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# Sunk Cost Effects: The Influences of Instruction and Future Return Estimates

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**Normative principles imply that decision makers' choices should be affected solely by the prospective future consequences of the options. Previous work, however, has demonstrated the occurrence of sunk cost effects, whereby decision makers are reluctant to abandon options in which they have made prior investments. The present research shows that, contrary to earlier findings, there exist conditions under which sunk cost effects are reduced significantly by instruction in pertinent economic principles. Additional findings indicate that sunk cost effects are mitigated by an important factor that is often present in real-world decision situations but omitted in most sunk cost research paradigms—explicit estimates of the future returns the given options might yield. Theoretical and practical implications are developed and discussed, including possibly common ambiguities about what normative sunk costs principles imply and how they should be applied.** 

Sunk cost effects are instances in which a decision maker's choices are affected by prior investments in the available options. Arkes and Blumer (1985) have provided two especially elegant demonstrations of such effects. Because they are such good illustrations of concepts explored in this article, we describe those demonstrations in some detail.

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Consider first what we might call the "Ski Trip Problem" (Arkes & Blumer, 1985, p. 126):

> Assume that you have spent $100 on a ticket for a weekend ski trip to Michigan. Several weeks later you buy a $50 ticket for a weekend ski trip to Wisconsin. You think you will enjoy the Wisconsin ski trip more than the Michigan ski trip. As you are putting your just-purchased Wisconsin ski trip ticket in your wallet, you notice that the Michigan ski trip and the Wisconsin ski trip are for the same weekend! It's too late to sell either ticket, and you cannot return either one. You must use one ticket and not the other. Which ski trip will you go on?

In this problem, note that, in terms of the anticipated enjoyment the trips themselves would bring, the trip to Wisconsin is better than the one to Michigan. Since there are apparently no other pertinent distinctions between the future consequence of the options, it seems "obvious" that anyone should pick the Wisconsin trip. Nevertheless, only 46% of Arkes and Blumer's subjects actually chose that option.

The second illustrative problem, which we will call the "Airplane Problem," has two versions. The first was as follows (Arkes & Blumer, 1985, p. 129):

> *Version A (Prior Investment)*: As the president of an airline company, you have invested 10 million dollars of the company's money into a research project. The purpose was to build a plane that would not be detected by conventional radar, in other words, a radar-blank plane. When the project is 90% completed, another firm begins marketing a plane that cannot be detected by radar. Also, it is apparent that their plane is much faster and far more economical than the plane your company is building. The question is: should you invest the last 10% of the research funds to finish your radar-blank plane?

The alternative form of the problem read like so (Arkes & Blumer, 1985, p. 129):

> *Version B (No Prior Investment)*: As president of an airline company, you have received a suggestion from one of your employees. The suggestion is to use the last 1 million dollars of your



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> research funds to develop a plane that would not be detected by conventional radar, in other words, a radar-blank plane. However, another firm has just begun marketing a plane that cannot be detected by radar. Also, it is apparent that their plane is much faster and far more economical than the plane your company could build. The question is: should you invest the last million dollars of your research funds to build the radar-blank plane proposed by your employee?

Implicitly, the prospective future consequences of spending the $1 million to develop a radar-blank plane are identical in both versions of the Airplane Problem. Nevertheless, while 85% of Arkes and Blumer's subjects who considered the Prior Investment version of the problem chose to finance the project, only 17% of those presented with the No Prior Investment version did so.

Results with the Ski Trip Problem are considered an instance of sunk cost effects because we are essentially told that, all else being the same, the Wisconsin trip definitely would be chosen over the Michigan trip (i.e., would be more "enjoyable"). But the greater prior investment (i.e., "sunk costs") in the Michigan trip apparently tips the scales in its favor for subjects. In the Airplane Problem, the comparison is more explicit. The earlier expenditure of $9 million in the Prior Investment version of the problem appears to be the only possible reason people are more inclined to make an investment in that version than in the No Prior Investment version. In each case, contrary to normative principles, decision makers' choices are greatly affected by prior commitments to one of the options, commitments that can have no influence on what the options would yield after the time the choice is made.

