SUNK COSTS AT AN INDIVIDUAL LEVEL:
THE ROLE OF RESPONSIBILITY

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Joel Schiltz
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SUNK COSTS AT AN INDIVIDUAL LEVEL:
THE ROLE OF RESPONSIBILITY

By

Joel Schiltz

this thesis has been approved for

the Department of Psychology and

the College of Arts and Sciences of Ohio University

Claudia Gonzalez-Vallejo
Associate Professor of Psychology

Leslie A. Flemming
Dean, College of Arts and Sciences
The sunk cost effect is defined as an increased tendency to continue investing in an endeavor once a previous amount of money, effort, or time has been expended. The current experiments attempted to identify individual differences, as well as situational factors that affect this decision bias. A theoretical model was proposed, and support was found for the existence of two constructs related to the ultimate choice to re-invest. Participants’ ratings of the potential success of the project were strongly related to their decision to continue the endeavor, while their ratings of responsibility for the initial choice had a smaller, yet significant relationship with the investment rating. Variables contributing to these constructs were also investigated. Mixed results were found for the existence of individual differences among decision-makers in sunk cost decision tasks.

Approved:

Claudia Gonzalez-Vallejo

Associate Professor of Psychology
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Introduction

The Economics of Sunk Costs

Decisions do not take place in a vacuum. An extraordinary amount of information is now available to offer advice, recommendations, or data to anyone who has an important choice to make. For example, research and development directors must not only decide what new products to invest in, they also must evaluate feedback and choose whether or not they should continue investing in projects that are currently underway. It has been well demonstrated that when faced with these types of decisions, decision makers often succumb to the sunk cost effect (Arkes & Ayton, in press; Arkes & Blumer, 1985; Arkes & Hutzel, 1999; Bornstein & Chapman, 1995; Brockner, Nathanson, Friend, Harbeck, Samuelson, Houser, Bazerman, & Rubin, 1984; Garland & Newport, 1991; Garland, 1990; Rubin & Brockner, 1975; Schaubroeck & Davis, 1994; Tan & Yates, 1995; Thames, 1996). The sunk cost effect is defined as an increased tendency to continue investing in an endeavor once a previous amount of money, effort, or time has been expended (Arkes & Blumer, 1985).

The most notorious example of this bias took place in 1984, when William Catacosinos became CEO of the Long Island Lighting Company (LILCO), and was forced to decide the fate of the Shoreham nuclear power plant (Ross & Staw, 1993). Eighteen years earlier the company began construction of the facility, with the expectation that the project would cost $75 million. However, by the time Catacosinos took over experts had already advised LILCO that power plant would fail. Estimates for completion of the plant had risen to $4.1 billion, and the new CEO publicly admitted that the plant was a mistake and the company should abandon the project. However,
Catacosinos went on to say that they would continue to fund the construction of the plant because they had invested so much in it already (Ross & Staw, 1993). In 1988, LILCO finally abandoned the project after spending $5 billion. The plant never generated any power because the company could not afford to open it, and LILCO eventually sold the Shoreham nuclear power plant for one dollar.

The sunk cost bias is in clear violation of economic theory, which states that only the cost and benefits of the possible outcomes should be considered when making a decision. In sunk cost situations, such as the Shoreham nuclear power plant, the decision is clearly not tied solely to the possible outcomes, but rather motivated by the prior investment. Despite being warned by experts that the plant would not be successful, LILCO continued to invest in Shoreham.

