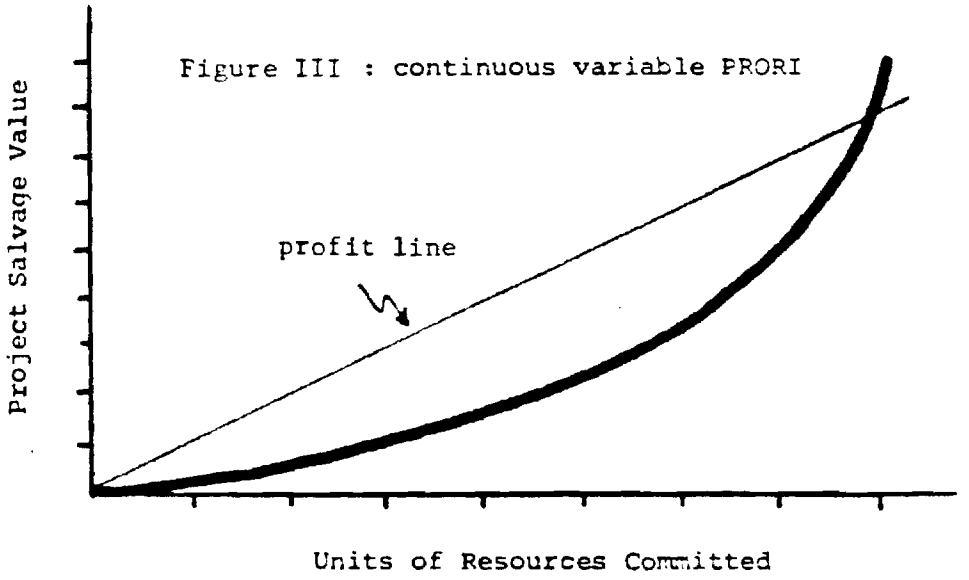


Figure III : continuous variable PRORI
Project Salvage Value
profit line
Units of Resources Committed

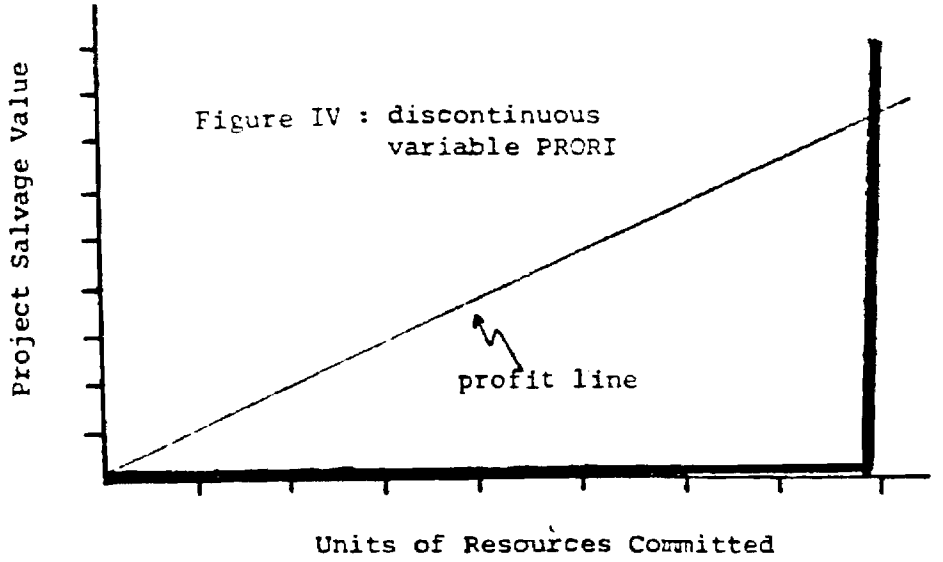


Figure IV : discontinuous
variable PRORI
Project Salvage Value
profit line
Units of Resources Committed

the entire project become equal to the EROI at the beginning of the project. This creates a situation during the sinking of sunk costs where the PROFI is always increasing relative to the EROI for the entire project, since costs figured into the EROI are being spent, but benefits figured into the EROI are not yet being realized.

> Example: Let's say that a manufacturing firm expects a total return on investment for a project of 20% for a new line of office furniture. Production and distribution cannot begin until $100,000 of equipment has been purchased, with a resale value of only $60,000 after use. At any point in the project after any money has been sunk into the equipment, the projected return-on-investment for remaining resources committed to the project must be greater than 20%, in order to recoup the $40,000 cost sunk into the equipment.

Type III: discontinuous variable PROFI. Figure IV shows a special case of the continuous variable PROFI, where no benefits are begin realized (i.e., no liquidation or salvage is accruing) until the very end of the project life-cycle, at which point all benefits accrue. An example of this would be the building of a bridge, or the construction of a pedestrian subway. For such projects, there may be little or no market for partially completed projects, and hence little or no salvage value to resources committed to the project until it is completed. After all, who would want to buy a couple of posts truly sunk into the middle of a river? Waiting in a bus line, or being put on hold on the telephone would also seem to fit this mold (see Rubin & Brockner, 1975).

In fact, one can imagine a family of curves of Type II, ranging from Type I to Type III, depending upon (i) the proportion

of sunk costs necessary to get the project off the ground (compared to the total budget for the project,) and (ii) the speed at which these sunk costs are being recovered. It also should be noted that these curves need not be monotonically increasing (despite the fact that all the examples have been drawn that way.) The project life-cycle curves might meander up and down in various ways throughout the life-cycle of the project. In terms of PROFI analysis, this might mean that it might make sense to commit some amount of resources to completion of a project which gets the project to a local maximum on the project life-cycle curve, without commiting enough resources to complete the project. (This should become apparent later, when the impact of negative feedback on PROFI analysis is discussed in further detail.)

Type IV: PROFI-inappropriate projects. The curve for this type of project may look like any member of the Type II family, except that for this type of project, PROFI analysis is inappropriate. There might be two reasons for this. First, some projects are undertaken not because they are cost-effective, but because they are effective period. For example, PROFI analysis may be inappropriate to understanding the funding of a war, or research on some acute disease cricis. Statements like, "HANG the expense," or "Whatever it costs, it's worth it" are traditionally associated with such projects. Another way of saying this is to note that such projects are dominated by outcomes. It may be worth just about anything to avoid losing a war if it means being sold into slavery. There are limits to this perspective, of course. It is not worth selling oneself into slavery to one group to gain their protection from another. But within limits,

PROFI may simply be the wrong kind of question to ask for some projects. Interestingly, the World Bank problem (Staw & Fox, 1977; Conlon & Wolf, 1980) may be of this type.

A second possibility for the inappropriateness of PROFI analysis arises when the benefits of a project are not easily specifiable, or not easily quantifiable. This would render the calculations of PROFI rather difficult, and may lead to the appearance or illusion of outcome domination (as noted above.)

This examination of return-on-investment curves for different projects immediately presents two possibilities where commitment of further financial resources would be rational even in the face of negative feedback (such as cost-overruns or revenue-shortfalls.) First, Type IV curves -- where projects are dominated by outcomes -- constitute situations where monetary bad news may have no bearing on whether a project should be continued or not. When an entire nation is dying from the plague, learning that research to find the cure is going to be more costly than originally suspected is not rationally tied to the decision of whether or not to continue the research. Second, if the environment changes during the course of the project, the profit line may be lowered in slope. If so, then even if bad news lowers the slope of a PROFI line, the slope of the PROFI line may nevertheless be higher than the comparison profit line, and further commitment of resources to the project would be rational.

Stages of a project.

The existence of variable PROFI's through the life-cycles of projects raises the specter of stages of a project during which

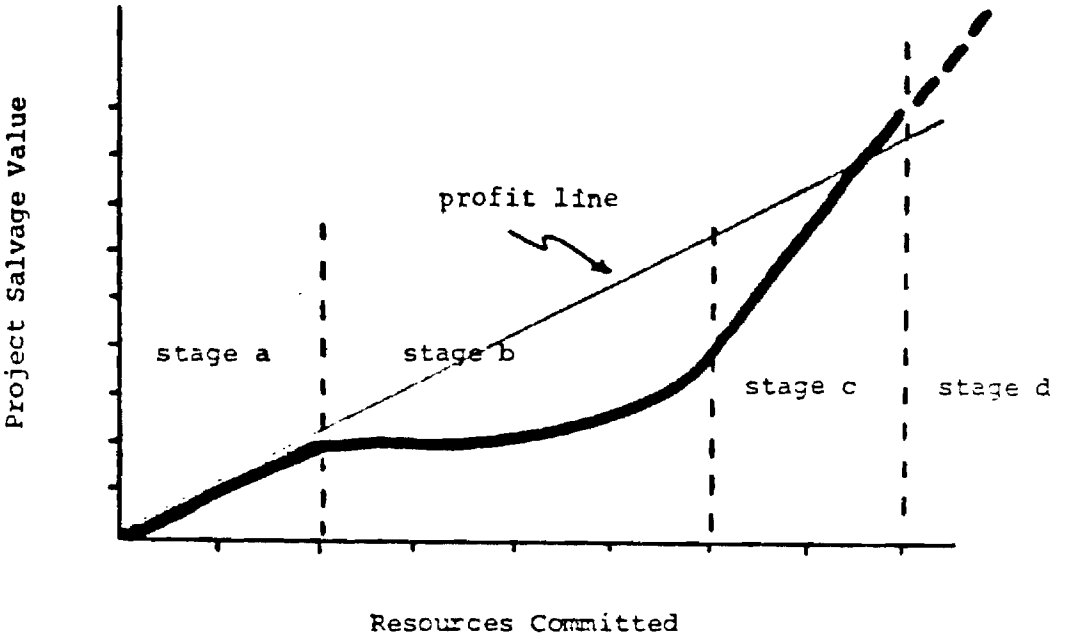
the PROFI is locally increasing, decreasing, or constant, and where the PROFI is higher or lower than the EROI for the entire project. Consider the example delineated in Figure V, where a manufacturing firm is designing and producing some new product. There are four stages in the life-cycle of the project which may be identified:

Stage A: No significant sunk costs have yet accrued. Time has been spent perhaps on "blue sky" types of research, which may be usefully applied to other projects. Personnel have been gathered or hired, or even trained in project-nonspecific ways, and can be diverted to other projects if this one is terminated. Materials may have been purchased or ordered, but not yet utilized in a way which prevents their return to the supplier, or again diversion to some other project.

Stage B: Costs are being sunk into the project. Sunk costs are accumulating. Workers are spending time on this particular project, or are being trained for aspects of this particular project which would not readily transfer to something else. Materials have been channeled into this project. But liquidation or salvage value is not accruing as fast as costs are being sunk. At any point during this stage of the project, the PROFI will be increasing, and greater than the EROI for the entire project.

Stage C: All sunk costs have been sunk, or income is being generated faster than further sunk costs are being sunk. In the manufacturing realm, this might be when production is going full swing. The only costs now are the variable variable costs per unit produced (such as labor and raw materials.) This is the period of the project life-cycle when sunk costs are being recouped. Unlike

Figure V : Four Stages in a Project Life-Cycle



Stage B, the PROFI may be constant during this period if there are no economies of scale to be realized during the latter stages of production. If there are such economies, the PROFI may continue to increase through this stage. In either case, the PROFI will be greater than the EROI for the entire project throughout this stage, just as it was in Stage B.

Stage D: Sunk costs have been fully recouped. At this point a project may be deemed completed and halted, such as in the case of a construction project when a building is finished and sold. Of PROFI may become constant or continue to increase, depending on whether there are additional economies of scale to be realized. In the manufacturing realm, this would correspond to that time in a project when all start-up costs have been recouped, and the production item has become on of the firm's "cash cows."

Nature of the negative feedback received

The nature of the negative feedback received (specifically, its magnitude) will interact with the type of return-on-investment curve of a project, and with the stage (A,B,C, or D) of the project, in determining the rationality of further commitment of resources to a partially completed project. It should be noted that negative feedback on a project here specifically refers to either a realized revenue-shortfall or cost-overrun, hence financial negative feedback.

In the case of a PROFI-inappropriate project negative feedback will have one of two effects: as noted earlier, it will either be ignored (since PROFI analysis is inappropriate anyway;) or it will push the limits of PROFI-inappropriateness, in which case PROFI

analysis will become appropriate and the project will become a variable or constant PROFI project.

In the case of constant PROFI projects (such as savings accounts,) negative feedback will have the same effect throughout the life-cycle of the project. Negative feedback will of course lower the PROFI's calculated throughout the project's life-cycle. If the PROFI falls below some accepted criterion value (the profit line comparison slope, which represents what is available elsewhere,) it would be unwise to remain in the project. Recalling from Figure II that for a constant PROFI project the PROFI line always falls on the comparison profit line, any negative feedback would have to lower the slope of a PROFI line at any time in the project to a value lower than the comparison profit line value. Therefore, for a PROFI constant project, any negative feedback constitutes a signal to get out and find another haven for investing resources.

For a variable PROFI project, the rationality of further resource commitment in the face of negative financial feedback becomes a stage-dependent issue. For simplicity, assume that:

$$\text{profit line slope} = \text{EROI} = 1 + X$$

at the start of the project, where X is the profit margin. The negative feedback then renders, for the entire project:

$$\text{EROI} = 1 + X - Y$$

where Y is the projected loss on the project (revenue-shortfall or cost-overrun.)

If the project is in Stage A, where no sunk costs have accrued, PROFI slopes will be equal to EROI and therefore Y less than the comparison profit line value. Therefore, negative

feedback received at this early stage in the project should lead to abandonment or termination of the project.

When the project has progressed to Stages B or C, the rationality of further resource commitment is much more dependent upon the magnitude of the negative feedback received, the amount of sunk costs sunk into the project, and how these affect PROFI slopes relative to the comparison profit line value. Unlike Stage A, the slope of PROFI lines will be greater than EROI. During Stage B and C, the PROFI slope value (in the absence of negative financial feedback) will be given by:

$$PROFI = 1 + X + Z$$

where Z is the amount by which the PROFI is greater than the EROI, in order to recoup any costs sunk into the project. We might think of Z as an annualized rate of sunk-cost recovery. If we then add negative financial feedback to the picture, the PROFI during Stages B and C will be given by:

$$PROFI = 1 + X + Z - Y$$

Knowing that the profit line slope has the value:

$$\text{profit line} = 1 + X$$

the PROFI will always be greater than the comparison profit line value as long as Z is greater than Y. In other words, the projected return on further investment in a partially completed project will always be greater than the comparison profit line value as long as the annualized sunk cost recovery rate is greater in magnitude than the annualized loss value of the negative financial feedback received. Consequently, it should be rational to commit further resources to a project if the annualized sunk

cost rate of recovery is greater than the projected loss. Interestingly, this will be true even if the project is destined to lose money on the whole (over the project's entire life-cycle.)

The important difference between Stages B and C in this analysis has to do with the sinking of sunk costs. As noted earlier, Stage B is the period of a project during which sunk costs are being sunk. Therefore, Z (the annualized sunk cost rate of recovery) must be increasing during this period, in order to accommodate the recouping of these increasing sunk costs. This increase in the value of Z is in fact what causes PROFI to be increasing during Stage B. Once Stage C is reached, where all sunk costs have been sunk (or revenue is being generated faster than further intentional direct losses are being taken,) Z may become relatively constant. This would mean that PROFI would also remain relatively constant throughout this period in the project life-cycle. Any realized economies of scale would increase Z (and thereby PROFI) during this period, as they would increase the rate at which sunk costs could be recouped.

Example: A company is in Stage C of a project (all sunk costs sunk) when it finds out some bad news. It expected X (its profit margin) to be in the neighborhood of 25%. However, now the public apparently will be willing to pay 27% less than expected, for a net loss of (25%-27%)= -2% per unit. However, at this point in the project, the annualized rate of sunk-cost recovery is 30%. Should the company terminate the project? By our figuring, the PROFI at this point in the project life-cycle is given by:

$$PROFI = 1 + X + Z - Y$$

$$= 1 + .25 + .30 - .27 = 1.28$$

Thus, the projected return on investment for commitment of further resources to the project is 28%. Since the original intended profit

margin was only 25%, it should be rational to stay in the project (unless the current accepted profit margin is more than 28%.) What if the company had received the news during Stage B, when (for instance) only half the sunk costs had been sunk? The annualized sunk cost rate of recovery at that point would have been only 15%, so that the PROFI at that point would have been given by:

$$\begin{aligned} PROFI &= 1 + X + Z - Y \\ &= 1 + .25 + .15 - .27 = 1.13 \end{aligned}$$

In this case, if available alternative opportunities offer more than 13% yield, this would be a good time to get out of the project.

The rationality of further commitment of resources in Stage D should be analogous to that for Stage C. The only difference is that once sunk costs have been recovered, Z becomes part of the profit margin for a project, rather than a sunk cost recovery rate.

Graphically, this PROFI analysis for variable PROFI projects is presented in Figures VI and VII. In the case of a revenue-shortfall (as pictured by the heavy black line in Figure VI,) there will be a period during the project (in this case, prior to point B') when the slope of a PROFI line will be less than the comparison profit line slope. During this period, it will make sense (i.e., be financially rational) to terminate the project and divert further resources to other available opportunities. However, after point B' has been reached in the project life-cycle, the slope of the PROFI lines will always be greater than the comparison profit line value. Therefore, after this point it will make sense to commit further financial resources to the project even though overall the project will lose money.

The analysis is the same for a cost-overrun, as shown in Figure VII. There will be some point (in this case, C') after which