A host of explanations have been proposed for why sunk cost effects occur (cf. Brockner, 1992). For instance, Thaler (1980) argues that the character of sunk cost effects can be described at one level in terms of elements in Kahneman and Tversky's (1979) prospect theory. At a more fundamental, psychological level, Arkes and Blumer (1985) infer that a major contributor is the revulsion decision makers experience when they "waste" things, such as the investments they make in options that are abandoned before they yield positive returns. Such revulsion might reflect the internalization of folk wisdom drummed into people over the years (e.g., "Waste not, want not"). A related explanation is that decision makers dislike seeing themselves as the kind of people who undertake actions without good reason (Staw, 1981). Thus, they stick with options to which they have made initial commitments in the hope that eventual returns would allow them to feel justified in having made those commitments. It is significant that the involvement of other people appears to exacerbate such sunk cost effect factors (e.g., Fox & Staw, 1979). That is, decision makers not only seek to avoid appearing wasteful or arbitrary to themselves but also want to avoid creating that impression in others, especially when those others might reinforce their disdain by punitive actions, such as firing them from their jobs—regardless of the fairness or appropriateness of those actions.

The present research was intended to further enhance our understanding of sunk cost effects by evaluating the roles of two additional potential contributors. One such factor is instruction in the normative principles that prohibit sunk cost effects. The other is a feature that is often present in real-world situations in which the implications of sunk cost effects would be most serious—the existence of explicit estimates of future returns.

## STUDY 1: INSTRUCTION/APPLICATION CONGRUENCE

One reason some decision makers might exhibit sunk cost effects is that they have never been exposed to the normative principles prohibiting them. Arkes and Blumer (1985) sought to test this possibility. They presented different groups of student subjects with the Ski Trip Problem. Two groups consisted of psychology students who had and had not ever taken at least one college economics course. Another comprised students currently enrolled in such a course. In their text and lectures, all the students in this latter group had been exposed explicitly to the concept of sunk costs (and told why these costs should not affect decision makers' choices). There were virtually no differences among the groups in their trip selections and hence their susceptibility to sunk cost effects. In a related study, Larrick, Nisbett, and Morgan (1993) found that tested knowledge of cost–benefit reasoning (including "relevant costing," which precludes sunk cost effects) was related to the number of economics classes a student attended. But their results concerning the effects of economics training on actual sunk cost behavior were mixed.

What do such negative results mean? One possibility is that a substantial number of people simply reject sunk cost principles, whether formally instructed in them or not. Another is that, although many people accept the legitimacy of such principles, there are factors that prevent them from invoking those rules in situations where they actually apply. In particular, the principles might not even come to mind on those occasions. The results of an accountability study by Simonson and Nye (1992) agree with this conclusion. Decision makers are said to be "accountable" when they expect that at some point in the future they might be required to justify their decisions to other people. Simonson and Nye found that business students who presumably "knew" sunk cost principles at an intellectual level were significantly more likely to adhere to

them when they were accountable than when they were not. As Tetlock and Boettger (1989) have demonstrated, a consistent effect of accountability demands is that they encourage people to work hard and bring to mind considerations that do not occur to them immediately but which they believe to be appropriate, or at least convincing to others.

This latter line of argument suggests that the occurrence of sunk cost effects is at least partly due to characteristics of the problem situation. In particular, it might depend on whether situational features encourage the decision maker to call to mind and recognize the relevance of sunk cost principles. The present study tested the role of one such feature, the content of the choice problem and its congruence with the manner in which the decision maker is instructed in sunk cost principles. The approach used to test this proposition involved two different kinds of sunk cost problems and two different kinds of subjects. The subjects were either ordinary university students, on the one hand, or accounting students, on the other. Accounting students are particularly appropriate for testing the effectiveness of sunk cost instruction. That is because sunk cost principles are especially important in accounting and are duly emphasized as such in accounting curricula. For instance, in their popular, standard text, Horngren, Foster, and Datar (1994, p. 948) note that sunk costs are "Past costs that are unavoidable because they cannot be changed no matter what action is taken." In vivid business illustrations, Horngren *et al.* seek to convince the student that such costs are "irrelevant" in good managerial decision making.

### *Method*

*Subjects.* One hundred eighty-nine undergraduates from two universities in Singapore volunteered to participate in the study. Eighty-nine of them were accounting and business students with management accounting backgrounds (i.e., including knowledge of relevant costing or sunk cost concepts). The remaining 100 subjects were engineering, arts, science, and computer science students without management accounting experience. These subjects are henceforth referred to as "accounting" and "nonaccounting" subjects, respectively.

*Problems.* Two hypothetical decision problems were prepared. The first was a variant of Arkes and Blumer's (1985) Ski Trip Problem, which we will call the "Resort Problem." It concerned possible vacation trips to two different resorts not far from Singapore. The Resort Problem read as follows (where, as in all problems discussed here, the currency is Singapore dollars):

> Assume that you have spent $52 on a ticket for a weekend trip to Batam. Several weeks later you buy a $26 ticket for a weekend trip to Desaru. You think you will enjoy the Desaru trip more than the Batam trip. As you are putting your just-purchased Desaru trip ticket in your wallet, you notice that the Batam trip and the Desaru trip are for the same weekend! It's too late to sell either ticket, and you cannot return either one. You must use one ticket and not the other. Which trip will you go on?