The sunk cost effect is not only demonstrated in business decisions that span years and billions of dollars, it can also be witnessed in routine situations where negative feedback is more immediate. For example, Staw and Hoang (1995) studied the effects of sunk cost in the National Basketball Association by testing if the team’s investment in a player affected the opportunities a player was afforded as well as their longevity on the team. A team’s investment was determined by the order the players were selected in the college draft, with an earlier pick representing a larger investment by the team. It was assumed that in the competitive sporting environment, players’ longevity and playing time would be judged by their performance on the court. However, Staw and Hoang (1995) found considerable evidence that teams granted more playing time and retained their most highly drafted players longer, even after controlling for players’ performance, injuries, trade status, and position played (Staw & Hoang, 1995).
Influencing Variables in Sunk Cost Situations

There has been considerable research across disciplines into the occurrence of the sunk cost phenomenon. This research has been invaluable in helping to understand these decisions by identifying many variables and factors that affect the sunk cost phenomenon. The following aspects of a decision are among the most scrutinized in this line of research: a) the proportion of the total budget already expended, b) the amount of the incremental cost to continue the investment, c) the scenario or context of the decision, d) the assignment of responsibility for the initial decision, e) the probability of the success of the project, and f) the degree of completion of the project.

a) Proportion of total budget expended. Studies have shown a positive monotonic relationship between the proportion of the total budget already spent and the decision to continue investing (Garland & Newport, 1991; Garland, 1990; Thames, 1996; Arkes & Blumer, 1985). This manipulation has been the most frequently studied and demonstrated in sunk cost literature.

Garland (1990) gave subjects research and development scenarios in which 10%, 30%, 50%, 70%, or 90% of a $10 million budget had already been invested. One group of subjects indicated the likelihood of investing all the remaining funds to the project; a second group indicated the likelihood of investing the next $1 million dollars of the budget. Garland found that in both groups the sunk cost effect increased monotonically with the proportion of the budget already invested. However, the mean likelihood of continuing the endeavor was the same in the “allocate the next $1 million” group ($M=52.00$) as in the “invest the remaining budget” group ($M=51.95$). This means that the amount of money to be allocated after the initial negative investment did not affect the
investment decision, rather subjects made their decisions based on the proportion of their budget that had been expended.

b) **Incremental cost of the continuing investment.** The incremental cost of a decision to re-invest has been shown to be unrelated to the pattern of sunk cost decisions (Arkes & Blumer, 1985; Garland, 1990; Garland & Newport, 1991). Garland and Newport (1991) manipulated the absolute and relative magnitudes of a continuing investment independently across four different decision conditions. Subjects completed four decision tasks where the total budget for the continued investment was either $10K or $90K, and the proportion of money already invested was either 10% or 90% of the total budget. Consistent with the previous findings, they showed that the proportion of the total budget already expended had a significant impact on subjects’ reported likelihood of committing additional funds. The total amount of money, or the incremental costs of continuing the investment, did not impact the probability of continuing the endeavor (Table 1).
Table 1

Average Reported Probability of Continuing with Course of Action Across Four Conditions of Sunk Cost Amount and Proportion

(Adapted from Garland & Newport, 1991, p. 63)

<table>
<thead>
<tr>
<th>Sunk Cost Proportion</th>
<th>Incremental Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low</td>
</tr>
<tr>
<td>Low</td>
<td>.340</td>
</tr>
<tr>
<td>High</td>
<td>.605</td>
</tr>
<tr>
<td>Combined</td>
<td>.473</td>
</tr>
</tbody>
</table>

c) Scenario/Context of the decision. Sunk cost has been shown to be consistently present across scenarios and decision tasks (Arkes & Blumer, 1985; Garland & Newport, 1991). In a landmark study by Arkes and Blumer (1985), subjects fell prey to the sunk cost bias when making decisions as the head of an airline company (business context), when deciding about weekend vacations (social context), and when making decisions about their expenditure on dinner (personal finance context). The authors also demonstrated the pervasiveness of this phenomenon by eliciting the effect outside of a laboratory. In an attempt to demonstrate the sunk cost effect in a more realistic setting, Arkes and Blumer provided discounts to subscribers for the Ohio University Theater season in 1982-1983. The first 60 people who bought season tickets were randomly assigned into one of three discount levels: 1) full price ($15), 2) $2 discount, or 3) $7 discount. The two discount groups were told that they received a lower price because of
a promotion being run by the theater department. The group that purchased the theater tickets at normal price used more tickets during the first half of the season than either of the discounted groups. This is a real world example of the sunk cost effect, as economic theory states that only present costs associated with attending each performance should have affected their attendance. Once the patrons had purchased their tickets the price should no longer enter into their decision about attending plays. The authors contend that this demonstration of the sunk cost effect is noteworthy because the effect lasted through the first half of the theater season (6 months).