Figure VI

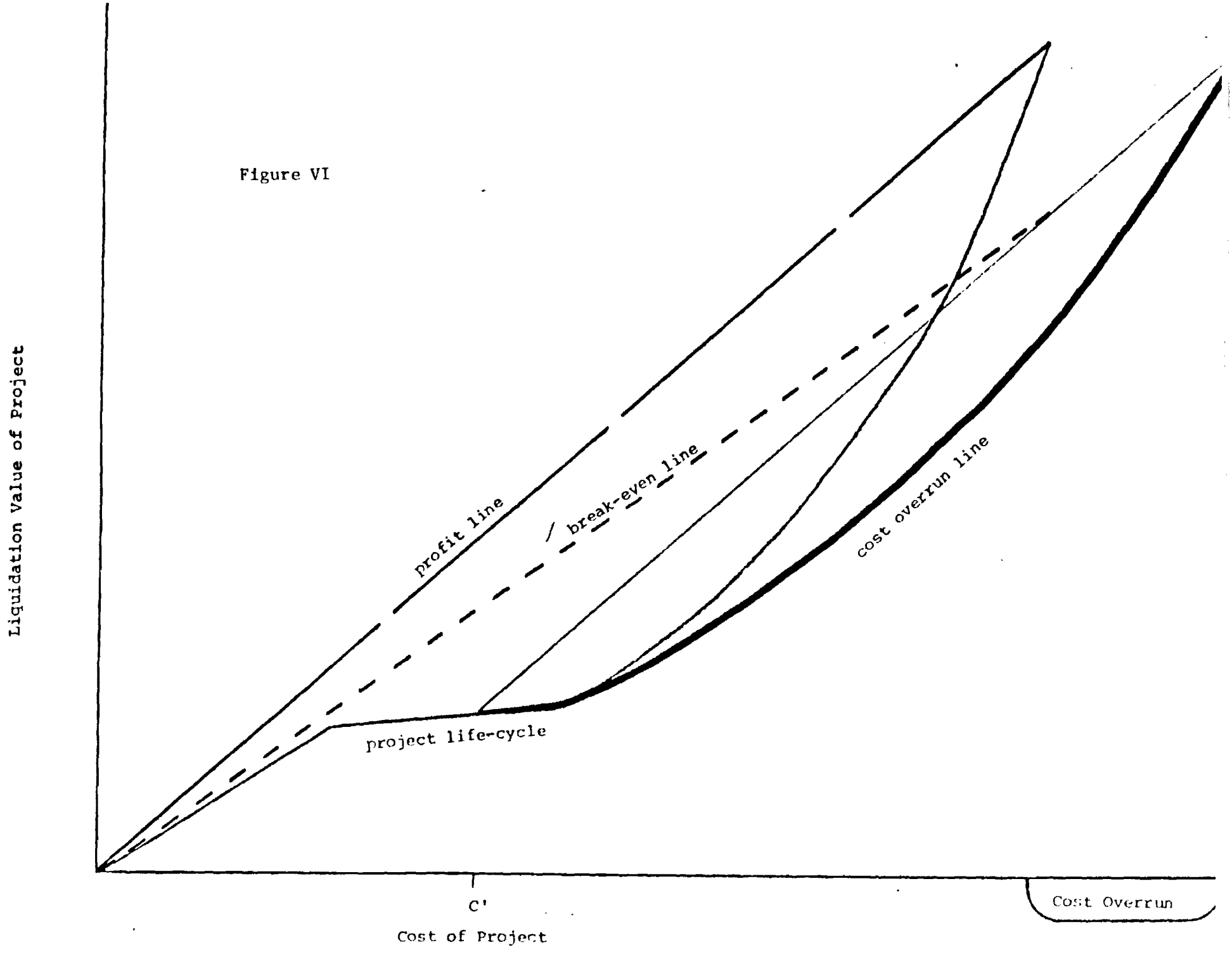
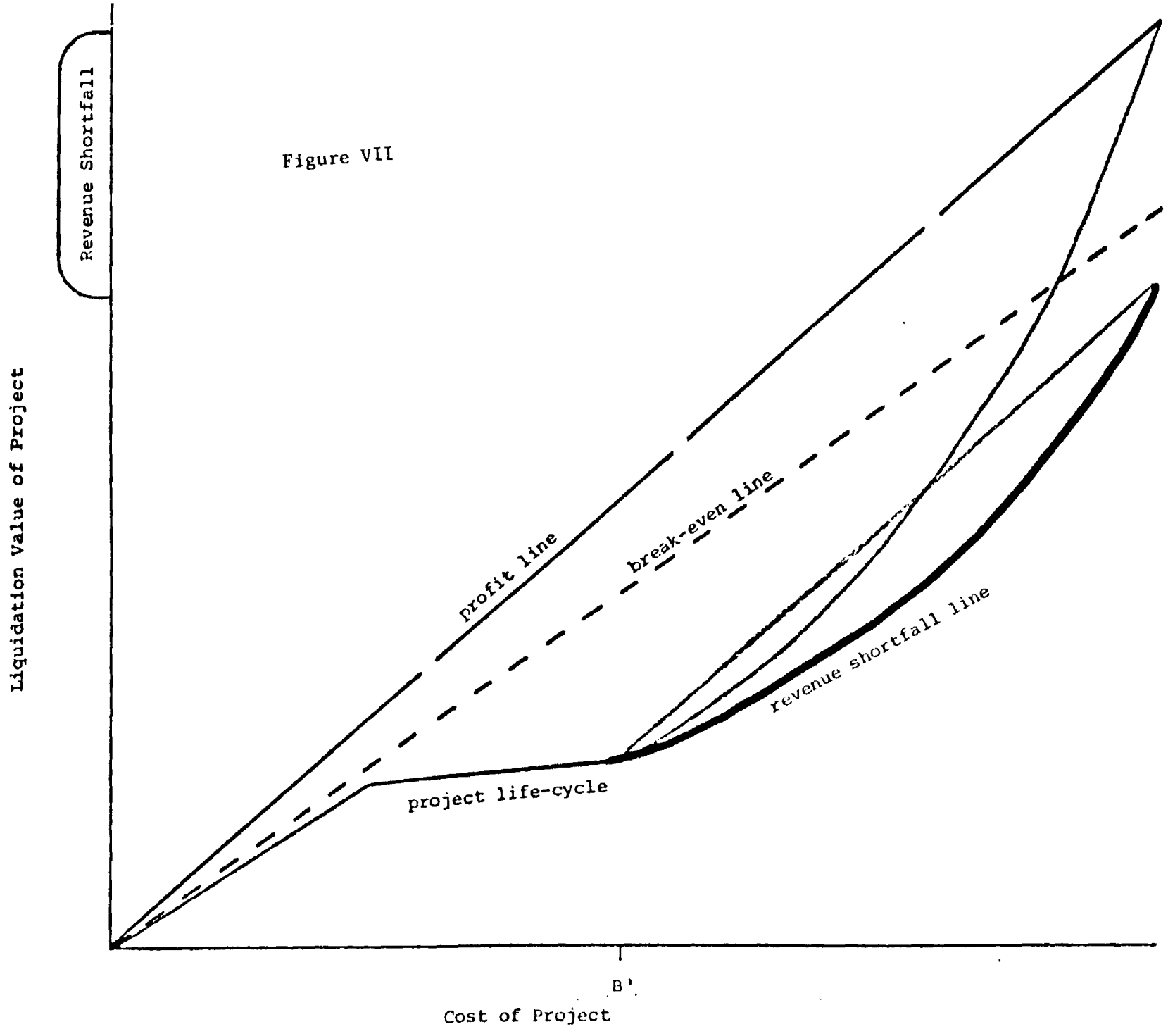

Liquidation Value of Project
profit line
break-even line
cost overrun line
project life-cycle
C'
Cost of Project
Cost Overrun

Figure VII


Revenue Shortfall
Liquidation Value of Project
profit line
break-even line
revenue shortfall line
project life-cycle
B'
Cost of Project

it will make sense to continue to commit resources to a project even though overall the project is destined to lose money. After point C', PROFI will always be greater than the comparison profit line slope. Thus, finishing the project is rational financially because after C' revenue will be generated at a rate faster for every additional dollar committed, than in another available opportunity.

These points C' (for cost-overruns) and B' (for revenue-shortfalls) represent points of "no return" in the completion of a project. After a certain amount of money has been committed to a project (sunk in,) it will be financially rational to continue to commit resources to the project <u>even though</u> the project will lose money overall.

Several quick heuristics about further resource commitment can be derived for variable PROFI projects. All other things being equal:

(i) further resource commitment is more likely to be rational as more sunk costs are sunk. This is simply because Z will continue to increase as more sunk costs are sunk, and therefore PROFI will also continue to increase as more sunk costs are sunk. As PROFI increases, further commitment of resources will be more rational financially.

(ii) further resource commitment is more likely to be rational as sunk costs constitute an increasingly larger proportion of a project's total budget. This is simply because Z must be proportionately larger as the sunk costs become a larger proportion of the total project budget. Only in this way can sunk costs ever hope to be

recouped. And, again as Z becomes larger, PROFI will also become larger, and it will become financially more rational to stay in even in the face of negative feedback.

Evaluation of the allocator

A final consideration lies in how the allocator of resources is to be evaluated. Here, the potential variability of PROFI for a project during the project's life-cycle presents a problem. Even if a project is destined to lose money overall, there nevertheless (as was shown above) may be stages in the project's life-cycle where PROFI for some amount of further resource commitment will be greater than the profit line comparison value. In Figure VI, for instance, the project is faced with a loss from a revenue-shortfall. However, anytime in the project life-cycle after point B' has been reached, return-on-commitment of further resources will be greater than the profit line comparison value. Therefore, if the resource allocator can get the project to point B' in the project life-cycle, his performance (in terms of return on resources committed) will look extremely good for the remainder of the project. This, of course, will not be a function of the allocator's behavior at all, but a matter of the magnitude of Z after this point of "no return" in the project's life-cycle. If the allocator can then focus evaluation of his performance on the period during the project life-cycle when PROFI is greater than the profit line comparison value, the allocator can look good even though the project will be losing money overall. This may lead the allocator to commit further resources to reach the point of "no return" in the project life-cycle, in order to get the project to a

point where the allocator is bound to look good for the remainder of the project. Notice that in this case, what is rational for the project may not be rational for the allocator. If the allocator wants to reach a point in the project life-cycle where he or she can look good by having a PROFI that is greater than the profit line comparison value, it may involve committing further resources at a point in the project when PROFI is less than the profit line comparison value.

Conclusions

This paper has focussed primarily on attacking the notion that classic sunk cost problems constitute a unitary phenomenon. Of importance to our understanding of sunk cost problems are the ideas that:

-- there are different types of return-on-investment curves for different types of projects, and

-- there are different return-on-investment stages for different return-on-investment curves.

These distinctions take on some importance in view of recent findings (e.g., Conlon & Wolf, 1980) that calculation strategies may play a role in mediating the psychological impact of sunk costs on financial decision-making. This paper suggests that calculation strategies may be more appropriate for some return-on-investment curves than others. Further, at different stages in a project's life-cycle, calculation strategies may produce quite different recommendations for further resource commitment, even in the face of the same magnitude of negative financial feedback.

Because these ideas have not previously received any attention

in the literature on financial decision-making, they provide some interesting possibilities for reinterpreting the impact of sunk costs. Rather than sunk costs per se having any impact on decision-making, commitment to a project may systematically influence: (a) an individual's perception of where in the project life-cycle a project is — a psychologically committed person may be more likely to perceive a project to be in advanced Stage B or Stage C, where PROFI would be sufficiently greater than the profit line comparison value to rationally justify further resource commitment. This might explain the findings of the "A & S Financial Decision Case" research, e.g., Staw, 1976; (b) an individual's perceptions of what type of return-on-investment curve applies to a particular project — a psychologically committed individual may be more likely to perceive a project to be of Type IV, and hence invulnerable to negative feedback effects, than if not psychologically committed. This might explain some of the findings from the "World Bank Problem" research, e.g., Staw & Ross, 1978.

The upshot of these insights is that the impact of sunk costs may not be related to sunk costs at all. Rather, psychological commitment to a project (perhaps through felt responsibility for its initiation, as commitment is usually operationalized) may bias perceptions of what we have shown as a very complex economic reality. The biased perception of economic reality might then influence decisions about further resource commitment. The economic reality would then play only a supporting role in initiating sunk cost effects. Only further research can settle these issues.

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THE UNIVERSITY OF ARIZONA
TUCSON, ARIZONA 85721
COLLEGE OF BUSINESS AND
PUBLIC ADMINISTRATION
DEPARTMENT OF MANAGEMENT AND POLICY
HARVILL BUILDING #76
(602) 621-1474 or 621-1053

May 3, 1984

Dr. Joseph Young
Program Director
NSF
Washington, D.C.

Dear Joe:

Enclosed is a copy of the form 98A, a final report and copies of papers from grant DAR 8016275. This grant was started at Georgia Tech and subcontracted to U of Arizona when I moved here. I thought you had received this material months ago, but Georgia Tech notified me that the report was missing. The mail disappeared from here in February to the University's surprise and chagrin.

The grant helped us on the concept of sunk costs. We thank NSF for its support in this research. A few papers are still being revised. When published, copies will be sent.

Sincerely yours,

Gerrit Wolf
Professor and Head

GW/lf

enclosure

cc: Contract Research
Georgia Tech
Atlanta, GA

NATIONAL SCIENCE FOUNDATION
Washington, D.C. 20550

FINAL PROJECT REPORT
NSF FORM 98A

PLEASE READ INSTRUCTIONS ON REVERSE BEFORE COMPLETING

PART I–PROJECT IDENTIFICATION INFORMATION

1. Institution and Address	2. NSF Program	3. NSF Award Number
University of Arizona Tucson, Arizona	Cognition	BNS 861 6275
	4. Award Period From 6/81 To 10/83	5. Cumulative Award Amount $79,000

6. Project Title

Resource Allocation With Sunk Costs: A Behavioral Approach

PART II–SUMMARY OF COMPLETED PROJECT *(FOR PUBLIC USE)*

The effect of sunk costs on continued resource allocation was studied by finding out from managers what kinds of sunk cost projects there were, how negative feedback occurred, and what was done about a less than successful project.

Sunk cost problems were found in manufacturing, construction, information systems, and new products. They usually involved the making of a product or service but, also, occurred in the buying and selling modes. Setbacks were usually of a cost-overrun rather than a revenue-shortfall and occurred because of unplanned events. Persistence in the project occurred because there was weak financial analysis to start and because of one or more external factors: self justification of the manager, commitment to constituencies, technological opportunity, or consistency with global policy and strategy. While these non-economic factors come into play for managers, one can justify continuing a project on economic grounds even if the project appears to be failing. The research showed that the further into a project a setback occurs, the larger the setback that can be endured on rational grounds.

The research concluded that the psychology of justification was reported by managers but was not of great importance in their analysis. Also, without careful economic analysis of the problem what may appear as the throwing of good money after bad may actually be rational completion of a project.

PART III–TECHNICAL INFORMATION *(FOR PROGRAM MANAGEMENT USES)*

ITEM *(Check appropriate blocks)*	NONE	ATTACHED	PREVIOUSLY FURNISHED	TO BE FURNISHED SEPARATELY TO PROGRAM	
				Check (√)	Approx. Date
Abstracts of Theses		X			
Publication Citations		X			
Data on Scientific Collaborators	X				
Information on Inventions	X				
Technical Description of Project and Results					
Other *(specify)*					

Principal Investigator/Project Director Name *(Typed)*	3. Principal Investigator/Project Director Signature	4. Date
Gerrit Wolf	Gerrit Wolf	3/1/84

Form 98A (3-83) Supersedes All Previous Editions

Form Approved OMB No. 3145-0058

Final Report

NSF Grant DAR 8016275, Sunk Costs: A Behavioral Approach

Gerrit Wolf

University of Arizona

Ed Conlon

University of Iowa

The objective of this project was to findout how managers perceived and dealt with sunk costs in the field. The results found that the decision to persist in a project was seen from three perspectives: 1) The economic model used to decide whether to get into the project in the first place, 2) the nature of the setback and the uncertainty it generates, and 3) a set of external factors having to do with psychology, sociology, and politics that are not evaluated in terms of dollars. All three of these perspectives play a role in the field. The relative importance and magnitude of their effects remains for future research.

Multiple methods and studies were used in this project. First, the researchers carried on focused interviews with small groups of executives in major corporations (Conlon and Wolf). These interviews discussed a sunk cost problem selected by the firm. Secondly, a theoretical paper was written on the economics of sunk costs, showing that if a project makes sense economically at the beginning of the project, the further into the project a setback occurs, the larger the setback that can be suffered and still have it make economic sense for the project to continue (Northcraft and Wolf). Thirdly, several laboratory studies were run to look at the interactions of externalities and nature of setbacks with economics of the project (Leatherwood and Conlon; Northcraft and Gleeson). Last, a survey was designed based on the previous results to assess the economics, setbacks

and externalities found in the field (Wolf and Conlon).

This project was initiated by Ed Conlon and Gerrit Wolf while on the faculty at Georgia Tech. During the past several years each has moved to the University of Iowa and the University of Arizona, respectively. The benefits of these moves to the project included the involvment of PhD students Marya Leatherwood and Bill Gleeson in the research. Also, there has been the involvment of junior faculty at Arizona of Greg Northcraft and Joel Brockner, and at Iowa of Peter Carnival and Bruce McCain as intellectual colleagues who may have effects on furture research.

The following bibliography lists five papers produced from the project. All have been or will be presented at professional meetings. One paper has been published in an important journal, two are under review, and two more are being revised for publication.

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3. The Impact of Setback Characteristics on Subsequent Financial Allocations: Escalation and Withdrawal Propensities. Leatherwood and Conlon. Paper presented at the National Academy of Management Meeting, Dallas, Tx, August, 1983. Prepared for Organizational Behavior and Human Performance

4. Commitment: "Bounded Irrationality" and other Insights. Northcraft and Gleeson. Paper presented at Western Academy of Management, Vancouver, April, 1984. Prepared for publication for the Journal of Applied Social Psychology.

5. Economics, Setbacks and Externalities: Sunk Costs in the Field. Wolf and Conlon. Paper presented at Academy of Management Meetings, Boston, August, 1984. Paper to be prepared for publication in Journal of Applied Psychology.

Published. AMJ. Spring 1987

DOLLARS, SENSE, AND SUNK COSTS:

A Life-Cycle Model of Resource-Allocation Decisions

Gregory B. Northcraft

Department of Management & Policy

University of Arizona

&

Gerrit Wolf

Department of Management & Policy

University of Arizona

Running head: Sunk Costs

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Abstract

This paper explores how we might know whether the decision to cut off a losing enterprise is clouded by what already has been invested in the venture. A new model is proposed — the Life-Cycle Model. The Life-Cycle Model borrows an accounting measure (the Time-Adjusted Rate-of-Return) to describe the effect of "sunk costs" on the expected rate of return for future costs in a project. The Life-Cycle Model proposes two dimensions of consideration for resource-allocation decisions: types of projects, and stages within projects. The Model is used to examine the relevance of negative feedback to the decision to commit further resources to completion of a project. It is noted that when a relatively large proportion of a project's total costs are taken early in the project, a region of rationality is created. The region of rationality is an amount of negative feedback which can be absorbed by a project, while maintaining the project's original rate of return over the remaining costs for the project. The implications of the Model for future research on psychological commitment and managerial resource-allocation decisions are discussed.

Dollars, Sense, and Sunk Costs:
A Life-Cycle Model of Resource-Allocation Decisions

The year 1982 began on a record tear in business and economic circles: in the first quarter, more U.S. based companies filed for bankruptcy than in any first quarter since the Great Depression of the 1930's. For the owners or CEO's of firms in the throws of such economic woes, deciding whether to "throw in the towel" could be the most difficult and painful choice of a lifetime. However, this type of decision is not an extraordinary circumstance. Even for the most profitable companies, not all projects and new ventures meet with success. Cost-overruns, revenue-shortfalls, and bads news of other sorts are, unfortunately, all too common. Often the decision that needs to be made is when to cut off a losing proposition, before it can take the rest of a corporate entity down with it.

But is this an easy decision to make? This paper explores how we might assess whether this decision is clouded by what has already been invested (or "sunk") in a venture — both personally and monetarily. Consider the following examples:

- An investor has all her money in a long-term savings account at 20% interest. Interest rates change, so that new certificates become available at 21%. After some deliberation, the investor decides to keep her money in the 20% account.

- A construction company is building a new subdivision when interest rates go sky high and the bottom falls out of the housing market. Despite facing certain losses in doing so, the company decides to finish building the subdivision.

- A secretary is calling an airline to make plane reservations for

his boss. He knows he can expect to wait at least four or five minutes, and often ten, before getting through. But today he has already waited fifteen minutes. He decides to keep waiting.

- The city council of a major metropolitan area decides to go ahead with a slum renewal project. The project will provide new low-cost housing for low-income residents of the area, while lowering crime rates, and generally improving the quality of life in a substantial portion of the city's old downtown area. Halfway through the project, it becomes clear that costs for the project have been underestimated by almost 40%. The city council decides to finish to project, as planned, anyway.

These examples all share one central theme. An initial decision to invest time or money in some venture has met with negative feedback — the expected "best-possible" outcome has not been realized. Nevertheless, the decision-maker has opted to continue in the course of the initial decision. In common parlance, this smacks of "throwing good money after bad." Worse yet, this scenario does not appear to be at all uncommon (e.g., Staw, 1981). Why should such seemingly irrational behavior occur? This paper will present a framework — the Life-Cycle Model of investment decisions — which begins to answer this question.

These examples are all instances of "sunk cost" situations — a decision has been made and resources irretrievably expended following from that decision. From a traditional accounting or financial analyst perspective, decision-makers throw good money after bad in sunk cost situations because of confusion. The decision-maker fails to understand that money already spent should not have any bearing on decisions to commit further resources to a project in the future. If the decision-maker is interested in maximizing returns-on-investment, the path to the best return lies in allocating resources to whatever available investment

alternative promises the best ratio of future revenues to future costs, even if it means abandoning a project that is a success in comparison to prior expectations. The best return on future allocation of resources is what counts, and the past therefore cannot possibly be relevant (Horngren, 1982).

The psychologist brings a different perspective to bear in understanding why a decision-maker might throw good money after bad. The psychologist claims to be less interested in how investment decisions should be made, and more interested in how they are made. The psychologist says a decision-maker faced with negative feedback about a project's financial progress, may feel the need to reaffirm the wisdom of time and money already sunk into a project. Further commitment of resources in the face of negative feedback somehow "justifies" the initial decision (Staw, 1976), or at least provides further opportunities for it to be proven correct. The decision-maker may also treat the negative feedback as simply a learning experience — a cue to redirect efforts within a project, rather than abandon it (Connolly, 1976). Or perhaps the decision-maker will rationalize away the negative feedback as a whim of the environment — a storm to be weathered, rather than a message to be heeded. In any case, the psychologist's conclusion is the same: whether it should or not, a project's financial past plays a role in future decisions. Quite simply, sinking resources into a project fosters a kind of psychological momentum or inertia that negative feedback may be powerless to halt.

For the practicing manager, throwing good money after bad is the aftermath of a particularly puzzling dilemma: when to get out of a losing situation one has already sunk time and money into, versus when to

persevere to overcome adversity. In fact, the manager is often caught between acknowledging the wisdom of the accountant's prescription, and living out the psychologist's inertia. As the accountant suggests, the manager wants to get the best possible return on allocation of his resources. But as the psychologist suspects, the manager feels committed or entrapped. He feels that money already sunk into a venture somehow "counts" in making decisions.

What Are Sunk Costs?

Sunk costs arise not in a single choice and outcome situation, but in projects, where there are streams over time of anticipated costs and revenues. In a project, funds are expended incrementally and precede revenues. A plan or budget for a project details the disbursement of costs for the project over time, and the projected revenues. Often, there will be a period in the budget when costs exceed revenues, in anticipation of subsequent periods in the budget when revenues will exceed costs. Sunk costs are this negative cashflow experienced in anticipation of future compensating positive cashflow. Without flows of revenues and costs, one cannot have sunk costs. If costs and revenues occur in a single decision or time period, there can be no sunk costs. Sunk costs are of interest after a project has started, and the point in the budget reached where costs spent exceed revenues realized. Now the manager needs to decide whether to continue and finish the project. What might be considered at this juncture?