In addition to their choices, subjects were also asked to state reasons for those choices.

The second decision problem was what we will call the "Mobile Phone Problem," and had two versions. It is modeled closely on Arkes and Blumer's (1985) Airplane Problem and in form is representative of cases used in other studies of sunk cost effects in financial investment decisions (e.g., Conlon & Garland, 1993; Garland & Newport, 1991). The "Prior Investment" version of the Mobile Phone Problem read as follows:

> Assume you are the director of "Innovation Pte Ltd." Your company has embarked on R & D for a new product—a mobile phone that allows communication to be made within 500 miles. You have already spent $7m on the project and would require an additional $3m to complete it. At this point in time, one of your competitors has come out with a superior mobile phone that is lighter and that can communicate within 1000 miles. As the director of the company, would you continue to invest the additional $3m to complete the project?[1]

The "No Prior Investment" version of the Mobile Phone Problem was identical except that it excluded the statement that the subject had already spent $7 million on the project. As before, subjects were asked to state both their choices and their rationales.

*Procedure.* Every subject was asked to respond to the Resort Problem. Each of approximately half the subjects (41 accounting and 50 nonaccounting) also was randomly assigned to respond to either the Prior Investment version or the No Prior Investment version of the Mobile Phone Problem.

### *Results and Discussion*

Table 1 describes subjects' responses to the Resort Problem. A sunk cost effect is indicated by the selection of the trip to Batam, in which the subject made a greater prior investment of $52 rather than only $26. Observe that the incidence of sunk cost effects was substantial; more than 55% of the subjects picked the Batam trip. For present purposes, the important feature of these results is that there was no difference in the incidence of sunk cost effects for accounting and nonaccounting subjects ($\chi^2 < 1.0$). This result is reminiscent of what Arkes and Blumer (1985) found in their comparison of economics and noneconomics students.

[1] Presumably, the only way the decision maker could sell any of the inferior phones being developed is if they were priced lower than the competitor's product.

**TABLE 1**
**Study 1: Frequencies (Percentages) of Resort Selections by Accounting and Nonaccounting Subjects**

| Resort selected (prior investment) | Subject group | | Total |
|---|---|---|---|
| | Accounting | Nonaccounting | |
| Batam ($52 investment) | 48 (53.9%) | 56 (56.0%) | 104 |
| Desaru ($26 Investment) | 41 (46.1%) | 44 (44.0%) | 85 |
| Total | 89 | 100 | 189 |

Table 2 displays subjects' decisions about investing $3 million to develop a new product in the Mobile Phone Problem. First consider the nonaccounting subjects. Observe that when they had been told that they had already spent $7 million on the mobile phone development project, 80% of these subjects chose to invest the $3 million needed to bring the project to completion. This preference pattern was reversed when the subjects were not told of such a prior investment, $\chi^2$ (1, $N$ = 50) = 17.53, $p < .001$. Thus, it appears that the nonaccounting subjects were affected by sunk costs in both the Resort Problem and the Mobile Phone Problem. Interestingly, one popular reason cited by subjects justifying continued investment in the mobile phone development project was that they hoped to recoup the prior costs they had incurred.

Now consider the choices of the accounting subjects for the Mobile Phone Problem. These subjects were much less likely than the nonaccounting subjects to invest in the new phone. Most importantly, however, in contrast to what occurred with the Resort Problem, the accounting subjects did not exhibit strong sunk cost effects with the Mobile Phone Problem. Observe that the tendency to invest in the project was not significantly different according to whether or not there had been a prior investment in the project ($\chi^2 < 1.0$).

A logistic regression analysis yielded results consistent with the previous $\chi^2$ analyses. The analysis was performed with subjects' investment choices (invest vs do not invest) as the dependent variable and subject group (accounting vs nonaccounting), previous investment (prior investment vs no prior investment), and the subject group-by-previous investment term as independent variables. For the full model, $\chi^2$ (3) = 19.76, $p < .001$. Previous investment had a significant effect on subjects' choices (Wald statistic = 14.75, $p < .001$), while the effect of group membership was nonsignificant (Wald statistic = 0.53, $p = .47$). Most importantly, the group-by-previous investment interaction was significant (Wald statistic = 5.91, $p < .02$).