d) **Assignment of responsibility for the initial investment.** Another common topic found in sunk cost literature is the subjects’ responsibility for making the initial decision to invest in an endeavor. When the subject is responsible for the first investment, he/she is more likely to continue investing in the failed plan of action (Arkes & Blumer, 1985; Bazerman, et al., 1982; Bazerman, et al., 1984; Conlon & Parks, 1987; Garland, & Newport, 1991; Schaubroeck & Davis, 1994; Schoorman, Mayer, Douglas, & Hetrick, 1994; Staw, 1976; Staw, 1981; Staw, Barsade, & Koput, 1997).

Bazerman, Beekun, and Schoorman (1982) studied the effect of personal responsibility when rating an employee who had negative performance data. They demonstrated that when rating recently promoted employees who received poor performance reviews, evaluators responsible for the promotion rated the employee more positively than if their predecessor made the decision. Those responsible for the promotion gave better evaluations and higher rewards to the employee, as well as making more optimistic projections of future work.
In a follow up to the 1982 study, Bazerman, Guiliano, and Appelman (1984) tested to see if the responsibility manipulation would have the same effect on groups as it did on individuals. Subjects were either assigned to the “group” condition, in which they were part of a managerial committee consisting of three other participants, or they were assigned the task as an individual. Responsibility was manipulated within both the group and individual samples, and the subjects were asked what percentage of a $20 million research budget they would allocate towards the already failing endeavor. The authors found a main effect for responsibility, while presence in a group did not affect the decision to continue the investment. They concluded that decision making groups are as likely to be influenced by prior responsibility as an individual when assessing a sunk cost task.

e) **Probability of success of the project.** Another variable that influences the investment decision is the person’s beliefs that they will see a gain as the result of a continued investment. Garland, Sandefur, and Rogers (1990) eliminated the sunk cost effect by including information about the opportunity for a positive outcome. Expert geologists were told that they had originally received a $1 million budget and enough acreage to drill 5 oil wells. The cost for drilling each well was $200K, and the number of dry, non-oil producing wells already drilled on the land was manipulated within-subjects (1-4). The geologists were asked to rate the likelihood (1-100) that they would continue drilling given the prior number of dry wells. They were also asked to estimate the probability of successfully discovering oil (1-100). As the number of dry wells increased, the subjects were not only less willing to continue searching for oil, but they
also estimated that there was less of a chance to discover oil on the land (Garland et al., 1990). (See Table 2)

Table 2

Responses to Dependent Measures Across Four Dry-Well Conditions

(Adapted from Garland et al., 1990, p.724)

<table>
<thead>
<tr>
<th>Condition</th>
<th>Probability of continuing drilling</th>
<th>Probability of well producing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>One dry well</td>
<td>.653</td>
<td>.355</td>
</tr>
<tr>
<td>Two dry wells</td>
<td>.308</td>
<td>.318</td>
</tr>
<tr>
<td>Three dry wells</td>
<td>.274</td>
<td>.297</td>
</tr>
<tr>
<td>Four dry wells</td>
<td>.139</td>
<td>.192</td>
</tr>
</tbody>
</table>