- Are the experienced revenue and cost streams following the plan? If there are large costs early in the project, the return-on-investment for costs taken to this point in the project may be less than what is expected for the project as a whole. But is it less than planned? Without a budget, this would be impossible

to know, and meaningless to ask.

- What is the projected return-on-investment for the remaining costs of the project? How does it compare with the return-on-investment rates offered by other current investment alternatives?
- If news is received that a departure from the budget (a cost-overrun or revenue-shortfall) is imminent, how much of either is acceptable? Does it matter when this departure from the budget occurs? And finally, which is preferable: cost-overruns or revenue-shortfalls?

Without the necessity of further resource commitments, there seems little for the manager to decide. Why exit a project when it promises only future revenues at no additional costs? In that event, decreased future revenues are annoying, but don't present any decision for the manager. The problem occurs when there are sunk costs, required future costs, and a departure from the budget is anticipated. In that event, the manager needs to understand the relationship between past and future costs, and future revenues.

In the traditional "sunk costs" situation, recovery through use seems to be an appealing notion. When a piece of machinery is purchased for a project, the machinery is expected to "produce" revenue during its productive life, for instance by turning raw materials into marketable finished goods. Faced with negative feedback (i.e., certain loss through cost-overrun or revenue-shortfall,) the manager may wish to continue a project to its natural (albeit costly) conclusion, whereby recovery through use would be maximized and loss through sunk costs minimized. Intuitively, this strategy is rather attractive, and may underlie the manager's feeling that the accountant is not capturing the whole picture in his prescriptions.

to ignore sunk costs in making investment decisions. For the accountant, the decision to continue is simply a matter of the ratio of future revenues to future costs; "recovery through use" muddies the waters of the decision.

Psychologists have tended to leave "negative feedback" ill-defined in their experimental examinations of sunk cost situations. The information provided is rarely sufficient to complete future-revenues-to-future-costs calculations (such as Net Present Value or Time Adjusted Rate-of-Return). This reflects the psychologist's claim that the "correctness" of further resource allocation is not an issue. The psychologist is interested only in whether the existence of "sunk costs" influences psychological commitment (as revealed by further resource commitment) in the face of negative financial feedback.

Yet, this rendering of the psychologist's position seems misleading. What makes further allocation of resources to a project in the face of negative feedback indicative of psychological commitment to the psychologist clearly must be the apparent irrationality of the resource-allocation decision. In cases where it is economically advisable to allocate further resources despite negative feedback, any psychological causal mechanism volunteered by the psychologist is superfluous — a simple economic explanation would be equally predictive and more parsimonious. This is not to suggest that a manager cannot feel psychologically committed to a project when the project is successful. Rather, the notion of commitment under such circumstances may add little or nothing to our understanding of behavior. Therefore, any hope the psychologist holds of shedding light on "sunk cost" decision-making must come from examining situations where the accountant would maintain that "good money is being thrown after bad."

Unfortunately, previous "sunk cost" research by psychologists has

not examined decision-making situations in which commitment of further resources is explicitly economically inadvisable. Instead, psychological researchers have examined decisions in which sunk costs and negative financial feedback are explicit, but the revenue picture is not (e.g., Staw & Ross, 1978). The economic rationality of further resource commitment is left indeterminable for the decision-maker. In some cases (e.g., Brockner, Shaw, and Rubin, 1979), the expected rate-of-return for further financial commitment even can be shown with a few assumptions to be increasing and (after a certain amount of investment) financially advisable, despite the claim that further resource commitment under the circumstances is psychologically rather than economically motivated.

Altogether, it is not clear that psychologists have examined investment decisions where further commitment of resources amounts to "throwing good money after bad." Yet, only through examining decisions in situations where further resource commitment is demonstrably irrational can the psychologist hope to add to the explanatory power of economic accounts of resource-allocation decision-making.

TARR: A Tool for Assessing Investment Rationality

Return-on-investment decisions have three dimensions: expenses, revenues, and time. Time enters the picture in terms of the opportunity costs of committing capital. For instance, one would expect $5000 "sunk" into a project for two years to yield a greater return than the same amount committed for one year. The second year of being "sunk" represents foregoing other investment opportunities which would yield additional earnings.

Accountants and economists have often assumed that managers are interested in the time dimensions only in so far as it influences cost and revenue calculations, since profit is the goal of resource-allocation decisions, and profit is a function of revenue-to-cost ratios. Consequently, accountants have developed such discounting procedures as the Time-Adjusted Rate-of-Return to encorporate time in the evaluation of costs and revenues for investment opportunities. The Time-Adjusted Rate of Return (or TARR) is derived by adjusting the actual costs and revenues written into a budget to reflect the time value of money, and then calculating a rate of return-on-investment for all costs and revenues discounted to the present. The resulting rate of return is the effective yield of a project, or the interest rate for borrowing money at which the project would exactly break even.[1] (This measure is also known as the Internal Rate of Return.)

It would be foolish to dispute the usefullness of procedures like TARR for objectively assessing the advisability of an investment opportunity. As a comment on how decision should be made, the TARR represents an important point of departure for assessing how they are made. This paper will develop a richer framework of investment decisions — the Life-Cycle Model — into which the accountant's prescription for handling sunk-cost situations can be explored.

The Life-Cycle Model has two dimensions: types of decisions, and stages within decisions. The Life-Cycle Model follows the lead of the Time-Adjusted Rate-of-Return in encorporating time as a consideration. The Life-Cycle Model uses the TARR to examine successive resource-commitment decisions over the life of a project. Previous researchers (e.g., Terborgh, 1958) have, of course, examined and discussed the interplay and influence of different facets of resource-allocation decisions. Hackney (1965), for instance, modelled changes in overall return rates for a project, over the life of the project, as influenced by such factors as cost over- and under-runs. However, the Life-Cycle Model provides two important benefits over previous work in this area. First, it allows a clear specification of when a financial setback is likely to constitute a rational reason to terminate or abandon a project. For future psychological research, this will provide a true baseline from which to explore more precisely than previously when and why people really do throw good money after bad. More to the point, the Life-Cycle Model clearly reveals the psychologist's fallacy: continuing a project in the face of a financial setback is not always irrational (it depends upon the stage in the project, and the magnitude of the financial setback). Second, the Life-Cycle Model provides an insight into the manager's preoccupation with a project's financial past. The Life-Cycle Model demonstrates how a project's financial past can be used heuristically to understand the project's future.

Project Life-Cycles

The following discussion of the Life-Cycle Model considers four types of project life-cycles, corresponding to the four examples with which this paper began. These four types are derived from examining the changes

in the TARR for the allocation of further resources to a project, throughout the courses of different projects. (To be fully accurate, rate of return figures should encorporate dollar value estimates for corporate image cultivation, influence on reputation, and other "intangible" costs and revenues, as well as some adjustment for appreciation or increased liquidation value of a project.) The projected TARR for a project is of interest precisely because this is one measure recommended accountants, by which to judge whether resources should be committed to a project. For instance, if competing investment opportunities offer a TARR of 20%, a TARR of 21% for commitment of further resources to a partially-completed project would be worth putting money into; a TARR of 19% would not. Anytime the TARR for a project is less than what is available from competing investment alternatives, commitment of resources would be financially inadvisable.

Typically, the Time-Adjusted Rate-of-Return might be used to choose among competing investment opportunities before any of the opportunities have been invested in. In practice, the Time-Adjusted Rate-of-Return would be one of several measures used; any one measure alone has limitations. For instance, TARR compares return rates, rather than total dollars returned. TARR therefore may be misleading if comparing two investment opportunities with cost streams that are quite different in magnitude. The following discussion draws on TARR because of its intuitive appeal — similar measures (such as Net Present Value) would lead to the same conclusions.

TARR calculations can also be used to decide whether to continue a project which has incurred a financial setback. Negative financial feedback (either cost-overrun or revenue-shortfall) will diminish a project's overall projected rate of return. This is irrelevant

financially, though it could well make a difference to a manager. What matters financially, as the accountant will be quick to note, is the rate of return (as measured by TARR, for instance) for remaining resource commitments required by a project. TARR calculations can be used to assess whether this rate of return for remaining costs is better than competing investment alternatives (either new or partially completed.)

insert Table 1 about here

Table 1 presents four different types of sample project budgets. Each sample budget is represented by a five-year cost stream, and a five-year revenue stream. The format for presenting cost and revenue streams is taken from Horngren (1982); to simplify the examples, costs are assumed to be taken at the beginning of each year, and revenues realized at the end of each year. For each of the sample project budgets presented, the Time-Adjusted Rate of Return for remaining expenditures in the project is also shown both for the beginning of the project, and at the end of Year 4. This highlights the changes in TARR values over the course a project budget, as influenced by different cost and revenue streams, and leads to four types of rate-of-return life-cycles:

Type I: Project A in Table 1 shows a project budget in which TARR is constant (at 20% return) throughout the entire life-cycle of the project. The investor mentioned at the beginning of the paper, with her money in a long-term savings account, provides an example of a Type 1 rate-of-return life-cycle. Notice that there are no sunk costs in such an investment opportunity. At no point would halting the "project" occasion a financial loss for the investor. Also notice that the TARR for such a project is always the same at all points in the project's

life-cycle.

Type II: continuous variable TARR. Projects B and C in Table 1 show project budgets in which the TARR for remaining expenditures varies over the life-cycle of the project. Specifically, there are costs at the beginning of the projects (these may be start-up costs or equipment expenditures) which are not expected to generate immediate revenue These are sunk costs in the traditional sense. The construction company building a subdivision provides an example of this, where materials and machines must be purchased, designs drawn up, and workers trained, before any income is realized. Because revenues are not accruing when these costs are realized (or perhaps, revenues are not being generated at the rate of expenditures,) the TARR must be greater after these costs than before, in order that total revenues exceed total costs for the entire project. Only if the TARR increases after costs that don't generate immediate revenue have been realized can the rate of return for the entire project reach the rate projected at the project's inception.

Project C in Table 1 illustrates this point. A substantial proportion of the project's total costs ($200) are taken early in the project, while revenues are evenly distributed throughout. Consequently, while the rate of return for the entire project is only 20%, by the beginning of Year 4 the rate of return for remaining expenditures ($245 in Year 4 and $220 in Year 5) is 316%.

Type III: discontinuous variable TARR. Project D in Table 1 shows a special case of the continuous variable TARR life-cycle, where virtually no revenue accrues, until the very end of the project life-cycle, at which point all benefits accrue. Examples of this would include the building of a bridge, or waiting "on hold" on the telephone to make airplane reservations.

Table 1

Four Sample Project Budgets

	Project A		Project B		Project C		Project D	
TIME	Costs	Revenues	Costs	Revenues	Costs	Revenues	Costs	Revenues
Year 1	$ 833	$ 1000	$ 1200	$ 1000	$ 2300	$ 1000	$ 1540	0
Year 2	833	1000	800	1000	300	1000	200	0
Year 3	833	1000	720	1000	270	1000	180	0
Year 4	833	1000	650	1000	245	1000	150	0
Year 5	833	1000	590	1000	220	1000	120	$ 5000

Time-Adjusted Rate of Return (for remaining expenditures)				
at Year 1	20%	20%	20%	20%
at Year 5	20%	70%	355%	4067%

One can imagine a family of curves of Type II, ranging from Type I to Type III, depending upon (i) the proportion of costs (compared to the total budget for the project) realized before revenues begin accruing faster than costs, and (ii) the ratio of revenues to costs when revenues are accruing faster than costs. It bears mentioning that TARR values might meander up and down through the life-cycle of a project. For instance, in building missiles, some assembled components might command a healthy profit for the maker. However, once fitted and installed in the missile, they become effectively valueless until the entire missile is completed, at which point an even healthier profit is realized. Rate of return thus reaches a potential local maximum once when components are completed but not yet physically "committed" to final assembly, and then reaches yet a higher maximum again when the missile is completely assembled. In terms of TARR analysis, this means that it might make sense to commit some amount of resources to partial completion of a project which gets the project to a local maximum in the project's life-cycle, without committing enough resources to complete the project. (This should become apparent later, when the impact of negative financial feedback on TARR calculations for remaining expenditures is discussed in further detail.)

Type IV: TARR-inappropriate projects. The life-cycle for this type of project may look like any member of the Type II family, except that for this type of project, TARR calculations are inappropriate. There might be two reasons for this. First, some projects are undertaken not because they are cost-effective, but because they are effective. Period. For example, TARR calculations may be unnecessary to understanding the funding of a war, or research on some acute disease crisis, or the slum renewal project noted earlier. Statements like, "HANG the expense," or

"Whatever it costs, it's worth it," are traditionally associated with such projects, whether accurately or not. Another way of saying this is to note that decisions concerning such projects appear to be dominated by outcomes. It may be worth just about anything to avoid losing a war if it means being sold into slavery. There are limits to this perspective, of course. It is not thought to be worth selling oneself into slavery to one group to gain their protection from another. But within limits, the apparent extreme value of anticipated revenues makes formal TARR calculations unnecessary.

A second possibility for the inappropriateness of TARR calculations arises when the benefits of a project are not easily specificable, or not easily quantifiable. This would render the calculations of TARR difficult, and may lead to the appearance or illusion that the outcome picture renders TARR calculations unnecessary, as noted above. Behaviorally, a manager may even prefer to keep the outcome picture ambiguous so that his or her performance cannot so easily be monitored or evaluated.

This examination of TARR values over the course of different projects immediately presents two possibilities where commitment of further financial resources would be rational even in the face of negative feedback (such as cost-overruns or revenue-short-falls). First, Type IV life-cycles (where projects are dominated by outcomes) constitute situations where financial negative feedback may have no bearing on whether a project should be continued or not. When an entire nation is dying from the plague, learning that research to find the cure is going to be more costly than originally projected does not render continuation of the research economically inadvisable. On the other hand, managers interested in protecting their turf may find this reasoning a convenient smokescreen behind which to hide their failures. Second, if the environment changes

during the course of a project, the relevant comparison value for TARR may change. If so, even if a financial setback decreases TARR, the TARR for the remainder of the project nevertheless may exceed the rate-of-return offered by competing investment opportunities, so that further commitment of resources to the project would be economically advisable. Note that either of these points could hold even if the financial setback were encountered at the beginning of a project, even before any money had been spent.

Stages of a Project.

The existence of variable TARR's through the life-cycle of projects raises the specter of stages of a project during which the TARR for the remainder of the project is increasing, decreasing, or constant, and where the TARR is greater or less than the return rate projected for the entire project before the project was begun. There are four stages in the life-cycle of a project:

Stage A: No significant sunk costs have yet accrued. Time has been spent perhaps on "blue sky" types of research, which may be usefully applied to other projects. Personnel have been gathered or hired, or even trained in project-nonspecific ways, and can be diverted to other projects if this one is terminated. Materials may have been purchased or ordered, but not yet utilized in a way which prevents their return to the supplier, or diversion to some other project.

Stage B: Costs are being realized faster than revenues are accruing. Workers are spending time on this particular project, or are being trained for aspects of this particular project which would not readily transfer to something else. Materials have been channeled into this project. But revenues are not accruing as fast as costs are being

realized. At any point during this stage of the project, the TARR for the remainder of the project will be increasing, and greater than the return rate projected for the entire project before it began.

Stage C: Revenues are being realized faster than further costs. In the manufacturing realm, this might be when production is going full swing. The only costs now are the variable costs per unit produced (such as labor and raw materials). In the traditional view, this is the period of the project life-cycle when sunk costs are being recovered. Unlike Stage B, the TARR for the remainder of the project may be constant during this period if there are no economies of scale to be realized during the latter stages of production. If there are such economies, the TARR may continue to increase (as it does for Projects B and C in Table 1) through this stage. In either case, the TARR for the remainder of the project will be greater throughout this stage than the return rate originally projected for the entire project, just as it was in Stage B.

Stage D: Revenues for the entire project now exceed total costs. At this point, a project may be deemed completed and halted, such as in the case of a construction project when a building is finished and sold. Or TARR may become constant or continue to increase, depending on whether there are additional economies to be realized. In the manufacturing realm, this would correspond to that time in a project when all start-up costs have been recovered, and the production item has become one of the firm's "cash cows."

APPLICATION: The Impact of Negative Feedback

Negative financial feedback to a project can be of two kinds; cost-overruns or revenue-shortfalls. Cost-overruns and revenue-shortfalls occur as discrepancies between experienced costs and revenues, and the costs and revenues planned in the budget for a project. Negative feedback

can occur for any of the four types of projects. However, the variable-TARR projects (Types II and III) have different stages, and negative feedback will have a range of different implications for decision-making, depending upon the stage in the project during which the feedback is received. The limits of this range of implications are found in the Type I and Type IV projects.

In the case of Type I (constant TARR) projects, negative feedback has the same effect throughout the life-cycle of the project. Negative feedback lowers the calculated TARR's. If the TARR falls below the acceptable criterion value (which represents what is available elsewhere), it would be irrational to stay in the project and unlikely that a manager would stay unless the manager was inattentive, or the cost of changing was great (as with savings certificates that require "substantial penalties for early withdrawl.") In the other most extreme case, Type IV projects, TARR analysis is inappropriate because one would finish the project regardless of feedback. Negative financial feedback could have an impact on decision-making for a Type IV project if the feedback caused the manager to reconceive the project as a Type II or III project.

The Type II (variable TARR) project begins (Stage A) as if it is a Type I project. In subsequent stages, costs flow out faster than revenues flow in. (If revenues are all deferred to the end of the project, the project is a Type III project.) To determine the magnitude of negative feedback that can be absorbed in a variable-TARR project, an analysis crossed four levels of how early in a project costs are spent against four levels of how late the revenues are realized. The four cost levels were: (1) all costs at the beginning of the project, (2) most costs early, (3) costs almost evenly distributed over time, and (4) costs

evenly distributed over time. The four levels of revenues were: (1) revenues evenly distributed over time, (2) revenues distributed almost evenly but with slightly more at the end of the project, (3) revenues skewed strongly toward the end of the project, and finally (4) all the revenues realized at the end of the project.

insert Table 2 about here

Table 2 reports the results of the analysis, showing the magnitude of negative feedback that can be absorbed by a project, if the project is to yield a 20% time adjusted rate-of-return for the remaining costs in the project. In Table 2, the magnitude of negative feedback which could be absorbed is expressed as a factor — the maximum number by which subsequent costs could be multiplied, or subsequent revenues divided, and the 20% TARR maintained for the remainder of the project. (For example, in cell 2 of row 2 of Table 2, if at the beginning of year 3 all subsequent costs were multiplied by 4.11, or all subsequent revenues divided by 4.11, the project would still have a 20% TARR for remaining costs taken in the project.) This factor is shown for all combinations of the four types of cost streams and four types of revenue streams, at the beginning of each year of the project budget.

This analysis shows that if there is a period in a project's budget (Stage B) in which costs are to be taken faster than revenues are to be realized, it will be possible during subsequent periods for the project to absorb negative feedback and still obtain its initial intended return-on-investment for the remaining costs taken in the project. We might call the allowable discrepancy between intended and realized costs and revenues post-Stage-B in a project the region of rationality for the project. This region of rationality bounds the magnitude of negative

- Table 2.

TARR Factors for Projects with Various Costs and Revenues Streams

	REVENUES*			
	Constant	Slowly Increasing	Quickly Increasing	All at the Project's End
COSTS*	$ 1000 1000 1000 1000 1000	$ 720 865 1035 1245 1475	$ 440 660 990 1490 2175	(Type III) $ 7442
All Up Front				
$ 2988				
1	833	924	1014	1155
1	833	1021	1234	1704
1	833	1125	1501	2819
1	833	1229	1812	6201
Mostly Up Front				
$ 2306				
300	3.15	3.49	3.83	4.36
270	3.36	4.11	4.97	6.87
245	3.57	4.81	6.42	12.06
220	3.79	5.59	8.24	28.19
Somewhat Up Front				
$ 1164				
800	1.18	1.31	1.44	1.64
720	1.26	1.54	1.87	2.58
650	1.33	1.81	2.41	4.53
590	1.41	2.08	3.07	10.51
Constant	(Type I)			
$ 833				
833	1.00	1.11	1.22	1.39
833	1.00	1.22	1.48	2.04
833	1.00	1.35	1.80	3.38
833	1.00	1.48	2.18	7.44

*All costs, revenues, and TARR factors are shown for a 5-year project life-cycle, as in Figure 1. TARR factors are the numbers by which remaining costs could be multiplied or remaining revenues divided, while maintaining a TARR of 20% for the remainder of the project.

feedback which rationally can be absorbed if a project is to continue. The contents of Table 2 demonstrate that the later in a project revenues are realized, or the earlier in a project costs are taken, the larger will be this region of rationality in the later stages of the project. The region of rationality is non-existent with a Type I project, increasing in size from Type II through Type III projects (as anticipated revenues are realized later in a project), and largest in Type IV projects (where virtually any negative feedback can be rationally absorbed).