In summary, the results of Study 1 indicate that instruction in sunk cost principles *can* reduce the incidence of sunk cost effects. Perhaps more significantly, however, the data imply that the effects of such instruction are not universal. Instead, whether instructed decision makers exhibit sunk cost effects depends on the nature or context of the decision problem. In the present study, when subjects were confronted with an "everyday" personal decision task, the Resort Problem, they were disposed to display sunk cost effects regardless of their prior exposure to sunk cost principles.[2] But when instructed subjects were faced with a "business" decision task, similar to those used in standard methods of teaching sunk cost concepts to accountants, they were much less likely to be affected by sunk costs.

## STUDY 2: ESTIMATED RETURNS

Reexamine Arkes and Blumer's (1985) Airplane Problem and its isomorph, Study 1's Mobile Phone Problem. One feature of each of those problems that is uncharacteristic of real-life business proposals is that there is no explicit mention of projected returns. Research on sunk cost effects has been of great interest partly because of their potential implications for what happens in actual business practice. Thus, it is important to determine the extent to which such effects occur in situations that are highly faithful to the conditions of ultimate interest. Study 2 was intended to address

[2] It is also perhaps noteworthy that accounting subjects exhibited sunk cost effects on the everyday problem despite the request for rationales, which Simonson and Nye (1992) have shown should reduce these effects for knowledgeable individuals.

**TABLE 2**
**Study 1: Frequencies (Percentages) of Mobile Phone Investment Choices by Accounting and Nonaccounting Subjects**

| Choice | Subject group | | | | | |
|---|---|---|---|---|---|---|
| | Accounting | | | Nonaccounting | | |
| | Prior investment | No prior investment | Total | Prior investment | No prior investment | Total |
| Invest | 9 (37.5%) | 5 (29.4%) | 14 | 16 (80.0%) | 6 (20.0%) | 22 |
| Do not invest | 15 (62.5%) | 12 (70.6%) | 27 | 4 (20.0%) | 24 (80.0%) | 28 |
| Total | 24 | 17 | 41 | 20 | 30 | 50 |

this fidelity question with specific reference to the provision of estimates of returns.[3]

A priori, why might we expect explicit return estimates to influence sunk cost effects? In order for any particular aspect of a decision situation (e.g., sunk costs) to affect a decision, that factor must be "important" in two different ways. It must first have what Yates (1990, p. 367) describes as "effect importance." A dimension that distinguishes decision alternatives from one another has effect importance if, assuming that the decision maker notices them, the decision maker reacts to variations along that dimension. This is the form of importance implicit in multiattribute utility theory (cf. Keeney & Raiffa, 1976; von Winterfeldt & Edwards, 1986). There, for instance, if value is represented by an additive utility function, and if Dimension X is more important than Dimension Y, it is assigned a larger weight in that function.

The above conditional phrase, "assuming that the decision maker notices them," implicates the second form of importance distinguished by Yates (1990, p. 376), "inclusion importance." If the decision maker never even acknowledges the existence of a particular dimension, then the decision maker cannot possibly respond to that dimension. Effect importance is guaranteed to be nil in such a case because the dimension is not included in the decision maker's cognitive representations of the options. An aspect dimension is said to have a high degree of inclusion importance to the extent that there is a high probability that it will be acknowledged by the decision maker; inclusion importance is nil if the probability of recognition is zero. It is worth noting that inclusion importance is the variety of significance entailed in decision schemes like Tversky's (1973) well-known elimination-by-aspects (EBA) model. In the EBA model, an aspect is considered important if it has a good chance of being sampled on a given cycle in the decision process.

Previous research, including Study 1 (for nonaccounting subjects), has established that, under the given, restricted conditions, sunk costs have considerable effect importance. But suppose that the situation is more realistic in the sense of including other features that are present in many practical decision situations. The literature provides no assurance that, in competition with those other features, sunk costs would exhibit the level of inclusion importance that would permit them to achieve the same degree of effect importance manifested in earlier studies. In other words, it is quite possible that sunk cost effects would be lessened.

[3] Heath (1995) also argued for the specification of future benefits in sunk cost studies. His emphasis, however, was on demonstrating how decision makers can inappropriately de-escalate prior investments when informed of future benefits. Moreover, Heath's design did not permit conclusions about the issues addressed here.

*Method*

*Subjects.* As in Study 1, the participants in this study were undergraduates at two universities in Singapore who either did or did not have experience in managerial accounting courses. There were 48 accounting subjects and 50 nonaccounting subjects.