As can be seen in Table 2, the geologists’ reported likelihood of discovering oil is correlated with their action to continue drilling. The lack of a sunk cost effect in this study is clearly a function of the subjects’ perceived lack of opportunity to profit from the investment as the number of dry wells increased. In other words, if a subject is certain he/she will lose their investment they are likely to stop their commitment to the endeavor. Conversely, as demonstrated in a study by Tan & Yates (1995), if a subject is certain he/she will receive a gain, he/she is likely to continue investing.
Similar to the Garland and Conlon study, Tan & Yates were able to alter the typical sunk cost pattern by including return estimates; this time by informing decision makers they would profit. More specifically, the inclusion of this information led the non-responsible decision makers to choose to invest at the same rate as those who were told they had made the initial choice. Knowing the expected sales made the subjects more willing to invest, because they were confident that they would gain a profit from the project.

f) **Degree of completion of the project.** One variable that appears to be closely aligned to the perceived success is the degree of completion of the project. In fact, it has been shown that the degree of completion, as opposed to the previous investment, is the driving factor in decisions in the studies by Garland and Conlon (1993) and Garland and Conlon (1998). Garland and Conlon (1998) argue that in many sunk cost scenarios, as the project progresses, completion itself begins to take precedence over the sunken investments. In this experiment, the degree of completion and the amount invested were independently manipulated in a two-by-two design. Subjects were asked to rate the likelihood that they would allocate the next $2 million of a possible $10 million loan to a long-standing client whose place in the market was declining. The scenario described the project as being either 20% or 80% complete, and having sunk either $2 million or $8 million into the investment. Whether participants had invested $2 million or $8 million did not make a difference in terms of the sunk cost bias. There was no effect for the proportion of the budget already expended; it was the degree of project completion that led subjects to continue lending to the company (See Table 3).
Table 3

The Effects of Sunk Cost and Project Completion on Resource Allocation in the Bank Manager Sample

(Adapted from Garland & Conlon, 1998, p. 2032)

<table>
<thead>
<tr>
<th>Project Completion</th>
<th>20%</th>
<th>80%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sunk Cost</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$2 million</td>
<td>.663</td>
<td>.772</td>
</tr>
<tr>
<td>$8 million</td>
<td>.563</td>
<td>.760</td>
</tr>
</tbody>
</table>

The authors contend that as progress moves forward, completion of the project itself takes an increasing precedence over other goals (i.e. economic profit) (Garland & Conlon, 1998). Thus, the effect of the proportion of the budget invested was not observed in this experiment, because the subjects’ beliefs about the degree of completion of the project matter most. In most sunk cost studies subjects are not informed of the degree of completion, therefore, they rely on the amount of money invested to ascertain how close the project is to being finished. When information about the degree of completion is included, subjects cease to rely on the previous investment data, and make their decision based on project completion (Garland & Conlon, 1998).

**Theoretical Explanations of the Sunk Cost Effect**

Prospect theory (Kahneman & Tversky, 1979) has been used as the explanation of the sunk cost phenomenon by Whyte (1986), Thaler (1980), and Zeelenberg and Van
Dijk (1997). The prospect theory value function represents the relationship between gains and losses and the value associated with the outcome. (See Figure 1)

The reference point (point A) identifies the neutral or initial location of a decision maker. When a subject enters an investment decision scenario it is assumed they are at the reference point. After an unsuccessful investment, the decision maker moves to point B and becomes risk seeking. Since the value function is convex below the reference point, further losses do not result in a large negative value for the subject, whereas an equivalent gain would result in a large positive value. Therefore, a decision maker at point B will be risk seeking, and hence more likely to continue the investment because they are risking small losses in value compared to the opportunity for much larger gains. Subjects facing the reinvestment decision in a sunk cost scenario are at point B, which explains why they are more willing to make a risky investment than subjects who have not already invested in the endeavor (subjects at point A) (Arkes & Blumer, 1985).
Another way that prospect theory can account for the sunk cost effect is by the certainty effect. When subjects have been told that they have invested time, money, or effort into a project they are more likely to continue investing because the decision to cease funding to the project would result in a certain loss of the initial investment. According to Kahneman & Tversky (1979) a certain loss is weighed very heavily; therefore, subjects tend to reinvest in the project in an attempt to avoid the unfavorable certain loss.