This analysis shows the conditions under which it is quite rational to throw good money after bad: the more a manager has invested in a project early on, or the larger and later the payoffs, the wiser it is to stay in a project. Thus, the Life-Cycle Model suggests that it should not be surprising that in many cases managers persist in a course of action even in the face of negative feedback. What may need explanation is why a manager might not persist, when his or her project is well within the region of rationality? The answer may lie in the manager's framing of a project as a whole — a series of investments which began in the past, rather than a series of remaining investments which begin now. It may be rational to finish a project even in the face of substantial negative feedback. However, in evaluating a manager, it may also be reasonable for the organization to hold the manager accountable for the total project, which would return a loss. Finishing the project efficiently may not offset the project's overall sub-par performance, and may imply that the manager is ignoring or unaware of the project's shortcomings.

This trade-off can lead to an interesting dilemma for the manager. Even if a project is destined to lose money overall, there may be a point

in the project's life-cycle after which the TARR for further funding will be greater than what is offered by competing investment opportunities. Therefore, if the manager can get the project to that point in the project's life-cycle, his or her performance will look extremely good for the remainder of the project. This may lead the manager to commit further resources, in order to get a project to the point where the manager is bound to look good for the balance of the project. What is irrational for the organization may be rational for the manager. This would happen if the organization rewards turning a loss into a success, rather than holding the manager accountable for the total project.

This tradeoff of success over the remainder of a project against failure over the total project raises new opportunities for research on project selection. If two projects have the same expected TARR, which is preferred: one with smaller or larger proportion of costs early in the project? A smaller proportion of the costs up front means it will be more likely for a project to be abandoned if negative financial feedback is encountered, since the region of rationality will be smaller. On the other hand, a larger proportion of costs early in the project helps insure completion of a project, even in the face of a financial setback, since the region of rationality will be large. Options and strategies of this sort may be salient to politicians and managers, but have not yet been the subject of systematic investigation.

The Life-Cycle Model also suggests that further research on cognitive biases of decision-makers may add to our understanding of resource-commitment decisions. Specifically, managers may have preferences for revenue-shortfalls over cost-overruns within the region of rationality; revenue-shortfalls may be seen as gains foregone, but cost-overruns felt as losses out of pocket. Kahneman and Tversky (1979) have proposed that

utilities for gains are treated differently than losses; managers are risk-averse toward gains, but risk-prone toward losses. Further, as noted earlier, managers may have a bias to construe their failures as Type IV projects, whereby they can contend that the success or failure of the project is beyond any numerical assessment.

In summary, the Life-Cycle Model suggests two major directions for research on resource-allocation decisions. These two directions correspond to the two types of departures from the Model we might expect to see in resource-allocation decisions. First, the behavior of decision-makers may depart from the Model because of involuntary cognitive biases. Decision-makers simply may not be able to see the world the way the Model suggests that the world should be seen. Second, the behavior of decision-makers may depart from the Model because of deliberate indifference to the Model's prescriptions. This may occur, for instance, when psychological commitment overrides any sense of financial rationality, or when repeated receipt of alterations to a project budget cause the decision-maker to lose faith in the budget as a reliable input to the decision-making process. Both of these directions for research certainly invite the psychologist both to expand and clarify his contributions to our understanding of why a project manager might commit further resources to a project in the face of negative feedback.

Conclusions: Project Life-Cycles and Resource-Allocation Decisions

The Life-Cycle Model of resource-allocation decisions provides a richer framework in which to view the accountant's prescription that resource-commitment decisions should be made only by comparing future revenues to future costs. The Life-Cycle Model does not dispute the accountant's claim. Rather, the Life-Cycle Model notes the heuristic value of:

— different types of cost and revenue life-cycles, and

— different stages in cost and revenue life-cycles,

in arriving at the decision of whether to commit further resources to a partially-completed project.

The Life-Cycle Model is not at all in conflict with the accountant's prescription. What the Life-Cycle Model does provide is an understanding of what the accountant's "future revenues to future costs" measures (like TARR) are likely to be at any point in a business venture, and, perhaps more importantly, where (higher or lower) those measures are likely to be going. The Life-Cycle Model uses the accountant's prescription to capture the systematic predictability of costs-to-revenues measures during the course of a business venture.

The region of rationality established by the Life-Cycle Model serves as a baseline from which to pursue new research. Exploration should begin on the possibility of behaviors genuinely outside the bounds of rationality. There might be personal, organizational, or other non-financial reasons for such behaviors, as suggested by previous psychological research on commitment. Research also needs to focus on managerial decision-making processes and propensities within the region of rationality. Within the region of rationality, managers' perceptions of changes in revenues-

to-costs measures over time, and in reaction to cost-overruns and revenue-shortfalls, need to be examined. Further, the behavior of these measures reveals (perhaps) a dilemma for the manager in managing a project. Accolades may accrue for turning losses into gains, but punishments may await projects that lose money overall. Similarly, while managers may prefer revenue-shortfalls after a project is under way, budgets with large "up-front" costs may be preferred before a project is underway, if the manager is committed to seeing the project finished.

Thus, the Life-Cycle Model — with its types and stages — lays the groundwork for some important insights into the managerial investment decision process. It does not redefine the accountant's prescription for investment rationality, but instead extends that rationality to a point of predictive utility. It provides a framework into which the psychologist can cast his contribution, and in which the practicing manager can better understand the meaning of his intuitions. In the end, it is a model that should help all three (the accountant, the psychologist, and the practicing manager) do better in their attempts to make dollars and sense out of sunk costs.

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Footnotes

[1]The calculations for Time-Adjusted Rates-of-Return are compound interest calculations. Imagine that you have $1 today. There is some amount of money you would be willing to accept two years from now in exchange for foregoing the use of your $1 for the intervening two years. If you knew you wanted to make a 20% annual return on your $1 for the two years, the amount you should receive at the end of two years would be given by ($1)x(1.20)x(1.20)=$1.44 . The Time-Adjusted Rate-of-Return is calculated simply by working this process backwards. If someone offered you $2 two years in the future in exchange for the use of your $1 starting today for two years, you would know that ($1)x(R)x(R)=$2, where R refers to the annual rate of return received for the use of your $1 for the two years. Solving for R, (R)x(R)=2, or R=1.41 . Therefore, if someone offered you $2 two years from now for the use of your $1 for two years, you would be looking at a Time-Adjusted Rate-of-Return of 41% on your investment over the two years. Notice that this figure is equivalent to the discounting rate which would put the Net Present Value of the investment at zero. For more complex cost and revenue streams, the calculations are more complicated. For instance, for the column 2 revenue stream and row 2 cost stream in Table 2, the Time-Adjusted Rate-of-Return would be calculated from the following equation:

$$2306(R^5)+300(R^4)+270(R^3)+245(R^2)+220(R) = 720(R^4)+865(R^3)+1035(R^2)+1245(R)+1475$$

For a more detailed explanation of these calculations, the reader is urged to consult an accounting text, such as Horngren (1982).

THE ARCHITECTURE OF A COURSE OF ACTION: CASE STUDIES AND THEIR IMPLICATIONS

Edward J. Conlon
Gerrit Wolf

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Send Correspondence to: Edward J. Conlon
Department of Management Sciences
The University of Iowa
Iowa City, Iowa 52242
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The Architecture of a Course of Action: Case Studies and Their Implications

Edward J. Conlon
University of Iowa

Gerrit Wolf
University of Arizona

Abstract

This paper examines the course of action concept (Staw, 1981) in terms of the interdependencies created in a sequence of decisions. Case studies of courses of action, collected using focus groups with managers, are used to develop a typology of interdependencies. Theoretical and empirical implications, especially for future escalation research, are discussed.

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Staw, in his research on escalation (e.g., Staw, 1976; Staw and Fox, 1977) and in a capstone review (Staw, 1981) has called attention to a variety of behavioral issues regarding decision making in situations requiring a sequence or series of decisions. These particular sequences are referred to as courses of action. The sequential aspect of decisions in a course of action implies that these decisions are, in some fashion linked. This linkage, which we refer to as an interdependency, is arguably a crucial aspect of courses of action and is proposed here as the essential feature of their architecture.

An Exemplar of Interdependency

Staw (1981) provides several real-life exemplars of courses of action. One of these is Chicago's "Deep Tunnel" project which proposed to dig 131 miles of shafts, reservoirs and pumping stations to solve some severe drainage problems. When only 10% into the project, it became clear that the total cost would be much greater than anticipated and, perhaps, would not be justified by the benefits. A second example is a stock holder who buys stock at $50/share and its price falls to $20/share. He then buys more and it falls again. He is then faced with another decision to buy, hold or sell. Each project is subject to very different types of interdependency and their contrast can be used to illustrate the interdependency concept.

In Deep Tunnel, the money spent on the 10% of the project completed is a sunk cost, but it is not a loss. It would be a loss only if the project was terminated and all of the completed work scrapped or sold for its salvage value. If the project was completed, the loss or gain due that 10% would depend on the economic performance of the overall project, the point being that the 10% of the project completed, although it is a sunk cost, is not irrelevant to determining the overall performance of the project if completed. Stated a bit differently, the 10% completed is an asset with some

impact on future returns, meaning that in order to get the anticipated return at the point 10% has been invested, one need only invest an additional 90% of the total cost. From an economic standpoint, that 10% is hardly worthless and greatly impacts the present value of the remainder of the project.[1] There is, therefore, an economic interdependency between the 10% (asset) and the remaining 90%. Without tha 10%, the present value of the remaining 90% would typically be much lower.

No economic interdependency exists in the stock example. The purchase of $50/share stock has no implications for the return that would accrue from stocks purchased at $20/share (or at any price) at a later point in time. In a sense, each share of stock purchased is of itself a "project" with its unique cost and return function. Although the treatment of stocks as a portfolio can create financial interdependencies similar to those in the Deep Tunnel case, such a treatment is purely discretionary and not predetermined by the project type. Note also, that portions of a stock portfolio can always be sold, whereas such options may not be available in a construction project.

The major issue is that the particular type of interdependency(ies) linking decisions in courses of action is likely to have an important influence on the decision making of the allocator. To the extent that financial interdependencies exist, it can be shown that for many classes of projects allocating additional funds is not "throwing good money after bad" but is, in fact, financially rational (Northcraft, Wolf and Conlon, 1982). For financially interdependent decisions, a variety of normative models exist which, if the decision makers adhere to them, makes explaining their allocations fairly simple. The behaviorally interesting phenomena are those

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[1] A quantitative proof is available, on request, from the authors.

situations when (1) a financially normative model exists and is not adhered to or (2) non-financial forms of interdependencies appear to mediate the decision process, one of these being the "portfolio thinking" implied by Staw's investor example.

Interdependencies in Prior Allocation Research

Prior studies of allocation have not explicitly manipulated the interdependencies, but the two cases that have been used in these studies, "The A & S Financial Case" (Staw, 1976; Staw and Fox, 1977) and "The World Bank Case" (Staw and Ross, 1978; Conlon and Wolf, 1980) appear to differ in the type of interdependency created. In the A & S case, subjects allocated funds to the R & D department of a firm with the goal of improving the financial performance of the firm. They were later given data showing the overall performance of the firm in the five years following the allocation. In the setback condition, no improvement occurred, and subjects were asked to make a future allocation of some amount. In the World Bank case, subjects made an allocation to build an industrial project in a developing nation (e.g., a hydroelectric plant) and were later told that the project is only one-half complete for a particular reason (e.g., heavy rain, corruption, etc.) and were asked to allocate again.

The differences in interdependencies are obvious. In the A & S case, the relationship between the first allocation and the second allocation is totally ambiguous. For example, one can assume that the first allocation has resulted in the development of several new products and that all that is needed are funds for additional engineering work before performance will be turned around (e.g., the glass is nearly full), or one can assume that the earlier funds were totally ineffectual (e.g., the glass is empty). The wisdom of future funding clearly depends on the relationship assumed between past and future

funding. In the World Bank case, the interdependency is far more explicit. The decision maker knows that half of the project is completed and the reason for the setback. Conlon and Wolf (1980) show how a mathematical calculation can be used to determine the appropriate future funding in this case and provide evidence for the use of that calculation by some subjects.

It should be clear that the type of interdependency created in these cases is crucial to evaluating the internal and external validity of the studies which utilize them. In the A & S case, for which an escalation tendency has been demonstrated, how important is the assumption made by the allocator regarding the efficacy of the first allocation? If subjects were given explicit reasons for the failure of the funds to produce results (e.g., incompetent scientists and engineers; placing all the funds on a single idea that did not work, etc.), would the same results accrue? Escalation has never been demonstrated using the World Bank study. One can only speculate, but perhaps that failure is due, in part, to the interdependencies produced in the case.

The above observations highlight the need for developing experimental case stimuli which explicitly mirror the architecture of courses f action as they occur in organizations. The next section of this paper reports on a set of cases collected from working managers using focus groups interview techniques. These interviews, in which managers described actual cases of decisions involving sunk costs, are used to identify and illustrate the forms of interdependencies that occur in organizational courses of action.

MANAGERIAL DESCRIPTIONS OF SUNK COST EXPERIENCES

Sample

In an attempt to learn more about the development and treatment of sunk costs in allocation contexts involving courses of action, the authors

conducted focus group interviews with managers from a convenience sample of nine corporations. This sample included four corporations devoted essentially to the manufacturing, marketing and delivery of hard goods, four corporations devoted to the marketing and delivering of essential non-financial services and one financial service organization. All of these were private sector firms. With the exception of the financial corporation and one of the manufacturing firms, interviews were held with small groups of top level managers who were deemed by our various contacts in these organizations to be or to have been centrally involved in financial allocation decisions. In the financial corporation, two focus groups interviews were held, one with corporate controllers and the other with credit managers. In one manufacturing firm, one-on-one interviews were held with three senior executives regarding a particular product which was removed from the market partly because of sunk costs. In all cases, interviews were conducted at corporate headquarters with groups where at least one member was a senior level (i.e., Vice Presidential or above) executive. Group sizes varied from two to six.

The format used for the interviews was extremely non-directive. There were basically three phases to each interview. The first phase was devoted to having the managers define "sunk costs" and talk about how they are perceived and treated. The second phase asked managers to recall cases of decisions that involved sunk costs. The last phase asked the interviewers to summarize those factors which may have caused an allocator to consider sunk costs when making allocations.

Tabulation of the Cases

Audio tapes were used to record the focus group interviews. The discussions fluctuated between general observations about decision making and

descriptions of specific case episodes. These case episodes were easy to identify on the tapes because they were generally given as responses to the investigators' requests for specific examples of sunk cost decisions.

A total of 16 cases were identified. The investigators, for purposes of this tabulation, did not attempt to evaluate whether each case was a bona fide instance of decision making with sunk costs, but left that judgement to the interviewees who presented the case. These cases are tabulated in Table 1 and are subdivided by allocations into four basic types: Mergers and Acquisitions, New Products, New Plant, Equipment or Processes and, finally, Normal Operations.

Mergers and Acquisitions are attempts by a firm to secure a new operating company. They are acquisitions of ongoing businesses which may or may not be similar to the acquiring firm's ongoing business. New Products are allocations made to cover the costs of bringing new products or services to market and, more specifically, may cover development costs or costs of establishing new markets. New Plant, Equipment or Processes are allocations to acquire new capital or establishing new processes in order to continue or become more effective in the ongoing business. Normal Operations are expenditures made to cover everyday costs.

The cases are described according to the type of business in which the case originated, a brief description of the allocation, a brief description of the setback and why it occured and the current disposition of the product or project for which the allocation was made. These are largely self explanatory.

Types of Interdependencies

Cases were reviewed for the type of interdependency implied; that is, in what ways were the initial decision and subsequent decisions to continue

interrelated. Five forms of interdependency were determined: Financial considerations, environment and market considerations, technological considerations, resource utilization considerations, corporate strategy (strategic) considerations and personal considerations.

The most frequent form of interdependency was financial. Even failures can create assets and the existence of ready assets may affect subsequent decisions. An example of this from our cases was a firm that because it had a full inventory of parts devoted to old engines, delayed the replacement of the old engines with new, more efficient ones even though the cost-effectiveness of the delay could be questioned. The major issue is that large, immediate write-offs can have an important impact on the confidence that investors, suppliers and clients may hold toward a firm.

A second type of interdependence concerns environment and market. Resource allocations can sometimes constitute commitments to constituencies external to a firm. One firm gave the example of two unprofitable plants, one located in a major urban center, the other in a semi-rural community. The firm closed down its urban facility, but reallocated its rural facility to a more profitable operating division. The reason was that in the small town, the firm was a major employer and had a felt commitment to the community. A somewhat different example was a firm's retaining certain unprofitable product lines because of either believed interdependencies with other profitable products (e.g., the ability to sell a complete system) or felt prior commitments to clients that they would continue to carry a product.

A third type of interdependency concerns technological considerations. One firm gave an example of resurrecting and modifying an old prototype in bidding on new business to fit the needs of new potential clients. The reasons for this were two-fold. First, the development costs associated with

the new bid would probably be lower, but it was also the case that the felt risk of the bidding firm was also less. Stated a bit differently, the bidders felt that because all of the necessary steps through producing a prototype had already been taken, many of the uncertainties involved in product pricing, especially those involving start-up costs, had already been eliminated. In a way, these are really "sunk benefits". We have labeled such considerations technological, because they involve the impact of prior allocations, even failures, on learning how to do things and the contingencies that ultimately affect success and/or failure. Generally speaking, the more comlex the technology or process that is being dealt with, the more likely will be the sunk benefits of prior experience.

A fourth form of interdependency involved strategic resource utilization. These interdependencies would be most likely in contexts where state-of-the-art technologies create areas of special expertise which cannot easily be bought in the labor market. In such cases, a firm might continue a failing project and incur further costs just to have something interesting for key personnel to do before a new project is initiated. One firm gave the example of a project from which the management never expects to directly benefit that is periodically resurrected to keep strategically important teams of engineers and designers busy.

A fifth and extremely interesting interdependency involved corporate strategy. Strategy produces interdependency by (1) creating general themes, policy or plans that place particular allocations in some sequence of intended actions and (2) providing institutional support and justification for actions. The most obvious forms such strategies take are the long-term business plan and statement of corporate policy and objectives. In these forms, the jointly defined strategies of top management become externalized

and give the appearance of consensus on "where a company is going". Consequently, such plans are potentially powerful tools for justifying actions. In our cases, we saw an instance of corporate strategy, in part, justifying a five year loss in the branch office case, and strategy, in part, justifying the removal of a product whose per unit profit potential was greater than any other in the firm. The interesting aspect of this process is that the economic wisdom of a given strategy (i.e., compared to alternatives) is generally more difficult to objectively ascertain and verify than that of any single investment decision and, therefore, the use of a plan to justify a particular decision is not necessarily economically rational. Nonetheless, strategy appears to be an important force in determining the persistence of allocators in the face of successes or failures.

The sixth and final type of interdependence is personal. This type of interdependency has been the major focus of previous research and refers to individual beliefs that decisions are somehow linked with regard to their implications for the person. For example, an attempt to "recover" sunk costs by allocating additional funds may be motivated by self-justification or justification to others. Both of these are attempts to protect one's self-image or reputation, hence this concern for image becomes a personal factor linking two or more decisions. This factor was noted explicitly in one of our cases where a losing subsidiary was retained because of the corporate president's involvement in its acquisition. The decision to retain was, importantly, made against the loud protest of corporate comptrollers and strategists. The idea of ego protection was also noted in two other interviews.

In summary, the interviews served to identify and illustrate six ways in which decisions may be interdependent. These interdependencies illustrate the

complexity of the allocation decision and the importance of the decision making environment in determining the actual amount allocated.

Implications for Theory

The cases suggest a variety of ways in which decisions may take place in an interdependent sequence. We suggest that these interdependencies create what Staw has labeled "courses of action". The theme that has been advanced in the previous research on courses of action is the general concept of retrospective sensemaking or, more specifically, self-justification of past actions (Staw, 1981). The theme is conceptually appealing partially because its relationship to "rationalizing" views of man (Aronson, 1976) and "counter-normative" implications for allocation behavior. The problem with that perspective, as the cases suggest, is its narrowness. The cases provide ample evidence for an impact of past decisions on subsequent decisions that may lead to systematic deviations from economic rationality. The relative importance of rationalizing for explaining such deviations remains an empirical issue.