*Problem.* The problem considered by subjects was a variant of the Mobile Phone Problem of Study 1. The only difference was that the new "Projected-Sales Mobile Phone Problem" included estimates of future sales, whereas the original made no mention of expected sales. Following is the Prior Investment form of the problem:

> Assume you are a director of "Innovation Pte Ltd." Your company has embarked on R & D for a new project—a mobile phone that allows communication to be made within 500 miles. However, at this point in time, one of your competitors has already come out with a superior mobile phone that is lighter and that can communicate within 1000 miles. At this stage, you decide to commission a market research project on the new project. Key data extracted from the report are presented below:
>
| Costs Incurred to Date | Expected Future Costs | Expected Sales |
|---|---|---|
| \$7m | \$3m | \$8m |
>
> Will you continue to invest the additional \$3m to complete the project?

The No Prior Investment version of the problem was the same except that there was no mention of the costs incurred to date.

*Procedure.* Subjects were randomly assigned to respond to either the Prior Investment or the No Prior Investment version of the Projected-Sales Mobile Phone Problem.

*Results and Discussion*

Table 3 shows the pertinent results, subjects' choices for the Projected-Sales Mobile Phone Problem. Accounting subjects once again failed to exhibit sunk cost effects on this business-type problem, reinforcing the conclusions of Study 1; the percentages of decisions to invest in developing the new phone did not differ significantly according to whether or not subjects had made prior investments in the project ($\chi^2 < 1.0$). The choices of the nonaccounting subjects were the ones most pertinent to the present issue. Recall from Table 2 that when nonaccounting subjects were presented with the original Mobile Phone Problem that made no mention of future sales, 80% of those with prior investments in the project chose to fund the project, whereas only 20% of those who had not made prior investments expressed that preference. Here we see that the provision of an explicit projection of future sales dramatically reduced that differential. In this study, the difference in the percentages of decisions to fund the de-

**TABLE 3**

**Study 2: Frequencies (Percentages) of Mobile Phone Investment Choices by Accounting and Nonaccounting Subjects Provided with Explicit Projections of Future Sales**

| | Subject group | | | | | |
|---|---|---|---|---|---|---|
| | Accounting | | | Nonaccounting | | |
| Choice | Prior investment | No prior investment | Total | Prior investment | No prior investment | Total |
| Invest | 15 (62.5%) | 12 (50.0%) | 27 | 21 (80.8%) | 16 (66.7%) | 37 |
| Do not invest | 9 (37.5%) | 12 (50.0%) | 21 | 5 (19.2%) | 8 (33.3%) | 13 |
| Total | 24 | 24 | 48 | 26 | 24 | 50 |

velopment of the new phone was nonsignificant, $\chi^2$ (1, $N = 50$) = 1.29, $p < .38$.

A logistic regression analysis was performed, with subjects' choices in the Projected-Sales Mobile Phone Problem as the dependent variable and subject group (accounting vs nonaccounting), previous investment (prior investment vs no prior investment), and the interaction term for these factors as the independent variables. Neither subject group nor previous investment entered the regression significantly. Most notably, the interaction term was nonsignificant as well, implying that both the accounting and the nonaccounting subjects failed to manifest sunk cost effects. A similar logistic regression analysis was performed on the responses of subjects in both Study 1 and Study 2, with the provision of projected sales as well as terms for the corresponding two-way and three-way interactions as additional independent variables. Of particular relevance here was that the three-way interaction term was significant (Wald statistic = 7.61, $p < .01$), confirming the reduction of sunk cost effects when nonaccounting subjects were given explicit sales estimates.

## GENERAL DISCUSSION

In summary, the present studies showed the following. First, they confirmed previous indications that instruction in sunk cost principles often has no impact on decision makers' susceptibility to sunk cost effects. But more importantly, they also demonstrated that such instruction *can* influence decision behavior if there is a close correspondence between the given decision problem and the manner in which the original instruction took place. In addition, the present research indicated that, even among decision makers uninstructed in sunk cost principles, sunk cost effects are substantially reduced when decision problems include one particular feature that is often entailed in real, practical decision problems—explicit estimates of future returns.

What is the significance of these results? First, consider the instruction findings. In general, why might instruction in sunk cost principles affect—or fail to affect—the extent to which decision makers exhibit sunk cost effects? Several possibilities suggest themselves:

(a) *Awareness:* As suggested previously, one reason people might display sunk cost effects is that they are ignorant of principles that argue against the role of sunk costs in decision making. Instruction would make them aware of these principles. Such instruction could be ineffective because a given decision maker might either misunderstand the principles or simply forget them completely; the instruction might not "take."