While recognizing the merits of explaining this bias with Prospect Theory, Arkes and Blumer (1985) proposed the wastefulness hypothesis, which they believed led to a better understanding of this phenomenon. They suggested that subjects are averse to
wasting what they have already invested; therefore they attempt to salvage their investments by continuing with the endeavor. In one of their experiments, Arkes and Blumer had subjects consider the choice between two identical TV dinners. Subjects were told that they had purchased a TV dinner on sale for $3 on their way home, but later invited a friend over to eat dinner and watch a movie and had to return to the store to purchase another meal. Unfortunately, all of the on-sale TV dinners were gone and they were forced to pay $5 for the identical meal. Upon returning home, the subjects began preparing the meals, only to find out that their friend was ill and could not come over for dinner. Since both of the dinners were fully cooked and neither could be saved, subjects were told they must eat one dinner and discard the other. Based on traditional economic theory, since the meals were identical, there should be no preference; however, 24% of the subjects reported that they would eat the more expensive meal. The authors contend that many subjects made the choice of the more expensive meal because throwing the $5 meal away would seem more wasteful than throwing the $3 meal away.

Other studies have indicated that the sunk cost bias might be a learned trait (Bornstein & Chapman, 1995; Arkes & Ayton, 1999). Bornstein & Chapman (1995) suggest that decision-makers may continue investing in a failing endeavor for three reasons: 1) the opportunity to learn a lesson, 2) as punishment for a bad decision, and 3) the desire to appear to be a consistent decision-maker. In their study, Bornstein & Chapman (1995) had subjects rate the quality of reasons that people should continue or quit cello lessons after they no longer have an interest. The experimenters presented the subjects with five choices to rate: 1) the lessons should continue so there will not be a waste of time or money, 2) the lessons should continue so that the student learns to be
more careful in their decisions, 3) the lessons should continue to punish the student for making a bad choice, 4) the lessons should continue because if it was the right decision when it was originally made than it is still the right decision, and 5) the lessons should cease so the student will not waste any more time or money (Bornstein & Chapman, 1995). The results demonstrated that subjects who chose to continue a failing endeavor justified their decision by stating they were teaching themselves, or a separate decision maker, a lesson. This response was heightened when an adult had an opportunity to teach a child a lesson. This suggests that children learn, as a rule, that they should continue what they started and not waste their initial investment.

More recently, Arkes and Ayton (1999) have compared proclivity for the sunk cost bias between humans and animals. In lower animals, this tendency has been named the Concorde fallacy, and when examining this effect a distinction is drawn between what constitutes a previous investment and the future costs and benefits. While in human decision scenarios sunk costs are easy to recognize as previous investments are well defined, understanding what constitutes a previous investment for animals is not as clear. Trivers (1972) proposed that a prior investment in animals could be understood and measured through their parental investment. A parental investment is considered to be any action by the parent that increases an offspring’s chance of surviving and reproducing (i.e., defending the nest or feeding the young), at the cost of the parent’s ability to invest in other offspring.

Utilizing the notion of parental investments, a study by Maestripieri and Alleva (1991) supports the lack of the sunk cost effect in animals by investigating the litter defense behavior of female albino mice when a male intruder was introduced. The mice
were assigned to one of four groups, with the number of children in the litter manipulated. In the first group each litter was culled to 4 pups at birth, while in the second group each litter was culled to 8. The third group consisted of litters culled to 8 pups at birth; however, 3 hours prior to the introduction of the intruder, 4 of the 8 pups were removed. The fourth group was identical to the third, except that the removed pups were returned to the litter after 10 minutes. Male intruders were introduced into the female’s nest, and her reactions were recorded. An attack (or defense of the litter) was defined as the pursuit of the male mouse by the female, resulting in physical contact typically in the form of bites to the back. The results of the study showed that the mothers of 8 pups defended their litters more vigorously than the mother of 4 pup litters. Of the two groups of females who defended litters of 4 pups, there was no difference in the level of aggression toward the intruder, even though one of the groups had invested twice as much energy while raising 8 pups. Thus, the parental investment was not the determining factor in the voracity of litter defense; rather it was the expected benefits.