The cases, in their exposition of the wide ranging motives of allocators faced with sunk costs, suggest that allocations result from a variety of complex and, possibly, conflicting or interacting forces. The only central theme appears to be that each form of interdependency may attach a particular array of costs and benefits to any given alternative. For example, financial interdependencies carry implications, especially through accounting conventions, for the stated performance of the organization (department, subunit, etc.) following a particular choice. Similarly, the honoring (or ignoring) of external commitments would engender a set of costs and benefits such as enhancement (or depreciation) of reputation, intrinsic payoffs (for doing the "right" or "wrong" thing) and so forth. The most interesting issues involve how the interdependencies alone, in combination with others and in

interaction with the decision maker's environment affect allocations. For example, would external commitments to a community play the same role in a munificient as in a meager environment? Do cognitive consistency effects occur when escalation has clear economic costs (i.e., boundary conditions)? What is the relationship between groupthink as strategy formulation and adherence to particular projects? The pragmatic application of the escalation and commitment research clearly demands inquiry on such issues.

Implications for Research Design

The financial allocation cases used in previous escalation and commitment research appear to suffer from insufficient attention to the architecture of the courses of action they create. They tend to be sporadic in their provision of financial data and non-specific in their definition of interdependencies (e.g., was the time 1 R & D expenditure an "asset creator?"). We suspect that real world decision makers, when faced with such ambiguities, would either search for more information or treat the decision as very risky. At the very least, these ambiguities have probably added to the error variance and, in some cases, may endanger internal validity.

A systematic and externally valid program of research on allocations in courses of action should carefully design experimental materials that 1) are explicit about interdependencies and 2) treat interdependencies as independent variables. Because the cases used to elicit decision from allocators determine the architecture of courses of action, they should be designed with care.

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TABLE 1

A Tabulation of the Sunk Cost Cases

lergers and Acquisitions

Firm Type	Brief Description	Cause of Setback	Types of Interdependency
. Manufacturing-high technology	Overseas acquisition. Firm buys former overseas licensee	*Continual local labor problems *Weak Markets	*Financial *Strategic *Environmental
. Business Services	Bought a small firm in a new business thought compatible with existing resources.	*Could not compete using existing labor resources. *Regulatory environment changed.	*Financial *Resource utilization *Personal
. Financial Services	Bought a small bank.	*Underestimated start up costs, overpaid.	*Financial *Strategic

ew Products

Firm Type	Brief Description	Cause of Setback	Types of Interdependency
. Manufacturing high technology	Entered new emerging market with new products.	*Entered market 5 years too early, carrying costs not recouped.	*Financial *Strategic (mkt share)
. Manufacturing-Transportation	Designed new product for a certain large customer's use.	*Customer did not provide the anticipated market. Development costs not recouped.	*Financial *Technological *Resource Utilization
. Manufacturing	Designed, assembled and marketed a new product that would serve a new market for the firm.	*Encountered problems with the software for the prototype installation. Experienced excessive carrying costs due to marketing expenses with no established product.	*Financial

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TABLE 1
(Continued)

New Plant Equipment or Processes

	Firm Type	Brief Description	Cause of Setback	Types of Interdependency
1.	Manufacturing-heavy equipment	Plants devoted to certain unprofitable products needed to be closed.	*Weak markets	*Financial *Environment & Market
2.	Manufacturing-heavy equipment	Manufacturing equipment obsoleted prior to full depreciation.	*Rapid change in technology	*Financial
3.	Business Services	Firm opened branch office expecting to lose 5 million over 5 years.	*Competitive market with high start up costs.	*Financial *Strategic
4.	Transportation Services	Old engine parts obsoleted by more efficient new assemblys.	*Rapid technological change spurred on by fuel costs.	*Financial
5.	Transportation Services	Purchase 900,000 dollar piece of equipment to make engine repairs rather than make costly assembly replacement.	*High start up and carrying costs because of time lags due to (1) perfecting processes and (2) satisfying regulatory bodies.	*Financial
6.	Light Manufacturing	Obsoleted machines occasionally replaced.	*Technological change.	*Financial
7.	Light Manufacturing	Firm purchased a computer to eliminate a large, labor intensive sequence of tasks. Were dissatisfied with progress and price of implementation.	*Large carrying costs due to slow development, delivery and vendor monopoly.	*Financial

TABLE 1
(Continued)

Normal Operations

	Firm Type	Brief Description	Cause of Setback	Types of Interdependency
1.	Construction	Firm spent $25,000 preparing an invited bid on a very large project, then declined to bid.	*Last minute learning about unusual construction regulations--felt unfamiliar with the type of project.	*Financial
2.	Lodging	Firm spent a large amount on an advertising campaign built on double entendre that backfired.	*Did not anticipate adverse public response	*Financial
3.	Light Manufacturing	Firm periodically eliminates old product designs and introduces new one.	*Some designs may never recoup development costs.	*Financial

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THE IMPACT OF SETBACK CHARACTERISTICS ON SUBSEQUENT FINANCIAL ALLOCATIONS: ESCALATION AND WITHDRAWAL PROPENSITIES[1]

Marya L. Leatherwood, The University of Iowa
Edward J. Conlon, The University of Iowa

ABSTRACT

Using a sample of working managers and an allocation case modeled after actual land development decisions, a study was conducted to investigate the impact of setback foreseeability, likely persistence and diffusability of blame on subsequent allocations within the commitment/escalation paradigm. The results indicate the importance of diffusability of blame and persistence.

INTRODUCTION

This paper reports an empirical study which investigated the impact of different types of setbacks on managerial resource allocations. Although, as in most of the previous escalation and commitment studies, it was a laboratory simulation, the subjects were experienced practicing managers and the task was based on an actual investment scenario. Another methodological improvement was the use of multiple measures of allocation tendencies and commitment. Finally, the study yielded new and potentially important information about how the nature of a setback may affect subsequent allocation behavior.

Theoretical Rationale

Over the last seven years, a series of articles have appeared in the organizational behavior literature examining the impact of setbacks on subsequent resource allocation behavior (Staw, 1976; Staw and Fox, 1977; Staw and Ross, 1978; Fox and Staw, 1979; Conlon and Wolf, 1980). The primary tendency or "bias" demonstrated in these studies is escalation in situations where the decision maker feels responsible for the decision leading to the setback. Although two studies, both of which used the "World Bank Case" (Staw and Ross, 1978; Conlon and Wolf, 1980), instead of demonstrating the escalation tendency, produced the opposite tendency of withdrawal from the previously chosen course of action.

This study primarily addresses the impact that the nature of the setback might have on allocation tendencies. The impact of the type of setback on allocations was illustrated in an analysis by Staw and Ross (1978) on the four different setbacks used in their study, which were: (1) corruption of local officials, (2) a failure of the workers to respond to economic incentives, (3) illiteracy of the local workers or (4) rain. The study was designed so that subjects were provided information about the first three types of setback in advance of their decision. Each type of setback was associated with a particular region in which an industrial complex could be built. Depending on the region chosen, the subject was told that the project was not completed in the allowed budget because of the particular setback associated with that region. Because the subject had prior knowledge of the potential for these three setbacks, they were referred to, by Staw and Ross, as endogenous. Rain was the only exogenous setback, and was made so by not giving subjects prior information about the possibility of torrential rains in the region. Although the investigators were primarily interested in the endogenous-exogenous distinction, they performed a post hoc analysis on the allocations made following the three endogenous setbacks and found considerable variance in allocations resulting from each of the three types. There was no difference between the allocations made in the illiteracy (ie. endogenous) and the rain (ie. exogenous) condition. There were differences between rain and the other two endogenous causes with the allocation following the corruption setback being considerably lower than the allocation following the work incentives setback. Data on subjects' beliefs about the likelihood that the setback would persist, that financing would overcome the setback and that the government (of the Third World Country) was responsible for the setback indicated that the three endogenous setbacks varied systematically on a continuum of the liklihood that the setback might either continue or be overcome and that the mapping of this continuum onto allocations was essentially linear. The less likely the setback was to continue, the greater the allocation. There was not a clear relationship between the felt responsibility of the government and the allocation. Given the linearity of the first relationship one might expect that expressed confidence in the efficacy of further resources allocated could explain the differences among the allocations following each type of setback. The mean allocations following each type of setback further subdivided by expressed confidence (ie. a median split on a 7 point confidence scale) showed that even taking confidence into account there were substantial differences in the allocations made following the various setbacks. This result suggested that there may be additional factors associated with each setback that affect allocation tendencies.

In order to thoroughly understand the impact of setbacks on allocations it is necessary to develop

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theory at a more particularistic level of analysis than previous escalation and commitment studies. The theoretical rationale in prior studies utilized either cognitive dissonance or reactance theory to explain allocation phenomena. In the Staw and Ross study discussed above, reactance theory was used to explain the results obtained from the endogenous/exogenous partition (ie. in combination with other experimental factors). Reactance theory cannot, by itself, explain the variation in responses to the endogenous setbacks. Conlon and Wolf (1980), in a study based on the Staw and Ross design, provide a more micro level explanation for allocation tendencies by suggesting that allocations are mediated by a cognitive strategy which may differ among allocators depending on both individual and informational differences. The nature of the setback may direct the strategy used by the allocator. In the present study, the major focus was on the justification aspects of allocation strategies.

Hypotheses

In escalation and commitment studies, an allocator is faced with a situation where he/she has made a commitment to a project, but the project has apparently failed to meet expectations and he/she may not only be cognitively "trapped" by the need to self-justify the earlier allocation but also trapped by the need to justify his/her actions to "significant others" in the organization (e.g. to manage one's image). The need to justify is hypothesized to result from the amount of responsibility that the allocator feels for the setback, the greater the felt responsibility, the greater the motivation to justify. This study hypothesized that certain characteristics of setbacks, in particular (1) the likelihood that the setback would persist and (2) the availability of a third party on whom to place blame would affect allocations. The prior literature suggests that the allocator becomes entrapped when he/she feels responsible for a setback. Cognitive consistency theory has then been used to hypothesize continuing allocations as a function of the entrapment. It is important to note, however, that there are boundaries on the entrapment effect. Brockner, Rubin and Lang (1979) show that the degree of entrapment (escalation) is mediated by the anticipated costs and benefits of further commitment. In particular, as the expected costs are increased, entrapment becomes less likely and withdrawal may become the preferred way to "save face". Along those lines, we predicted that in a situation where an allocator feels responsible, there is no third party and the setback is likely to persist, the best option available to the allocator would be to withdraw from the project and take one's losses because, in the face of high risk (ie. high likelihood of additional losses), it may be the economically rational choice and the only arguably acceptable one in a for-profit, business environment. Escalation, the tendency to allocate more funds to a failing venture, would seem to make sense when blame is clearly inescapable for the allocator, but the setback is not likely to persist. In this case, the allocator is provided with the options of (1) being consistent, a valued aspect of managers (Ross and Staw, 1980) and (2) framing the initial setback as a necessary learning experience. Finally, when blame is attributable to a third party such as a corrupt official, a union or an incompetent architect, the allocator can best emphasize blame by withholding support either to punish the third party or to avoid additional involvement with a project made risky by the third party. The latter phenomenon differs from the first instance of withdrawal (ie. because of no other rational options) in that it is less dependent on the attributions of persistence of the setback, hence withdrawal for the purpose of diffusing blame should not depend on attributions of persistence.

The present study manipulated foreseeability of setback, type of setback and persistence of setback. Foreseeability refers to whether the decision maker had prior knowledge of the potential for the particular setback and was intended to create differential feelings of responsibility. Type refers to whether the setback was due to a technical (ie. non-third party) failure or a labor induced (ie. third-party) cause. Persistence refers to information provided regarding the likelihood that the particular setback could occur again. Our hypotheses, more formally stated, were as follows:

> (1) The tendency to continue the project will be greatest when the setback is foreseeable, the setback does not involve a third party and the setback is not likely to persist.
>
> (2) The tendency to withdraw will be greatest when the setback is foreseeable and either (a) the setback involves a third party or (b) the setback does not involve a third party but is expected to persist.

METHOD

Subjects

Sixty-eight business students enrolled in executive and part time MBA programs volunteered to participate in what was described as a decision making study. The participants ranged in age from 22 to 45 years (mean = 31.85), reported 1 to 19 years with their present organizations (mean = 6.69), and 3 months to 10 years in their current positions (mean = 2.92). Subjects reported spending an average of about 50% of their time on managerial functions.

Task

The basic task required subjects to analyze a case involving the funding of a land development project in one of several Southeastern cities. Case scenarios were constructed based upon information obtained from land development officers of two major corporations in the southeastern region of the United States and were designed to depict,

as closely as possible, the information available to administrators in those firms regarding prospective projects. The scenarios described the role of the subject as being a vice president in charge of projects for Conwood, Inc., a land development corporation, whose duties included selection of commercial projects, evaluation of projects over time and subsequent allocations to projects during the construction horizon. Each case included two project proformas (i.e. proposals) for office buildings to be located in Birmingham, Alabama and Jacksonville, Florida. The proformas included financial information on construction costs, land costs, finance rates, projected occupancy rates, leasing rates and anticipated annual cash flows in future years. Net present values (NPV) were computed for each project with the obtained values being comparable within the range of a few dollars. In addition, three specialists' reports were included for the Birmingham and Jacksonville projects. These reports (from the Market Specialist, the Contracting Specialist and the Financial Specialist of Conwood) provided similar information regarding site locations, predicted demands for office space, corporate growth patterns in the particular locale and so forth.

These case scenarios were pilot tested by eight business students who were asked to provide verbal protocols during their initial selection between the two office projects with respect to funding. Analysis of these protocols indicated that an equal selection between the office buildings was occuring and that the choices appeared to be based upon random attention to various pieces of information. That is, all individuals recognized the NPVs as being equal, reported that the sites both appeared to be suitable, and proceeded to select based upon ideosyncratic patterns.

Procedure

Cases were distributed randomly and fairly equally according to the following four classifications:

1) No information with respect to a strike (Not Foreseeable, Strike)
2) A warning that a strike might occur (Foreseeable, Strike)
3) Information regarding sitework risks for the locale with reassurance by the contracting specialist that no problems should occur (Not Foreseeable, Sitework), and
4) A warning regarding the potential risks involved with the site of the project (Foreseeable, Sitework).

All individuals in each category were asked to select either the Jacksonville or the Birmingham project as the commercial project for the southeastern region. The construction horizon was two years for each office building, thus the chosen project would be funded in two parts: one-half the development costs should be allocated at the present time; at the beginning of the next fiscal year (in order to create the effect of time, this second decision was made after one week had elapsed) the project would be reviewed and the decision regarding allocations should be made at that time. All subjects were told that this was according to corporate policy.

At time two (one week following the initial selection of the Birmingham or the Jacksonville project), individuals in each of the four classifications were told that a setback (either a strike or sitework problems) had occured resulting in a overrun cost of one million dollars. The feedback report also included persistence information. One half of the individuals in each setback classification were told that the problem had been resolved (A labor contract had been signed in the strike conditions while the construction problem had been solved in the sitework condition), while the other half of the decision makers were told that the setback had not been fully resolved and fairly ambiguous news regarding the likelihood of continuing problems was given (The contract had not yet been signed for the strike conditions and a number of influential leaders were stated to be in opposition to a resolution; for the sitework categories, it was stated that the work to date may result in allieviating the construction problem but at the present time it was uncertain if the new construction technique had been effective).

Measures

Multiple measures were designed and utilized to gain information about how the nature of a setback might potentially affect allocation tendencies and commitment on the part of decision makers. At time two, subjects were: (1) asked to decide on a second allocation to the initially chosen project, (2) requested to allocate a sum of money to a cost overrun account that would be specifically earmarked for that particular project (the decision makers were not given guidelines for this allocation although the previous setback had amounted to one million dollars and had been covered by a general slush fund account), (3) given a memo regarding a potential buyer for the project and asked to name a reccommended asking price and (4) requested to give a priority rating for the sale of the project on a four point scale that ranged from low priority/continue project to high priority/sell project.

In addition to the multiple dependent measures, five manipulation checks were included in a post experimental questionnaire to determine the perceived levels of responsibility (self and third party), persistence of the setback, potential control of the setback through continued allocations and the degree to which a third party was to blame for the project's upset.

RESULTS

A complete analysis of variance was conducted for the five manipulation checks. Main effects for foreseeability were found as expected on the responsibility felt by the decision maker for the setback. Main effects also resulted for type of

setback (ie. strike vs sitework) on both the responsibility felt by the decision maker for the setback and on the degree of blame attributed to a third party for the setback. Finally, status of the project had a main effect on the perceived likelihood that the setback would persist. Several interactions were also present for the manipulation checks. Two foreseeability by type interactions indicated that greater forseeability of setbacks led to greater attributions of foreseeablity for strikes and greater attributions for the efficacy of future allocations for sitework setbacks. Two foreseeability by persistence interactions suggested that foreseeability led to (1) greater attributions of personal responsibility for the setback and (2) efficacy of future allocations when the setback was resolved than when it would persist. Two type by status interactions indicated that greater responsibility and blame was attributed to a third party when the setback was a strike that had the possibility of persisting.

Multivariate analysis of variance was used to simultaneously analyze the effects of foreseesbility, persistence and type of setback on the multiple dependent measures. The Pillais-Bartlett multivariate test of significance indicated significant multivariate effects for persistence ($F\ 4,51 = 2.8035$; $p < .035$) and foreseeability by type ($F\ 4,51 = 3.8673$; $p < .008$). As suggested by Borgen and Seling (1978), follow up univariate ANOVAs and discriminant analyses were used for interpretation because the four dependent measures showed zero-order inter-correlations ranging from -.45 to .24(i.e. moderate multicollinearity). As is evident in Table 1, the two variables significantly affected by persistence of the project were the recommended asking price suggested by the decision maker and the subsequent priority rating given for the sale of the project. The correlations between the dependent variables and the canonical variables were also fairly high for asking price and the priority for sale measure. The foreseeability by type interaction seemed to be based mainly on the priority for sale rating with the corresponding correlation being .69.

The results provided partial support for the hypotheses. The significant interaction was a complete crossover indicating that the desire to withdraw from a project (ie. as indicated by asking price and selling priority) was greater for sitework in the not-foreseeable case and greater for the strike in the foreseeable case. This supports the hypothesized role of diffusability of blame. As indicated in Figure 1, the highest asking price was recommended when the setback did not involve a third party, was not expected to persist and was foreseeable by the decision maker. In the other conditions, either not involving a third party or entailing setbacks that were likely to continue, the recommended asking price ranged from 10.1 million to 11.9 million with the latter asking price occuring for setbacks that had been resolved. Persistence did not significantly affect the propensity to withdraw in the sitework condition as hypothesized, but the mean propensity to sell was equal in both which seems to counter, to some extent, the main effect for persistence. It should be noted that the asking prices fell closely in the range of the net present values for the projects at time 2 subsequent to cost overruns while the asking price of 14.9 million for the former condition is much greater than the 11.3 NPV for the projects.

An examination of the priority ratings for the sale of the projects show support for the tendency to escalate when a third party was not involved, the setback was foreseeable and the setback had been resolved. However, it should be noted that decision makers also showed a hesitation to recommend the sale of projects that were likely to have continuing setbacks as long as these setbacks were foreseeable but did not involve third parties in the cost overages. However, the projects in this condition were priced for sale at current NPVs, suggesting commitment was not as great as in the resolved setback persistence condition.

Conclusions and Discussion

The contribution of this study to the theories of escalation and comitment was to shed light on how certain characteristics of setbacks may affect how allocators frame the cause of the project failures. In particular, the presence of a third party as a "cause" of the setback provided ways in which blame could be diffused by the allocator. Additionally, the study reveals the importance of the attributed persistence of setbacks on allocations. In a real business environment, it seems unlikely that allocators would allocate to a project when that project was very likely to fail again, regardless of responsibility for past events.

This study also represents a methodological advance in its use of multiple measures of commitment to the project. Because financial allocations are best regarded as complex behaviors which could be affected by a wide range of contradictory or interacting motives, it seems especially important to utilize multiple measures. Space limitations do not permit an adequate discussion of the similarities and differences among the four measures, their covariance structure and important differences in the results obtained for each measure. It must suffice to say that each measure appeared to have its particular set of ideosyncracies vis a vis the experimental manipulations, although the multivariate results were unambiguous. The case, as well, represents an advance. This was the first escalation study to utilize a case which provided full financial information about the various alternatives and which was based on the materials and parameters used in an actual organizational environment.

Further studies of financial allocations should carefully consider the characteristics of the setbacks used to induce the failure experiences. Care should be taken to identify how the nature of these setbacks interact with the variables being manipulated in the study and the way the setbacks may direct responses. Future studies should also employ cases which adequately miror actual deci-

sion situations and provide sufficient information so that normative models, when they are available, may be applied. Future studies, and additional analyses on these data, should consider how actual allocations deviate from those prescribed by normative models.