(b) *Acceptance:* Even if a decision maker is aware of arguments that sunk costs should have no role in decisions, the decision maker could reject those arguments. Instruction in sunk cost principles might succeed with such individuals because it breaks down the decision maker's resistance to the arguments, perhaps by reinforcing them with additional ones. Conversely, instruction could fail because the decision maker concludes that counterarguments supporting the legitimacy of the role of sunk costs in choice are more compelling than the so-called normative rules. An example might be arguments concerning the involvement of other people (see Curley, Yates, & Abrams, 1986, for a discussion of similar considerations concerning ambiguity). The decision maker might be convinced personally that ignoring sunk costs is a sensible thing to do. But suppose that the people surrounding the decision maker (e.g., supervisors and peers) hold beliefs to the contrary. Then, if those other individuals observe the decision maker ignoring sunk costs, they might lower their opinion of the decision maker accordingly. And, to the extent that their options (and consequent actions) have greater significance than the adverse consequences of sunk cost effects per se, the decision maker quite appropriately *should* allow his or her choices to be affected by sunk costs.

(c) *Attention:* In a given decision situation, many different considerations might compete for the decision maker's attention. Thus, although the decision maker might be aware of sunk cost principles and also accept them, at the moment of choice, those principles might not come to mind. Instead, principles that support the

consideration of sunk costs (e.g., maxims like "Waste not, want not") might capture the decision maker's attention. Instruction in sunk cost principles might be effective (or ineffective) to the extent that it increases (or fails to increase) the relative probability that normative sunk cost principles would be called forth.

The present research has established that instruction is not always ineffectual. But it is impossible to draw definitive conclusions about exactly which of the above factors (or others) account for the observed pattern of successful and unsuccessful instruction; a priority of future research should be to discriminate among these possibilities. (Of course, there might well be multiple contributors to the pattern.) Nevertheless, the present results do suggest that attention will prove to have some role. For instance, suppose that decision principles are brought to mind according to association principles that rely on the similarity between a given decision problem and previous problems where particular principles were applied. Then we should certainly expect to observe effects like those seen here, whereby accounting subjects tended to follow sunk cost principles on business problems resembling those on which they had been instructed, but not on everyday problems quite different from them. The extensive literature on transfer processes in learning and problem solving is consistent with this conclusion (e.g., Reeves & Weisberg, 1994; Vander Stoep & Seifert, 1994). That literature indicates that people seldom spontaneously generalize what they learn in one domain (e.g., investment problems deliberated in an accounting course) to situations that, although formally equivalent, have very different surface features (e.g., vacation choice problems pondered in one's living room). More often, attention must be directed pointedly (e.g., by a teacher) to the correspondences between the new and original situations.

One potential explanation of Study 2's results on explicit return estimates entails related, though different, attentional mechanisms. In any given decision situation, there are likely to be a multitude of considerations the decision maker could take into account. Most studies on judgment and decision making have been experimental. That research has rigorously and convincingly demonstrated that various factors (including sunk costs) are *capable* of influencing people's behavior. But it is a separate issue whether particular factors *will* influence that behavior in the "wild and woolly" uncontrolled real world, where numerous contributing factors compete with one another for the decision maker's recognition. Study 2 showed that when one particular decision consideration—projected returns—was simply mentioned (and not even manipulated), the influence of sunk costs was weakened, plausibly because, in part, it reduced the amount of attention directed toward sunk costs. We suspect that such interactions are not uncommon in real life.

But there is another potential account for what happened with many subjects in Study 2. And this account raises some especially interesting theoretical and practical issues. Consider two different approaches to analyzing the Projected-Sales Mobile Phone Problem of Study 2. For convenience, we reproduce the previously displayed summary of the Prior Investment version of the problem, along with a similar summary of the No Prior Investment form:

Prior Investment Version:

| Costs Incurred to Date | Expected Future Costs | Expected Sales |
|---|---|---|
| $7m | $3m | $8m |

No Prior Investment Version:

| Costs Incurred to Date | Expected Future Costs | Expected Sales |
|---|---|---|
| [$0m] | $3m | $8m |

Let us first examine the "total cost approach." According to this strategy, we consider all the costs and projected revenues of each option in a given problem and select the alternative that has the greater net returns, i.e., total revenue minus total costs. So, in this case,

$$\text{Net} = -\text{Costs Incurred to Date} - \text{Expected Future Costs} + \text{Expected Sales.}$$

For the Prior Investment version of the problem, the net for the "Invest" option is

$$\text{Net(Invest)} = -\$7\text{m} - \$3\text{m} + \$8\text{ m} = -\$2\text{m},$$

and for the "Don't Invest" alternative, we have

$$\text{Net(Don't Invest)} = -\$7\text{ m} - \$0\text{m} + \$0\text{m} = -\$7\text{m}.$$

The decision should be dictated by the difference

$$\Delta = \text{Net(Invest)} - \text{Net(Don't Invest)} = \$5\text{m},$$

which, since it is positive in this case, implies that the Invest option should be picked. For the No Prior Investment version of the problem, the pertinent quantities are

$$\text{Net(Invest)} = -\$0\text{m} - \$3\text{m} + \$8\text{m} = \$5\text{m}$$
$$\text{Net(Don't Invest)} = -\$0\text{m} - \$0\text{m} + \$0\text{m} = \$0\text{m}$$

and

$$\Delta = \text{Net(Invest)} - \text{Net(Don't Invest)} = \$5\text{m},$$

which, exactly as before, indicates that the decision

maker should (continue to) invest in the development of the new phone.