In their review of the sunk cost effect and the Concorde fallacy, Arkes and Ayton (1999) contend that young children and animals are less affected by previous investments than adults. They attribute the lack of the sunk cost effect in these populations as an unawareness of the “don’t waste” rule. According to the Bornstein and Chapman (1995) learning theory, these populations would not have learned this rule; therefore it is unlikely that they would demonstrate this irrational behavior. However, as children learn these lessons through teaching and experience, they are more likely to apply them in their decision tasks later in life.
Another explanation for the sunk cost effect is cognitive dissonance or self-justification (Bazerman et al., 1984; Brockner, 1992; Caldwell, & O’Reilly, 1982; Schoorman & Holahan, 1996; Simonson & Staw, 1992; Staw, 1976; Staw & Ross, 1989). This theory states that the mechanism underlying the continued investment of funds in a failing endeavor is an attempt to make the previous decision appear rational. When facing an investment that is losing money, subjects decide to reinvest in the endeavor as a way of justifying the original investment decision. The self-justification effect is heightened when subjects are responsible for the initial investment decision.

*Individual Level Variables and the Sunk Cost Bias*

The research and theories discussed in the previous sections demonstrate that the sunk cost bias is a robust, but still not fully understood phenomenon. In addition, most of the research has focused on demonstrating this bias at a group level, while very little has been done to understand individual differences.

One goal of this paper was to determine if there is consistency within individuals when dealing with sunk cost decision tasks, and to attempt to identify the characteristics of the subject as well as the task that influence the final decision. Most previous studies have not examined the consistency of sunk cost at an individual level. The studies that have been interested in individual level variables have primarily investigated the role of education (or expertise) on the likelihood of succumbing to sunk costs. Even though these studies have focused on differences between individuals, they have been unable to provide definitive results about their targeted effect - financial education. Typically, studies have found that general instruction in economics does not lessen the sunk cost effect (Arkes & Blumer, 1985; Conlon & Parks, 1987; Garland & Newport, 1991).
However, Tan and Yates (1995) provided an anomaly to this trend by showing that accounting students are less susceptible to this bias when they are presented with decisions in a business scenario. While the economically educated students did not commit the sunk cost bias in business scenarios, these same subjects were as likely to demonstrate the sunk cost effect in personal situations as were students with no economic background. In other words, even though Tan and Yates found some evidence for individual differences, there have been no definitive findings about individual level variables and their affect on the sunk cost effect. The main question is: do the same people consistently choose the sunk cost option while others consistently avoid it?

*Individual Differences*

The present study develops a theoretical framework, based on individual level variables, to understand the sunk cost bias. The sunk cost bias may not be as pervasive as it seems, rather it may be that some individuals are more prone to it than others, and external factors may further influence this tendency. While the bias has been consistently demonstrated in many studies, only a certain percentage of the participants actually choose the sunk cost option. For example, in the Arkes and Blumer (1985) study on TV dinner choices, only 24% of the subjects reported that they would eat the more expensive dinner. While this is not the majority of the total sample, it represents a group of people who perhaps are more prone to succumb to this bias.

There is precedence for individual differences in the area of risk taking. In a study by Slovic (1972), participants had to evaluate a series of choices between two gambles. Subjects were asked to chose which gamble they would prefer to play for real money, and later they were asked to set a minimum selling price for each of the gambles.
Over thirty-eight decision tasks participants performed remarkably consistently. The gambles were divided into odds and evens, and the reliability for choosing the riskier bet between the two-halves of the test was .90. Similarly, the split-half reliability for setting the selling prices was .97. Slovic suggests that the consistency within subjects provides evidence of reliable individual differences in risk taking propensity.