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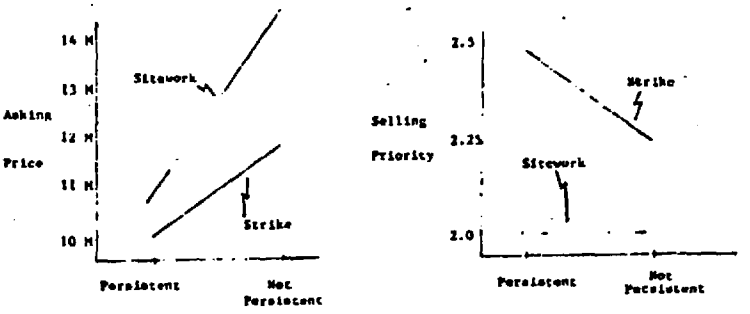
TABLE 1

Univariate ANOVAs and Discriminant Analyses

FACTOR	VARIABLE	UNIVARIATE F-TEST SIGNIFICANCE LEVEL	CORRELATIONS BETWEEN DEPENDENT & CANONICAL VARIABLES
STATUS	Second Allocation	.915	-.031
	Slush Allocation	.803	.073
	Asking Price	.014	-.739
	Priority For Sale	.035	.378
FORESEEABILITY BY TYPE	Second Allocation	.392	.212
	Slush Allocation	.172	-.342
	Asking Price	.191	-.323
	Priority For Sale	.007	.692

FIGURE 1

Recommended Asking Price and Priority Ratings for Sale When Setbacks Are Foreseeable



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THE ECOLOGY OF SUNK COST PROBLEMS

Gerrit Wolf
University of Arizona

Ed Conlon
University of Iowa

Sunk cost problems have become an interest of behavioral and economic researchers. A sunk cost problem can be characterized as having costs and rewards distributed overtime, with costs occuring before the rewards, and a decision of whether to continue investing resourses (costs) in order to obtain the future rewards (Northcraft and Wolf, 1984). This paper reports on a field study of the diversity of sunk cost problems in organizations and to the extent that psychological commitment compared to the ecology of sunk cost problems determines the decision to persist with a project.

Much of the research on sunk cost problems has been done in the laboratory. The focus of the research has been on the psychological process of commitment and the environmental factors that produce commitment. The laboratory research generally has shown that if one couples the responsibility of an important decision with some level of negative feedback about the decision, the person perseveres to try and turn the project around (Brockner and Rubin 1982; Staw, 1979)

Examples, such as the Vietnam War or waiting for a bus, used to motivate laboratory research, suggest that the conditions are pervasive. What sre the kinds of sunk cost problems found in organizations? This paper reports on part of a survey that defines sunk costs in the contexts of formal projects rather than informal, personal, or minor problems, as studied in the laboratory(Brockner and Rubin, 1982).

How extensive is psychological commitment as compared to the ecology of sunk cost problems as the motivating force underlying persistence in

sunk cost problems? Ecology refers to kinds of sunk cost problems and their associated economic characteristics. The latter are 1)the combination of the amount of costs early in the project and the amount of revenues late in the project, and 2) the amount of the setback. The types of problems induced from free responses focus on different types of internal and external projects and types of economic exchange (making, buying and selling). Commitment is operationalized as organizational roles relevant to what happened in a sunk cost problem.

Two hypotheses were proposed: 1) The more commited the person the less the effect of negative feedback on persistence, and 2) the greater the sunkedness (costs early and revenues late) of a project, the less the effect of negative feedback on persistence. With no commitment from the person or sunkedness from the project, the greater the negative feedback the more likely the project is terminated. In other words, commitment and sunkedness moderate the relationship between degree of setback and continuation of the project.

METHODS

Subjects

Fifty of the largest businesses in Arizona were solicited to participate in the research. The chief executive officer of each firm received a covering letter and five copies of a questionnaire. The letter requested that the executive select five subordinates to respond to each of the five questionnaires. Thirty firms participated with a total of 81 usable questionnaires.

Instructions

"This questionnaire asks you to describe an organizational decision process related to a less than successful project. It seeks how sunk costs are identified and dealt with by managers after a project is started but is

not succeeding. To orient you, an example project is described below. The questions on page two ask you for information about events prior to, during and after the project you choose to report. Think of a project that a significant budget, a number of people, and was important. After you think of the project, take 15 minutes to answer the questions. Do not spend extensive time to research the project. Report your best recollections."

Questionnaire

The questionnaire had four parts: 1) Background information about the manager and the firm, 2) How the project was select, 3) The setback and its effects, and 4) An overall evaluation of the project. The latter three sections had sections on the financial characteristics of the project. Questions were asked about the planned revenue stream and the planned cost stream. Also, there were questions about the amount of cost over run and revenue short fall. These questions reflected a project life cycle view of sunk problems(Northcraft and Wolf 1984).

In addition, there was an open-ended question at the beginning that called for the responded to describe the project and a question in the middle that asked for a description of the setback. These questions were coded after the fact by two independent judges using a Q-Sort. All the other questions were ratings on four, seven or ten point scales, or judgements of amounts.

The dependent variable of persistence asked respondents to check one of the following items: 1) continued with the project and absorbed the effects of the setback, 2) continued and absorbed the setback amd took steps to avoid the effects in the future, 3) redefined or revised the project making best use the assests, 4) temporarilty or permanently stoped the project and attempted to recover salvagable assets. The variable,

ACTS, was scored one to four.

An analysis of variance tested the commitment hypothesis and the ecology hypothesis. Independent variables for the commitment hypothesis were the magnitude of the setback and the degree of responsibility of the person. The independent variables for the ecology hypothesis were type of sunk cost problems, and sunkedness of the problem. A model using the variables (defined below) PROB, SUNK, SETB, NEG and ROLE as main effects and as two-way interactions was constructed. This model tested the ecology hypothesis using the SUNK by NEG interaction and the commitment hypothesis was tested using the ROLE by NEG interaction. The variables PROB and SETB were used to control for other possible hypotheses.

RESULTS

Table 1 reports the frequency of types and economic magnitude of sunk cost problems, the frequency of type and magnitude of the setback, and the mean persistence outcome as a function of the problem and setback variables. This table describes the independent and variables before hypothesis testing.

These results show that the majority of sunk cost problems involve producing a product or service, but 20% involved buying and 20% selling. Also, half the projects involved products or services for customers and the other half for internal use, such as an improved manufacturing process. These results show that there is a much wider range of sunk problems than found in the laboratory research. In this sample there is more persistence in making a product than in selling it and more persistence to construction than to internal systems.

There was no correlation among the problem variaibles accept for the fact that one does not sell internal projects. This empty cell

makes a relationship between the exchange and function defintion of projects. Therefore, a variable called PROB was defined as 1) make a product or a construction project, 2) make a system or redesign the orgnaization, 3) buy a product or service or real estate, and 4) sell a product, service or real estate.

The economics of sunk cost problems were rated as the extent that costs occur early and revenues take place late, as seen in Table 1. Persistence increases with earlier costs and with later revenues. An index was constructed of the degree of sunk cost of problem by averaging the earliness of costs and the lateness of revenues. This variable, called SUNK, had three levels: 0) no sunkedness(cost=revenue), 1) some sunkedness (cost greater than revenue), 2) large sunkedness (most cost early and most revenue late.)

The kinds of setbacks are categorized in Table 1 as incompetent top management, time pressures, bad planning and design of the project, uncontrolable third parties, and economic misjudgements of costs and faliable forecast of sales. There was no consistent relationship to persistence. A new variable, called SETB which varied from internal to external, was formed as follows 1) Product (design and time pressures), 2)managing (incompetence and misjudged costs) 3) Others (third parties) and 4) weak sales.

The magnitude of the setback, cost overrun or revenue short fall, ranged from 5 to 70%. The majority of the projects were judged to have large setbacks, as seen in Table 1. Actual magnitudes were insufficiently reported in order to determine the validity of the judgements. Persistence decreased with increased negative feedback. A variable, called NEG was defined as 1) 0 to 25%, 2) 26 to 45% and 3) 46% and above.

Table 2 reports the analysis of variance using PROG, SUNK, SETB, NEG,

and ROLE as independent variables and ACTS as the dependent variable. The two hypothesized interactions of ROLE by NEG for the commitment hypothesis and of SUNK by NEG for the ecology hypothesis were not significant, although thhey were in the predicted direction. Significant two way interactions were PROG BY SUNK and PROG BY NEG, providing some support for the ecology approach, and PROG BY ROLE and SETB BY ROLE, partially supporting the commitment approach.

The PROG by SUNK interaction shows that as sunkedness increases there is increasing persistence for make and sell projects, which is consistent with economic analysis, while for buy projects as sunkedness increases persistence decreases. This may because there is less control in the buy situation or that the seller can demand greater investments by the buyer before selling, which go beyond the buyers interest. This asymmetry of buyer and seller says that the seller is holding out for more while the buyer is more likely to get out with higher demands. Figure 1 graphs the interaction effect.

The PROG by NEG interaction shows that persistence increases as negative feedback increases for buy projects and internal systems projects, while persistence decrease with negative feedback for sales projects and making of products or construction.

The ROLE by PROG interaction shows decreasing persistence as commitment increases for make and buy projects, while only sales projects shows support for the commitment hypothesis of increasing commitment producing increasing persistence. This result contradicts laboratory findings.

The ROLE by SETB interaction shows increasing persistence as commitment increases for intrinsic design problems and third party causes

of the setback, while there is decreasing persistence as commitment increases for managerial causes of the setback and for poor customer response as the setback cause. This result is inconsistent with the commitment hypothesis.

DISCUSSION

Staw (1979) identified the commitment process in sunk cost problems. Previous research raised questions about the boundaries of the phenomena relative to individual differences (Brockner and Rubin 1982, Conlon and Wolf 1980). This field research tried to find the problem ecology boundary conditions. It appears that the sunk cost problem is ecologically rich, but it remains to be shown that commitment is the pervasive process that determines behavior in these problems.

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TABLE 1

Relative frequency of types and degree of sunk cost pproblems and type and degree of setback and frequency of types of results of sunk cost problems.

Sunk cost problems:					Dependent Variable Persistence(4=low, 1=high)
Types:					
	Exchange:	Make:	59%	XXXXXXXXXXX	2.6 YYYYYY
		Buy:	23%	XXXXX	2.9 YYYYYYYYY
		Sell:	18%	XXXX	3.1 YYYYYYYYYY
	Areas: Construction:		17%	XXX	2.6 YYYYYY
	Product/service:		27%	XXXXX	3.3 YYYYYYYYYYYY
	Systems		29%	XXXXXX	3.6 YYYYYYYYYYYYYYY
	Organization Design:		09%	XX	3.0 YYYYYYYYY
	Unknown		17%	XXX	2.4 YYYY
Economic Plan:					
	Costs:	Unknown:	16%	XXX	2.9 YYYYYYYY
		Earlyist	36%	XXXXXX	2.5 YYYYY
		Earlier	26%	XXXXX	2.6 YYYYYY
		Early	7%	X	2.7 YYYYYY
		Late	9%	XX	2.8 YYYYYYY
		Later	6%	X	3.0 YYYYYYYYY
	Revenues:	Earlier	6%	X	3.0 YYYYYYYYY
		Early	6%	X	3.2 YYYYYYYYYY
		Late	9%	XX	2.8 YYYYYYY
		Later	16%	XXX	2.5 YYYYY
		Latest	38%	XXXXXXX	2.4 YYYY
		Unknown	24%	XXXXX	2.6 YYYYYY
Setback:					
	Type:	Upper Management:	5%	X	3.0 YYYYYYYYY
		Time Problems	7%	X	2.5 YYYYY
		Outsiders	22%	XXXX	3.3 YYYYYYYYYYYY
		Porject Planning	12%	XX	3.1 YYYYYYYYYY
		Economic costs	17%	XXX	3.4 YYYYYYYYYYYYY
		Sales	17%	XXX	3.2 YYYYYYYYYYY
		Unknown	6%	X	2.4 YYYY
	Magnitude:	Small:	17%	XXX	2.7 YYYYYYY
		Medium:	38%	XXXXXXX	2.9 YYYYYYYYY
		Large:	45%	XXXXXXXXX	3.5 YYYYYYYYYYYYYY

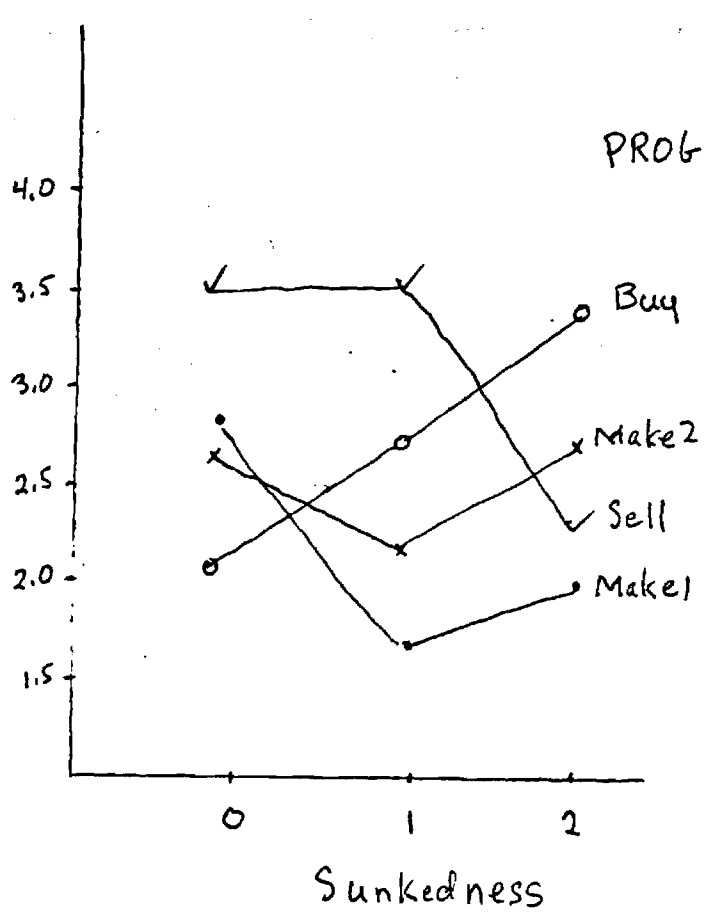
ACTS
BY PROG
X
SETB
NEG2
ROLE

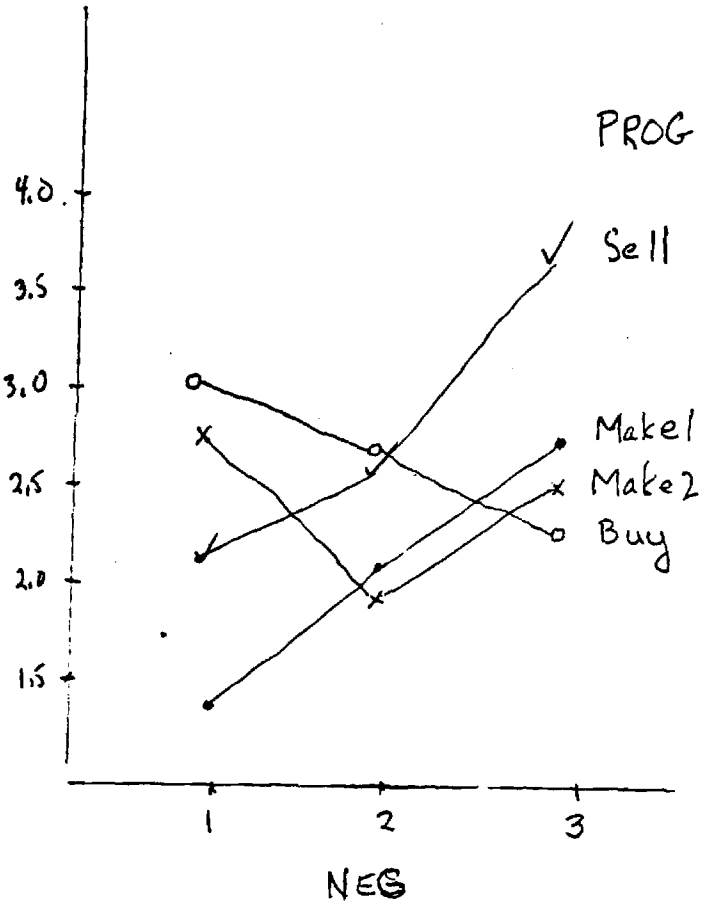
* *

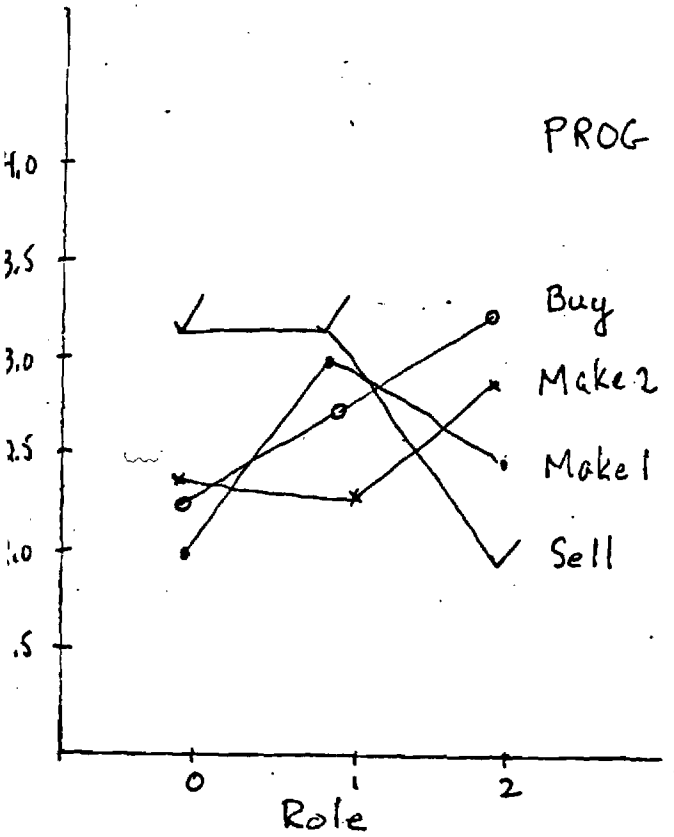
SOURCE OF VARIATION		SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS		12.838	12	1.070	.997	.492
PROG		2.786	3	.929	.865	.479
X		.330	2	.165	.154	.859
SETB		1.710	3	.570	.531	.667
NEG2		5.838	2	2.919	2.721	.096
ROLE		.654	2	.327	.305	.742
2-WAY INTERACTIONS		80.613	52	1.550	1.445	.212
PROG	X	19.453	6	3.242	3.022	.036
PROG	SETB	13.057	9	1.451	1.352	.287
PROG	NEG2	16.931	6	2.822	2.630	.057
PROG	ROLE	16.643	6	2.774	2.585	.060
X	SETB	5.577	6	.929	.866	.540
X	NEG2	6.817	4	1.704	1.588	.226
X	ROLE	.948	4	.237	.221	.923
SETB	NEG2	10.935	6	1.823	1.699	.185
SETB	ROLE	13.664	4	3.416	3.184	.042
NEG2	ROLE	1.041	1	1.041	.970	.339
EXPLAINED		93.451	64	1.460	1.361	.251
RESIDUAL		17.167	16	1.073		
TOTAL		110.617	80	1.383		

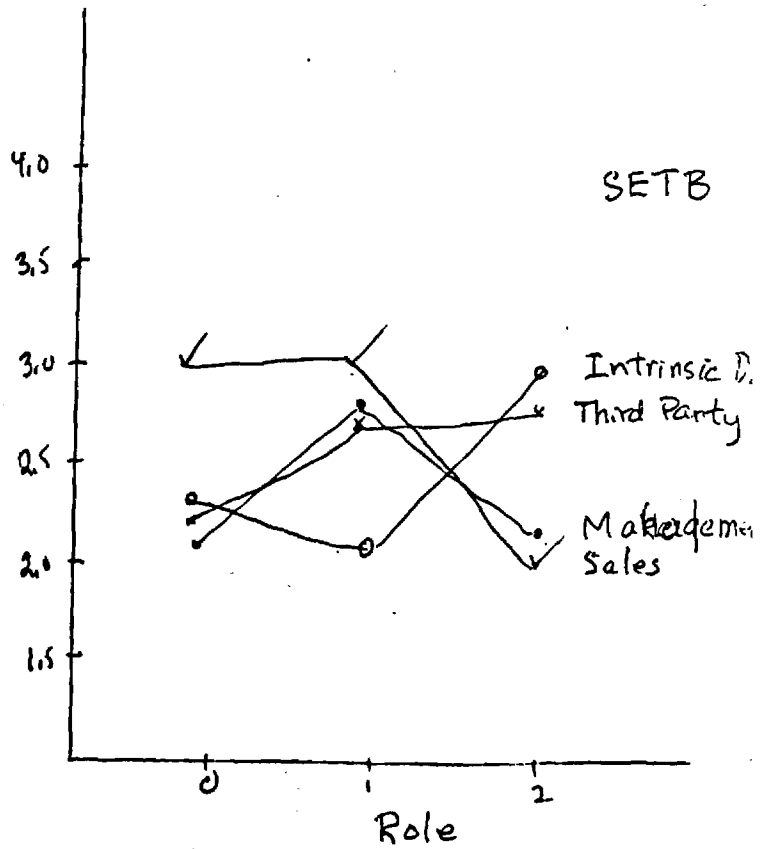
Figure 1

Persistence as a function of NEG, ROLE, SETB, PROG









COMMITMENT:

"BOUNDED IRRATIONALITY" AND OTHER INSIGHTS

Gregory B. Northcraft

Department of Management & Policy

University of Arizona

&

William J. Gleeson

Department of Management & Policy

University of Arizona

Running head: Commitment

Correspondence concerning this manuscript should be directed to Gregory Northcraft, Department of Management & Policy, University of Arizona, Tucson, AZ 85721. The authors are indebted to Dalice Sim of the University of Arizona Medical Center Cancer Research Unit for her invaluable assistance in analyzing the data; to Gerrit Wolf for his assistance in designing and writing up the study; and to Joel Brockner, Al Hastorf, Terry Connolly, and Maggie Neale for their helpful comments on earlier drafts of the manuscript.