Now let us consider the "marginal cost approach." This strategy is the same as the total cost approach except that the prior costs are omitted from the analysis. Thus, the relevant quantities for the Prior Investment form of the Projected-Sales Mobile Phone Problem are

$$\text{Net(Invest)} = -\$3\text{m} + \$8\text{m} = \$5\text{m}$$

$$\text{Net(Don't Invest)} = -\$0\text{m} + \$0\text{m} = \$0\text{m},$$

yielding

$$\Delta = \text{Net(Invest)} - \text{Net(Don't Invest)} = \$5\text{m}$$

and a decision to invest. The calculations—and decision—are identical for the No Prior Investment version of the problem.

What is the point of this exercise? First, it is conceivable that the mere presence of estimates of future returns induces some decision makers to perform intuitive (if not formal) analyses essentially equivalent to normative ones like those described above. Such analyses might serve to dampen sunk cost effects. This could occur partly because such explicitness disabuses decision makers of the kinds of rationales articulated by subjects in Study 1, that further investment might allow them to "recoup" initial losses.

Another reason for discussing this analytic approach is that we can expect many observers—including researchers—to believe that the marginal cost method is the correct, "normative" approach, while the total cost method is not. That is because the marginal cost method excludes prior costs at the outset, but the total cost method does not. However, the marginal and total costs methods are *both* instantiations of the normative strategy and are, in fact, equivalent to each other. Note, in particular, that quantities that are common to the two options simply disappear in the calculation of the differences in the net returns in either approach. (Incidentally, a similar analysis of Arkes and Blumer's (1986) Airplane Problem with plausible estimated returns, e.g., $.5 million provides a completely parallel illustration; the only difference is that the common indicated decision would be "Don't Invest.")

The present demonstration makes us realize that sunk cost effects probably should not be conceptualized as simply a matter of "recognizing" vs "ignoring" sunk costs per se. The phenomena that have been observed must rely on other considerations. One is the decision maker's personal responsibility for making the initial expenditures in a project. As Northcraft and Wolf (1984) remind us, almost every project entails a "start-up" period when costs outstrip income. Only later is the venture capable of generating revenue, in order to cover costs or anything else. Nevertheless, at any point in the project's life cycle, it is in the decision maker's interests to weigh the relative merits of alternative uses for available resources, for further commitment to the current project or for investment in new, competing opportunities. Sunk cost effects must rest on the decision maker's perception of special incentives to commit those resources to the project already in progress. A need to be or appear nonwasteful seems to be one such incentive. Avoiding the wrath of (unreasonable?) superiors who would consider project abandonment a "black mark" against the person who initiated the project could well be another (cf. Horngren *et al.*, 1994, pp. 406–407).

We should also mention a plausible form that the *inappropriate* consideration of sunk costs is likely to assume. Recall that, in either version of the Projected-Sales Mobile Phone Problem, the decision maker is presented explicitly with the costs and estimated sales associated with only one of the alternatives, the "Invest" option. In a proper analysis, as outlined above in total and marginal cost formats, the costs and sales for the "Don't Invest" alternative must be derived also. But, as Northcraft and Neal (1986) have shown, people tend to overlook opportunities that are not overtly presented to them. Thus, we could well expect many decision makers to perform a flawed analysis involving only the costs and income for the option that is concretely displayed. In the present case, a decision maker like this who also acknowledges prior costs would note that

$$\text{Net(Invest)} = -\$7\text{m} - \$3\text{m} + \$8\text{m} = -\$2\text{m}$$

implies a loss for the Invest option and hence decline it. On the other hand, if such a single-option focused decision maker is one who ignores previous expenditures (i.e., sunk costs), the analysis would yield

$$\text{Net(Invest)} = -\$3\text{m} + \$8\text{m} = \$5\text{m},$$

a projected profit, which would encourage *acceptance* of the Invest alternative. (Interestingly, the Airplane Problem does not share this ability of the Projected-Sales Mobile Phone Problem to discriminate decision makers who do and do not acknowledge sunk costs in this way.)

Do the present results imply that sunk cost effects are less common in real life than we might have suspected, because revenue forecasts are customary in business? A survey by McCarthy, Schoorman, and Cooper (1993) seems to cast doubt on such a conclusion. That study found, for instance, that entrepreneurs who personally started new businesses were more inclined

to make increased second-year investments in those businesses than entrepreneurs who acquired their companies by other means (e.g., purchase). We are not (yet) convinced that the present findings and those of McCarthy *et al.* (1993) necessarily contradict each other; further empirical work is required to find out. The main reason for our caution is that, although proposals for *new* businesses invariably include revenue projections, it is unclear that such projections are as routine for *continued*-investment decisions, e.g., for the second year on. Indeed, it is not implausible that an entrepreneur who has personally established a given business would be less inclined to make or request such projections than would an entrepreneur who bought the business from someone else. Further, perhaps the most important practical implication of findings like those here is that revenue forecasts should *always* be demanded on a continual basis and no matter how and by whom an enterprise was initiated.

## REFERENCES


Arkes, H. R., & Blumer, C. (1985). The psychology of sunk cost. *Organizational Behavior and Human Decision Processes,* **35,** 124–140.

Conlon, D. E., & Garland, H. (1993). The role of project completion information in resource allocation decisions. *Academy of Management Journal,* **36,** 402–413.

Curley, S. P., Yates, J. F., & Abrams, R. A. (1986). Psychological sources of ambiguity avoidance. *Organizational Behavior and Human Decision Processes,* **38,** 230–256.

Fox, F. V., & Staw, B. M. (1979). The trapped administrator: Effects of job insecurity and policy resistance upon commitment to a course of action. *Administrative Science Quarterly,* **24,** 449–471.

Garland, H., & Newport, S. (1991). Effects of absolute and relative sunk costs on the decision to persist with a course of action. *Organizational Behavior and Human Decision Processes,* **48,** 55–69.

Heath, C. (1995). Escalation and de-escalation of commitment in response to sunk cost: The role of budgeting in mental accounting. *Organizational Behavior and Human Decision Processes,* **62,** 38–54.


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Horngren, C. T., Foster, G., & Datar, S. M. (1994). *Cost accounting: A managerial emphasis.* Englewood Cliffs, NJ: Prentice Hall.

Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica,* **47,** 263–291.

Keeney, R. L., & Raiffa, H. (1976). *Decisions with multiple objectives: Preferences and value tradeoffs.* New York: Wiley.

Larrick, R. P., Nisbett, R. E., & Morgan, J. N. (1993). Who uses the cost-benefit rules of choice?: Implications for the normative status of microeconomic theory. *Organizational Behavior and Human Decision Processes,* **56,** 331–347.

McCarthy, A. M., Schoorman, F. D., & Cooper, A. C. (1993). Reinvestment decisions by entrepreneurs: Rational decision-making or escalation of commitment? *Journal of Business Venturing,* **8,** 9–24.

Northcraft, G. B., & Neale, M. A. (1986). Opportunity costs and the framing of resource allocation decisions. *Organizational Behavior and Human Decision Processes,* **37,** 348–356.

Northcraft, G. B., & Wolf, G. (1984). Dollars, sense, and sunk costs: A life cycle model of resource allocation decisions. *Academy of Management Review,* **9,** 225–234.

Reeves, L. M., & Weisberg, R. W. (1994). The role of content and abstract information in analogical transfer. *Psychological Bulletin,* **115,** 381–400.

Simonson, I., & Nye, P. (1992). The effect of accountability on susceptibility to decision errors. *Organizational Behavior and Human Decision Processes,* **51,** 416–446.

Staw, B. M. (1981). The escalation of commitment to a course of action. *Academy of Management Review,* **6,** 577–587.

Tetlock, P. E., & Boettger, R. (1989). Accountability: A social magnifier of the dilution effect. *Journal of Personality and Social Psychology,* **57,** 388–398.

Thaler, R. (1980). Toward a positive theory of consumer choice. *Journal of Economic Behavior and Organization,* **1,** 39–60.

Tversky, A. (1972). Elimination by aspects: A theory of choice. *Psychological Review,* **79,** 281–299.

Vander Stoep, S. W., & Seifert, C. M. (1994). Problem solving, transfer, and thinking. In P. R. Pintrich, D. R. Brown, & C. E. Weinstein (Eds.), *Student motivation, cognition, and learning: Essays in honor of Wilbert J. McKeachie* (pp. 27–49). Hillsdale, NJ: Erlbaum.

von Winterfeldt, D., & Edwards, W. (1986). *Decision analysis and behavioral research.* New York: Cambridge Univ. Press.

Yates, J. F. (1990). *Judgment and decision making.* Englewood Cliffs, NJ: Prentice Hall.