ABSTRACT

The study described here examined several important but heretofore neglected aspects of the role of commitment in resource-allocation decisions. Persistence in a course of action in the absence of extrinsic justification was used as the behavioral indicator of commitment. A simulation exercise using undergraduate business students as subjects provided the setting to test several hypotheses about the causes and nature of commitment to a course of action. The exercise entailed role-playing a college student making decisions about whether to stay in or drop a college course, in the face of negative feedback about his or her progress in the course. Results suggest that: (a) choice only fosters commitment to a course of action when there is something at stake in the choice, (b) amount of commitment is not a linear function of number of choices, (c) commitment is not accurately characterized as a suspension of rationality, and (d) commitment need not entail misperception of feedback about one's progress in a course of action.

COMMITMENT:

"BOUNDED IRRATIONALITY" AND OTHER INSIGHTS

Resource-allocation decisions have been the focus of a considerable amount of recent research (e.g., Brockner, Shaw, & Rubin, 1979; Staw, 1981; Staw & Ross, 1978). A concept often invoked to understand the behavior of decision-makers in such situations is commitment. Commitment is defined in the American Heritage dictionary as, "the state of being bound emotionally or intellectually to some course of action." Apparently, this emotional or intellectual binding can profoundly influence behavior.

In research, commitment has been played off against the rationality of economic calculation. It has been used to explain adoption of (e.g., Festinger & Carlsmith, 1958), persistence in (e.g., Freedman & Fraser, 1966), and even escalation of resources allocated to (e.g., Staw, 1976) a course of action when available extrinsic justifications (such as potential economic return) cannot account for such behaviors. Thus, commitment is invoked when economic calculation, or plausible errors in attempts to make economic calculations (e.g., Tversky & Kahneman, 1974), are no longer compelling descriptions of decision-making behavior.

Recently, the study of resource-allocation decisions (e.g., Staw & Fox, 1977) has suggested that choosing to engage in a behavior fosters commitment, even if the choice occurs in the presence of substantial extrinsic justification. In these studies, commitment has been thought to derive from an individual's adopting a stance of belief in the goodness of a course of action -- a stance which may be subject to justification to others and norms of consistency (e.g., Sidney, 1978) when the substantial

extrinsic justification later disappears.

Commitment has also been invoked to understand behavior in entrapping situations (e.g., Rubin & Brockner, 1975), such as waiting for a bus, or being put "on hold" on the telephone. As in situations from the resource-allocation literature, entrapment entails the decision to spend a valuable resource -- usually time -- in pursuit of some valued outcome. However, like the forced compliance situations, the perception of having freely chosen to spend that resource is retrospective rather than prospective. The entrapped individual sees him or herself as freely but inadvertently having invested too much to quit (Teger, 1980). Interestingly, persistence in such situations is economically justifiable in some circumstances, even when the behavior is emotionally motivated (Northcraft & Wolf, 1984).

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insert Table 1 about here

As noted in Table 1, the theoretical literature on commitment (e.g., Kiesler, 1971; Salancik, 1977; Staw, 1982) identifies between four and six characteristics of decision situations which influence the amount of commitment engendered by choosing to engage in a course of action.

The relationship between commitment and the public explicitness of a choice has been well documented. In several studies (Brockner, Shaw, & Rubin, 1979; Deutsch & Gerard, 1955), subjects chose a course of action, wrote the choice down on a piece of paper, and either (a) kept the piece of paper to themselves, or (b) gave the piece of paper to the experimenter. As predicted, subjects acted more committed to their choice when they had to explicitly reveal their choices to the experimenter.

The relationship between the other situational characteristics noted

TABLE 1

Determinants of Commitment

KIESLER (1971)	SALANCIK (1977)	STAW (1981)
Freedom of choice	Participation in the choice	Responsibility for the action
		Responsibility for consequences
Salience of choice	Salience of choice	Salience of action
Public explicitness	Publicness	
Irrevocability	Irreversibility	
Repetition of choice		
		Consequences of the action

above and commitment has been less conclusively demonstrated. The effects of irrevocability of a decision was also studied by Deutsch and Gerard (1955). Some subjects were given a "magic pad" on which to record their choices; the pad could be "erased" (or so the subjects believed) by lifting the top sheet. Subjects with this opportunity to "undo" their previous choice demonstrated less commitment than subjects who had to reveal their recorded choices to the experimenter, but more commitment than subjects who had not recorded their choices at all. Many choices, however, cannot be so cleanly "undone" in practice. Once made, even if a choice is changed, corrected, or abandoned it nevertheless was made. It is an act which has already occurred in time, a fact which cannot be revoked in any meaningful sense of the word.

There remain several ways in which the notion of irrevocability might prove meaningful. If a choice is not made public, the decision-maker can act <u>as if</u> the choice was never made. However, operationally this confounds irrevocability with the public explicitness of a choice. On the other hand, if once made a choice occasions some penalty or loss if changed, corrected, or abandoned, then it is irrevocable in the sense that once made things (for instance, financially or interpersonally) can never again be as they were. In this sense, irrevocability seems confounded with another situational characteristic noted above -- whether the choice has consequences. And further, what seems more likely to provide salience for a choice than whether that choice has important consequences and changes forever the status quo? The importance of the consequences thus would seem to be a critical determinant of the impact of a choice on commitment to that choice.

The importance of the consequences of a choice on commitment to that

choice has received some attention in the cognitive dissonance literature. Several studies (Calder, Ross, & Insko, 1973; Collins & Hoyt, 1972; Hoyt, Henley, & Collins, 1972) found that when subjects freely chose to engage in attitude-discrepant behaviors, attitudes became more consonant with the behaviors only if the behaviors had important consequences. However, in these studies, the choice to engage in the attitude-discrepant behaviors entailed important consequences for someone other than the subject. This leaves open the possibility that the resultant "attitude changes" reflect impression management demands (e.g., Gaes, Kalle, & Tedeschi, 1978), rather than actual changes in belief.

Furthermore, these studies involved experimental settings where the focal choice was attitude-discrepant. Less attention has been paid to situations where the focal choice is attitude-consonant and later proves to have been an undesirable choice in retrospect. In these situations, a different set of cognitive processes would be expected to be operating (Fazio, Zanna, & Cooper, 1977). In studying the psychology of "bad loans," Lewicki (1980) found that the magnitude of a loan does influence how far a loan officer or bank is willing to go with a borrower before foreclosing on a loan. Lewicki notes, however, that this may reflect survival needs of the bank (a large loan in default may take the bank down with it) rather than any emotional bond to the lending decision. More typically, researchers have examined the effects of choice (e.g., Staw, 1981), without systematically varying the importance of the consequences attached to the choice. As yet, no research has examined the impact on commitment of making an attitude-consonant choice when the choice changes nothing immediately -- entails no immediate positive or negative consequences. We might imagine

two distinct possibilities:

Hypothesis 1(a): choice fosters commitment to a course of action, independent of the importance of the choice (that is, independent of whether the choice has consequences)

Hypothesis 1(b): choice fosters commitment to a course of action only when the choice is important (that is, has consequences)

A last situation characteristic mentioned as a determinant of commitment -- the number of times a choice has been reaffirmed -- has also been neglected. Kiesler (1971) reports a study in which subjects who played a particular strategy in a game multiple times were more resistant to counter-communication about that strategy than subjects who had only played the strategy once or not at all. However, Kiesler's subjects did not choose the strategies they played; the strategies were randomly assigned. A more interesting question would seem to be the impact of the number of freely chosen repetitions or reaffirmations of the original choice. Three plausible alternative hypotheses might be entertained:

Hypothesis 2(a): commitment reaches a maximum with one choice

Hypothesis 2(b): commitment reaches an asymptote after several choices

Hypothesis 2(c): commitment is linearly related to choice

Another related, but also neglected, aspect of commitment research concerns the time lag between when a course of action is chosen, and when it becomes clear that there is no adequate extrinsic justification for the choice. We might imagine, for instance, an executive whose chosen project goes bad (removal of extrinsic justification for his chosen course of action) the day after he has made the choice to begin the project, versus a year after he made the choice. Two alternative hypotheses might be:

Hypothesis 3(a): the longer the time lag between choice and the revelation that there is no extrinsic justification, the more "justification" thinking (to oneself or others) will have occurred, and therefore the more commitment will be evidenced

Hypothesis 3(b): the longer the time lag between choice and the revelation that there is no extrinsic justification, the less will be the felt need to justify the choice, and therefore the less commitment will be evidenced

Finally, the behavioral manifestations of commitment (adoption, persistence, and escalation) have received some attention. Unfortunately, most studies have treated these behavioral counterparts of commitment only dichotomously. Consequently, few insights have been provided into the issue of whether commitment is impervious to the dictates of rational economic calculation over repeated reminders of the absence of external justification for the behavior. Even learning theory (e.g., Logan, 1969) does not suggest that removal of the extrinsic justification for a behavior should immediately extinguish the behavior. A more sophisticated account of commitment should consider the course of its decay over time. Two hypotheses that might be considered are:

Hypothesis 4(a): choice gives rise to long-term commitment to a course of action

Hypothesis 4(b): choice gives rise only to short-term commitment to a course of action; after repeated exposures to reminders of the absence of external justification for a behavior, extinction of the chosen course of action will occur

The following empirical study extended our understanding of the impact of choice on commitment to a course of action. Persistence in the course of action in the absence of extrinsic justification was used as the behavioral indicator of commitment. A simulation exercise using undergraduate business students as participants provided the setting to test

the four hypotheses outlined above.

METHOD

Subjects.

One hundred seven students from undergraduate Management classes at the University of Arizona participated in a class exercise on decision-making behavior. Participation was voluntary; subjects were randomly assigned to experimental conditions.

The original sample included two classes of students. The data from three participants were incomplete, and therefore were not included in the analyses. The data from an additional two groups of four participants each were also discarded because of suspected collusion (based upon the groups' identical and extremely atypical responding, and their members' physical proximity during the experimental session). The third class of subjects was added to compensate for this attrition from the original sample.

Design Overview.

Subjects participated in a paper-and-pencil in-class exercise. In the exercise, each subject role-played a college student making decisions about whether to stay in a college course. Commitment was operationalized as a subject's remaining in the course (persistence) when confronted with discouraging feedback about his or her progress in the course. The role-play dealt with the first thirteen "weeks" of the student's course. This setting was chosen for the role-play because of its familiarity to the participants.

There were two independent variables. The first independent variable was Investment; there were two levels of Investment. In the High Invest-

ment condition, only 5% of the student's fees for enrolling in the course was refundable if the course was dropped; books for the course had been purchased from a friend and therefore were not returnable. In the Low Investment condition, fees for the course were 100% refundable and all the books for the course were on reserve in the library.

The second independent variable was Choice; there were four levels of Choice. In all conditions, the course could be dropped anytime from Week 6 through Week 13. In the No Choice condition, the course could not be dropped until Week 6. In the One Choice conditions, the subject had one opportunity to drop the course before Week 6. There were two variants of the One Choice condition -- Early and Late. In the Early condition, prior to Week 6 the student was allowed to drop the course in Week 1 only; in the Late condition, prior to Week 6 the student was allowed to drop the course in Week 5 only. In the All Choices condition, the student was allowed to drop the course in any of the first six weeks. The two independent variables were fully crossed, yielding eight experimental groups for the exercise.

Procedures.

Upon arrival in the classroom, each participant was randomly assigned to one of the eight experimental groups. When all subjects were seated, a briefing sheet containing background information for the role-playing exercise was distributed to each subject. The role of each subject was to be an undergraduate student starting his or her junior year of college. The student was enrolled in four courses; three were required and one was an optional course. The subject was informed that he or she would expect with certainty a grade of B in two of the required courses; grades in the third required course and the optional course were uncertain.

The optional course was the focus of the role-playing exercise. The optional course was being taken simply because it was in an area of great interest to the student. The student was to receive feedback about his or her progress in the course week by week for the first 13 weeks of the semester. In the background information, the student was portrayed as being of limited means, needing to work to stay in school. The student's family had promised a substantial reward (a ten-speed bicycle) if the student completed the term with no grade worse than B. The final paragraph of the briefing sheet presented the experimental manipulation for the Choice and Investment independent variables.

For each of the hypothetical thirteen "weeks" each subject received a single sheet containing feedback about his or her progress in the course during the previous week. This feedback was the same for all subjects in all conditions, and consisted of class quiz score updates and feedback items. Examples of feedback included classroom activities and requirements, and events of significance (such as the loss of a notebook containing class notes). The feedback items had been pretested on a sample of business students from the same population as the subjects for the study. The feedback items were sequenced so that the feedback items for the first five weeks were relatively innocuous (mean rating of 4.32, on a scale of 1=very encouraging and 7=very discouraging) so that no subjects would drop the course during that time. From weeks six through thirteen the feedback items were discouraging (mean rating of 6.1). The class quiz score updates showed the student to be equal to or above the class mean during Weeks 1 through 5, but well below the mean in Weeks 6 through 13.

The "weekly" feedback sheets also contained several questions. The

principal question was whether the subject wished to continue with the course or drop it. This question constituted the primary dependent measure for the study and was asked of all subjects in Weeks 6 through 13. (This question was also asked of subjects in earlier weeks when required by the Choice manipulation.) Additionally, all subjects were asked each week to rate their probability of getting a B on the course, and to state their main considerations (for dropping or not dropping the course) at that time. Subjects who dropped the course were required to continue to complete the weekly feedback sheets, except for the decision-to-drop question. This prevented subjects from communicating to other subjects by their actions their decisions concerning the course.

Experimental assistants delivered the weekly feedback sheets one at a time to subjects. Subjects had four minutes to complete each weekly feedback sheet. The sheet for each week was collected before the next week's sheet was distributed. To track the decisions, each subject was required to put his or her name on each weekly feedback sheet.

After the feedback sheet for Week 13 had been completed and collected, subjects were given a short questionnaire. On this questionnaire, subjects rated the extent to which each week's feedback was seen as encouraging or discouraging, and answered five additional questions. These questions concerned the subject's justification for dropping the course (if applicable), and four checks of the Investment manipulation.

Following collection of the follow-up questionnaire, subjects were debriefed. The entire exercise took one hour and 15 minutes to complete. No subjects evidenced suspicion of the true purpose of the exercise.

RESULTS

Manipulation Checks.

Analysis of the responses to the post-experimental questionnaire showed that subjects did recall, unprompted, the key constraints given them in the background briefing sheets. The Investment manipulation was recalled correctly by 98% of subjects in the High Investment condition, and by 95% of subjects in the Low Investment condition.

Subjects' ratings of the weekly feedback items reflected the pattern of ratings obtained during the pretesting of the experimental materials. As shown in Table 2, for Weeks 1 through 5, the mean rating of feedback items

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insert Table 2 about here

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across all subjects was relatively neutral ($\bar{X}$=4.41, where 1=very encouraging, 7=very discouraging, and 4=neither encouraging nor discouraging); the mean rating of feedback items for Weeks 6 through 10 was discouraging ($\bar{X}$=5.74). The feedback items for Weeks 11 through 13 were also rated as neutral (X=3.89). The Investment and Choice manipulations had no significant effect on subjects' ratings of the weekly feedback. (It should be remembered that weekly feedback included both the feedback items and weekly quiz scores shown in Table 2.)

Dependent Measures.

The primary dependent measure for each subject was the weekly decision to stay in or drop the course for Weeks 6 through 13. Once having dropped, the subject remained in the "having dropped" status for the remainder of the experiment. The data are therefore binary in form and have a serial correlation from one decision point ("week") to the next. The dependent

Table 2

Week	Feedback Item	$\bar{X}$	s^2	Weekly Quiz: Your Scores	Weekly Quiz: Class Average
1	The course has 3 exams each worth 25% of your grade with the remaining 25% your overall average on weekly quizzes.	3.00	1.10	--	--
2	You don't know anyone in your class.	4.79	0.89	72	68
3	You have found out that students who took this course last term say it is tough.	4.71	0.83	68	65
4	Your instructor's office hours are at times when you have other classes.	4.84	0.98	62	62
5	Your first exam result was 55/100, C+.	4.83	1.22	55	56
6	You have lost one of your text books for this class with some of your notes in it.	5.54	1.41	53	58
7	Your instructor is boring.	5.95	0.86	57	63
8	Your partner for the term project is a	5.45	1.01	55	63
9	There is a field trip planned in place of one of the exams and it is scheduled for a weekend when you had planned a skiing weekend. As you are the organizer you will have to rearrange the skiing or miss it.	5.71	1.24	57	64
10	Your second exam result was 56/100, C-.	6.06	0.83	56	62
11	Since the course started one third of the class have dropped.	4.79	0.91	53	63
12	The instructor wants you and another student to recruit and organize drivers to take the class on a field site trip.	3.56	1.21	57	65
13	Final add/drop week without it appearing on your record.	3.32	1.70	55	65

variable for each subject was the time ("weeks") until dropping the course. For these reasons, the data were subjected to a survival (or "time-to-event") analysis. Survival analysis entails a comparison of successive differences among experimental conditions across time, but provides only paired comparisons of experimental conditions for significance testing. The basic procedure is analogous to using χ^2 to test for statistical independence of two variables. For each of the eight experimental conditions a survival curve was calculated using the Product Limit method (Kaplan & Meier, 1958). These survival curves, shown in Figure 1, display the proportion of subjects remaining in the course by the length of time (in weeks) they remained in the course after Week 6. (Week 6 is used as the zero point since it is the first Week in which subjects in all conditions have the opportunity to drop the course.) Thus, the proportion remaining seven weeks after Week 6 represents those subjectss who never dropped out. The curves were compared to each other using both the logrank (Peto et al, 1977) and the Generalized Wilcoxon (Gehan, 1965) statistics. Both of these methods are nonparametric tests suitable for censored time-to-failure data, but use different weighting schemes in asessing the significance of experimentl effects. Both test statistics must be significant in order to infer a significant experimental effect in the strictness sense.

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insert Figure 1 about here

The results of the survival analysis are shown in Table 3. Hypothesis 1(b) was confirmed; Choice influenced commitment (as measured by the subject's not dropping the course) only when Investment was High. In the

FIGURE 1 A

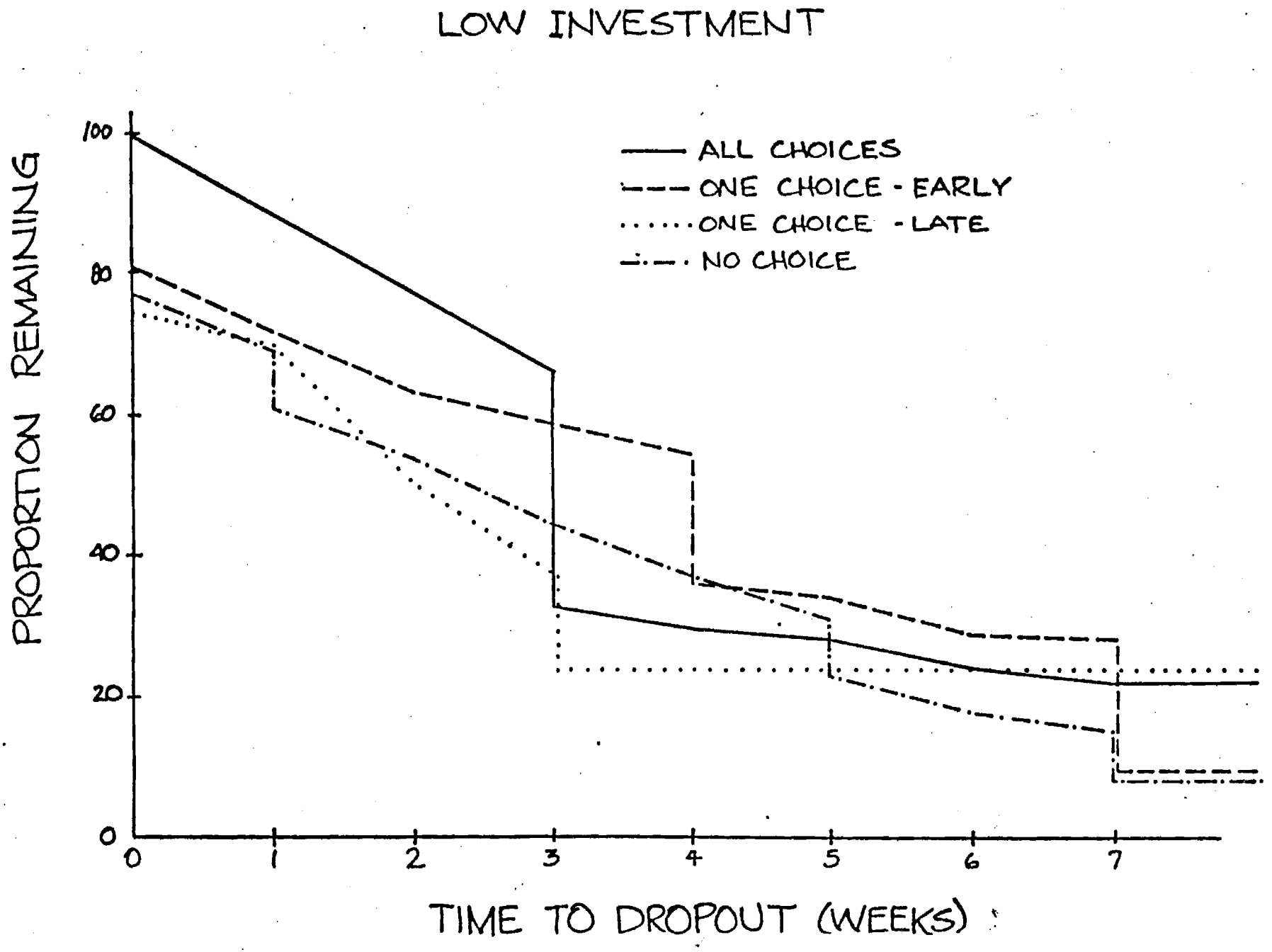
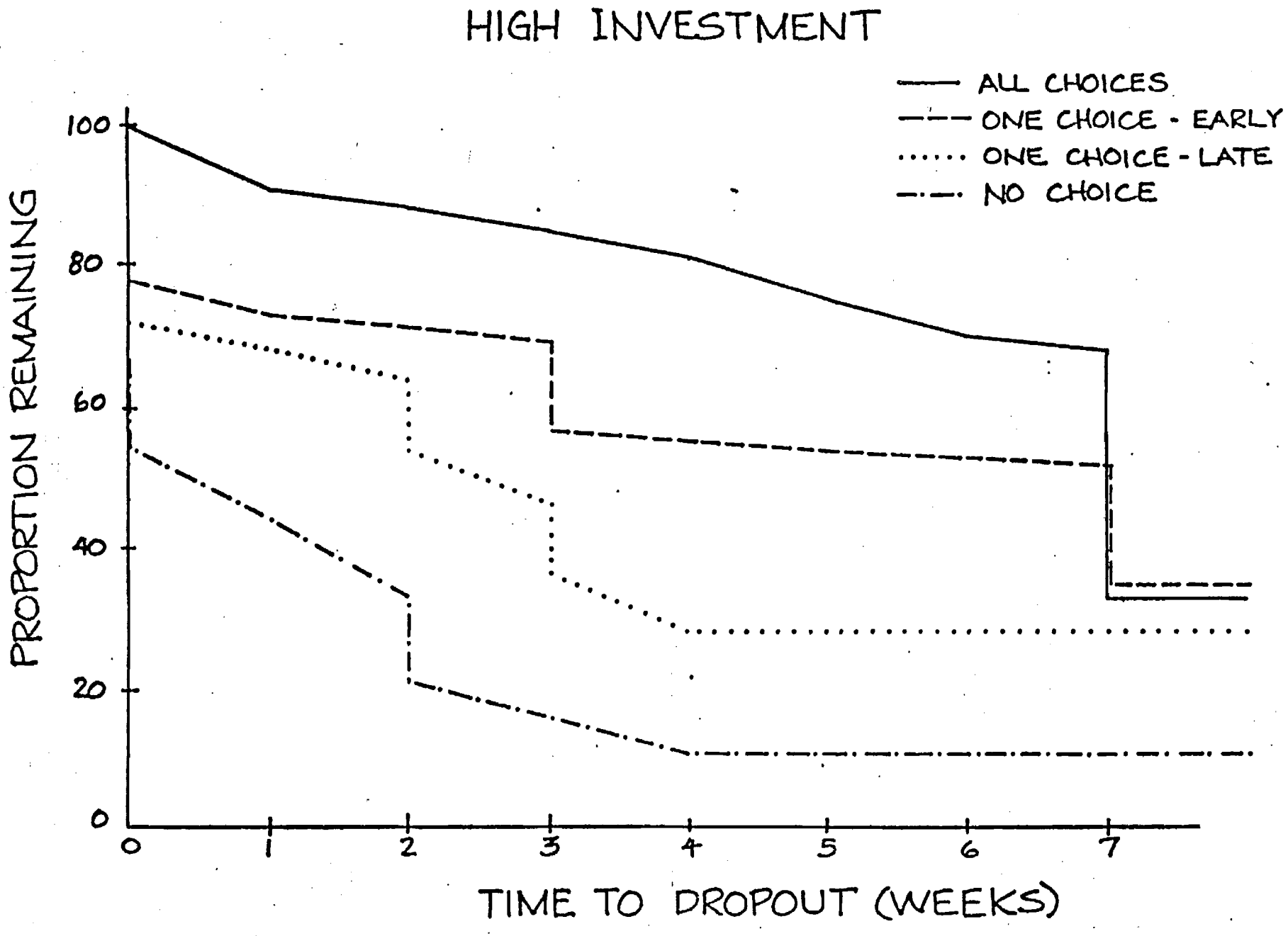

LOW INVESTMENT
ALL CHOICES
ONE CHOICE - EARLY
ONE CHOICE - LATE
NO CHOICE
PROPORTION REMAINING
100
80
60
40
20
0
0
1
2
3
4
5
6
7
TIME TO DROPOUT (WEEKS)

FIGURE 1 B


HIGH INVESTMENT
ALL CHOICES
ONE CHOICE - EARLY
ONE CHOICE - LATE
NO CHOICE
PROPORTION REMAINING
100
80
60
40
20
0
0
1
2
3
4
5
6
7
TIME TO DROPOUT (WEEKS)

Low Investment condition, paired comparisons among conditions revealed no significant effects for Choice (all p's>.37). A different picture emerged in the High Investment condition; subjects persisted in the course significantly longer in the All Choices and Once Choice Early conditions than in the No Choices condition (p<.05). Following from the confirmation of Hypothesis 1(b), subsequent analyses dealt with the effects of Choice only in the High Investment condition.

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insert Table 3 about here

Hypothesis 2 addressed the relationship between the number of choices made (before feedback became discouraging) and the amount of commitment evidenced. Persistence was not significantly greater in the All Choices condition than in either of the One Choice conditions (p's>.36). These results, together with inspection of the survival curves, suggest that the relationship between Choice and commitment is curvilinear rather than linear; Hypothesis 2(b) is supported.

Hypothesis 3 addressed the effects of a time lag between Choice and the onset of discouraging feedback. The survival curves for One Choice Early and One Choice Late did not differ significantly (p>.36). However, the One Choice Early condition did exhibit significantly greater persistence than the No Choice condition (p<.05), while the One Choice Late condition did not (p>.20). These results then provide only limited support for Hypothesis 3(a), that the longer the time lag between Choice and the onset of discouraging feedback the more commitment will be evidenced.

The fourth hypothesis related to the length of time that commitment sustains persistence. Hypothesis 4(b) was supported; inspection of the

Table 3

TIME TO DROP

Conditions	Paired Comparisons	Log Rank	Wilcoxon
Low Investment			
1=No Choice	1 v 2	.578	.618
2=One Choice Early	1 v 3	.725	.999
3=One Choice Late	1 v 4	.370	.399
4=All Choices	2 v 3	.889	.646
	2 v 4	.772	.908
	3 v 4	.599	.385
High Investment			
1=No Choice	1 v 2 *	.021	.044
2=One Choice Early	1 v 3	.236	.240
3=One Choice Late	1 v 4 *	.044	.044
4=All Choices	2 v 3	.366	.368
	2 v 4	.601	.354
	3 v 4	.129	.057

* indicates $p<.05$ for both logrank and Wilcoxon statistics

eight survival curves leaves no doubt that commitment does not endure unchanged in the face of repeated discouraging feedback. By the end of Week 13, fully 77% of all subjects had terminated their enrollment in the course. There were no significant differences by experimental condition in proportion of subjects remaining in the course after Week 13 ($p>.30$).

Subjects' ratings of the probability of getting a B in the course are shown in Figures 2(a) and 2(b). There were no significant differences in estimated probabilities of success by experimental condition ($p>.30$).

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insert Figure 2 about here

DISCUSSION

The results of the study described here provide some valuable additional insights into the relationship between choosing to engage in a course of action and feeling emotionally bound to pursue that course of action in the face of negative feedback.

One central finding of the study is that choice only affects commitment to a course of action (in the sense of being willing to persist in that course of action) when the choice has consequences. There is an important message here for the purveyors of participative decision-making: there are choices and then there are choices. An individual asked to take part in making a decision when it is clear that his or her voice has no effect on the outcomes may not feel committed to the decision. "Coopting" an individual therefore is not just a matter of getting him or her involved in the decision-making process; the involvement must be consequential from the individual's point of view. This may well fit Staw's (1981) observation

FIGURE 2 A

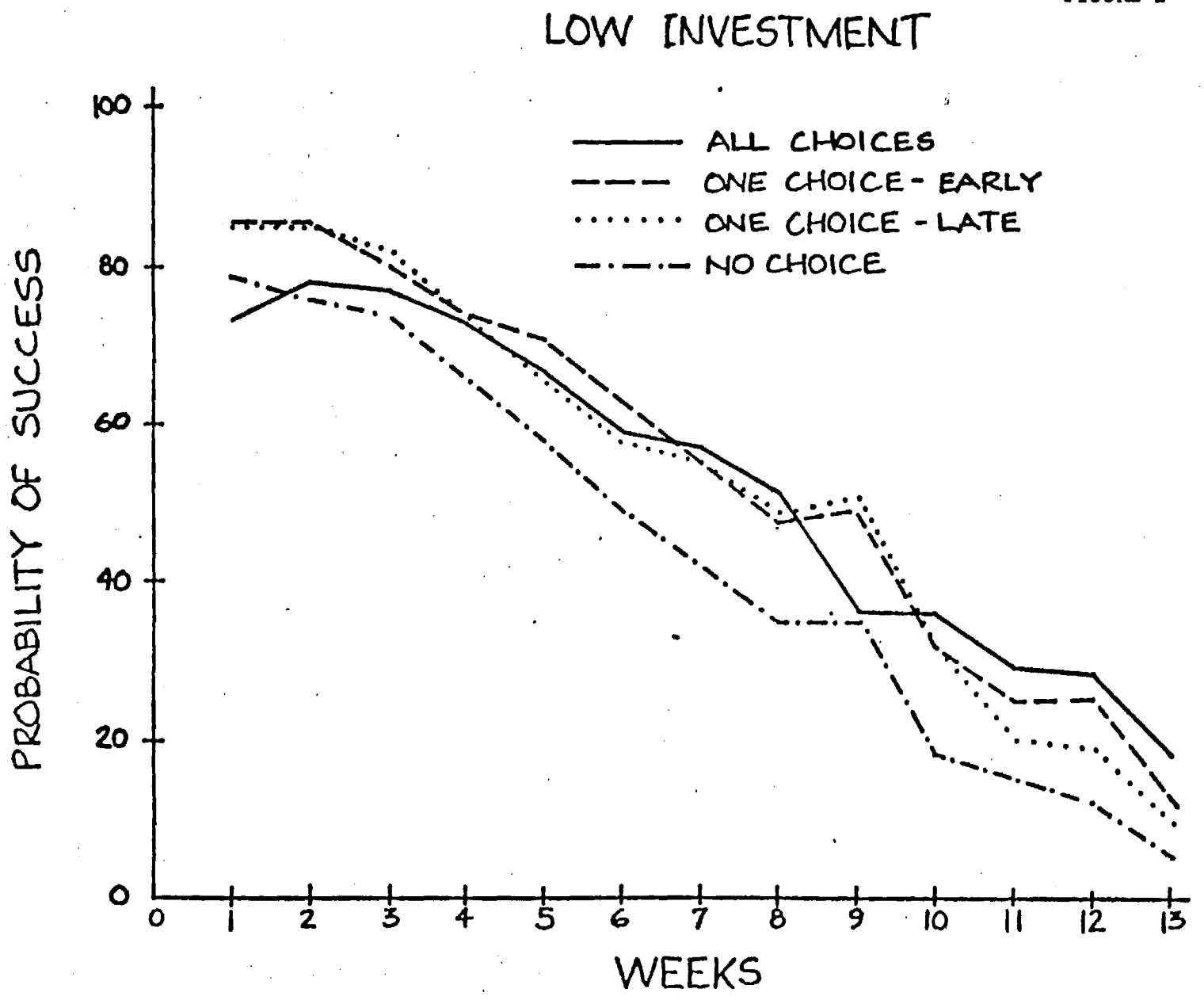
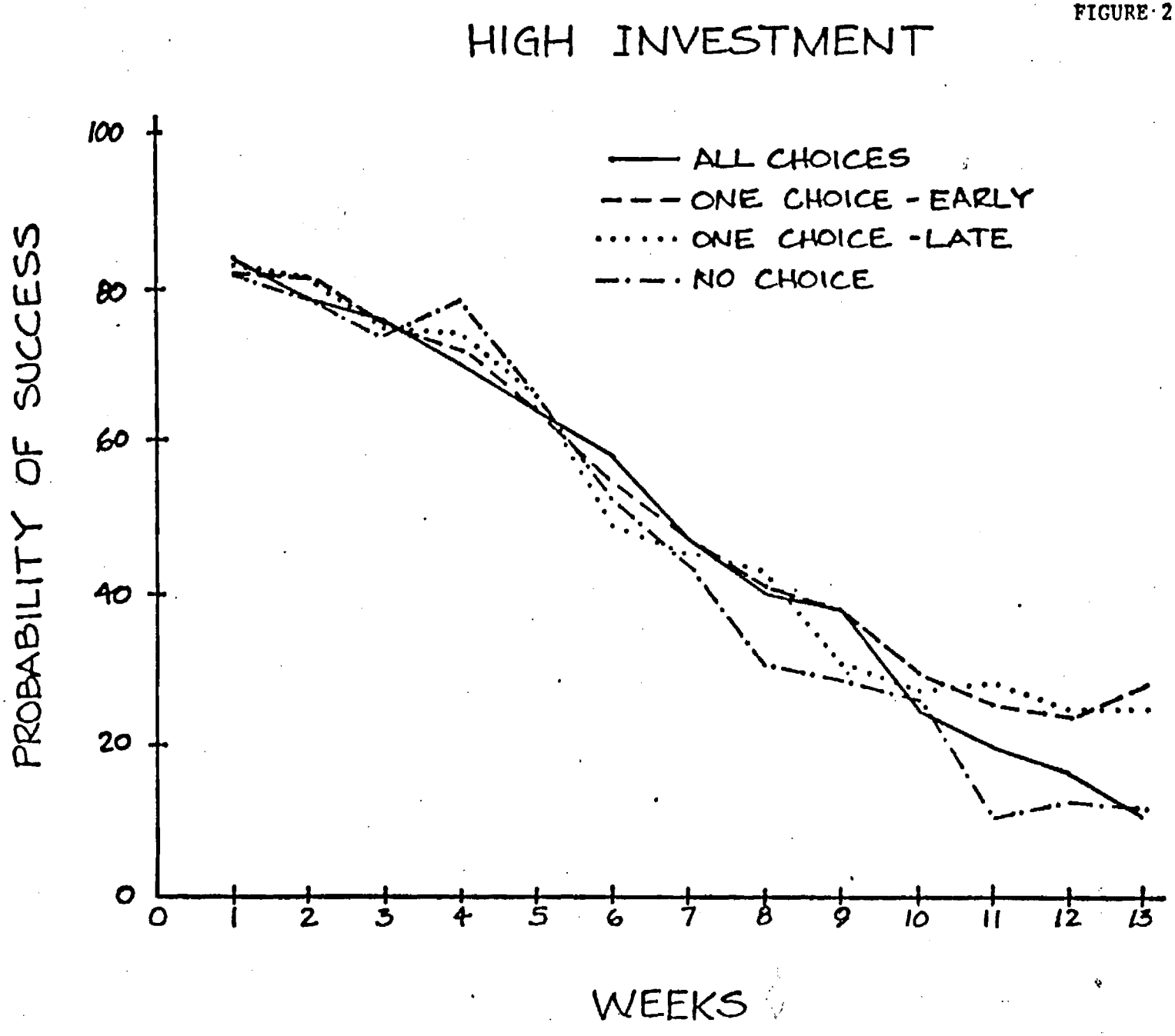

LOW INVESTMENT
ALL CHOICES
ONE CHOICE - EARLY
ONE CHOICE - LATE
NO CHOICE
PROBABILITY OF SUCCESS
100
80
60
40
20
0
0
1
2
3
4
5
6
7
8
9
10
11
12
13
WEEKS

FIGURE 2 B


HIGH INVESTMENT
ALL CHOICES
ONE CHOICE - EARLY
ONE CHOICE - LATE
NO CHOICE
PROBABILITY OF SUCCESS
100
80
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0
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13
WEEKS

that choice only fosters commitment when the choice entails responsibility for consequences.

On the other hand, the data from the present study also suggest that any involvement in a decision (if consequential) is involvement, as long as the involvement entails exercising choice once. Apparently the feeling of being responsible via choice need not be reinforced by repetition to influence behavior. One choice seems to generate the psychological binding almost as well as many choices. At a practical level, decision-makers should be warned that participation in only one consequential decision apparently induces stronger feelings of commitment than might be imagined, almost as strong perhaps as the feelings of someone who has "lived" with a decision for a while. In line with popular beliefs about prevention of "groupthink" (e.g., Janus, 1972), this conclusion warns against making "preliminary" judgments (and in favor of preliminary non-evaluative consideration of alternatives) before all the data are in on a question, lest a decision-makers feel trapped by any preliminary (albeit "non-binding") judgment.

The results of this study also clarify what it means (at a behavioral level) to say that someone is "committed" to a course of action. Often, commitment is used with the apparent denotation of irrational attachment to a course of action. The results of the study described in this paper belie this view of commitment; the persistence fostered by choosing to engage in a course of action decays in the face of negative feedback, indicating both a rational awareness and processing of the negative information. (Most subjects in this study "committed" to staying in the course by virtue of having chosen to do so eventually quit.) Thus, to the extent that commit-

ment entails some measure of irrational persistence or escalation, that irrationality is bounded; eventually the weight of the negative evidence takes its toll. It remains then as something of a puzzle that at the end of the study described here, some subjects persisted even in the face of seemingly overwhelming justification to quit. For these subjects, the irrational characterization of commitment may accurately describe their reaction to negative feedback, once having embarked on a course of action. It remains for future research to understand individual differences in this arena of investigation.

Finally, it is worth noting the implications of the "probability of success" data collected in this study. That there were no differences by experimental condition in perception of success probability, but nevertheless significant differences in persistence, suggests that choice need not result in some kind of motivated misperception to foster commitment. One popular interpretation of the "choice fosters commitment" notion is that being invested in a course of action via choice will influence perceptions of the world in a way that justifies the original choice, and persistence in that choice. In the present study, however, perceptions of success were the same even for groups of subjects whose reactions to those perceptions were quite discrepant. This suggests that motivated misperception, while perhaps sufficient for producing persistence to a previously chosen course of action, may not be a necessary condition. Thus, commitment may have less to do with how people see the world than with how those people choose to react to the world they see.

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FIGURE CAPTIONS

Figure 1. Proportion of subjects remaining in the course by time to dropout for (a) Low Investment and (b) High Investment conditions.

Figure 2. Subjects' estimated probability of success (getting a "B") by weeks for (a) Low Investment and (b) High Investment subjects.