A previous study (Kogan and Wallach, 1967) provides further support for these individual differences by demonstrating that there are groups of people who behave consistently in risky situations. This led researchers to investigate if certain personality traits could be associated with different preferences for risk. Koziellecki (1975) hypothesized that in risk-taking decisions there are three factors that affect the decision-making process: 1) external factors (characteristics of the situation), 2) personality factors (responsibility), and 3) extra-task factors (such as appreciation for an organization). However, further studies have led to the belief that only personality and environmental agents have an affect on the decision (Daniel & Dropova, 1979; Sarmany, 1977).

To test the influence of personality factors on risk taking behavior, Ivan Sarmany (1977) gave 41 operators in the chemical industry a battery of tests. The tests included an assessment of risk taking behavior as well as measures of personality traits, including responsibility, conscientiousness, anxiety, self-assurance, and perseverance. The subjects were divided into groups based on their tendency to take risks, which was a measure of the way in which the decision makers assimilate the possible gains versus the degree of risk of the option. The author then compared these groups in terms of the personality measures and found that the greatest difference between the groups was in terms of responsibility. Subjects who displayed a high risk-taking tendency were found to be
non-responsible, whereas, subjects with a low risk-taking tendency were defined as responsible. He concluded that personality factors play a large role on the extent to which an individual was willing to take risks.

Considering the existence of research that has tied individual differences to decision-makers’ choices, it is curious that this topic has not been investigated further in sunk cost studies. As responsibility has been shown to be related to risk-taking, and it is a key component of sunk cost decisions, logically it is an issue which bears some investigation. Therefore, the present studies sought to incorporate the notion of individual differences, specifically responsibility, in the overall understanding of the sunk cost effect. The proposed relationship between individual differences and situational factors is detailed in Figure 2.

Figure 2 identifies the variables and relationships that represent the theoretical framework. In the figure, circles represent constructs, squares represent observed variables, and arrows represent relationships among variables.
In Figure 2, the investment decision depends on two factors: the subjective personal responsibility for the decision, and the subjective expected potential future gain. The present studies focus on understanding the relationship between each subjective latent variable and the decision. In addition, external factors were systematically manipulated in order to test the joint effect of the latent variables and these external factors.

**Personal Responsibility**

When dealing with sunk costs, most studies have focused on the external factors of the scenario with little regard for personality differences among the subjects. One particularly relevant way in which individuals differ is their level of responsibility for a decision task, which is a feeling of responsibility for the outcome of their decisions. Many sunk cost studies have dealt with the issue of responsibility, and found an external manipulation of this variable to be important; however, no one has yet identified if the personality trait of responsibility plays a role in the investment decision in a similar way as it does in other risk-taking scenarios.

Figure 3 displays the relationships of interest with regards to the personal responsibility construct. It is expected that the responsibility personality trait that has been shown to be a factor in risk taking behavior will also be a factor in sunk cost decisions. Higher levels of this responsibility trait should lead to higher ratings of personal responsibility and therefore a heightened likelihood of reinvesting. However, this is not the only factor that influences how personally responsible a decision-maker feels (See Figure 3); rather, as Kozielecki (1975) has shown, external factors work in
concert with personality traits to influence the decision maker. Thus, it is believed that subject’s personal responsibility state is anchored by their responsibility trait level, but that this anchor is shifted when there is an external manipulation of responsibility in the scenario. As in previous research, making decision-makers responsible for the problem will lead to a heightened likelihood of continuing with the failing endeavor.

Studies have shown that responsibility is an important personality trait when assessing risk-taking behavior. A responsible decision maker is defined as one who shows a ready willingness to accept the consequences of his/her own behavior, who has a sense of commitment to the decision he/she makes, who is dependable, and who possesses integrity (Gough, McCloskey, & Meehl, 1952). In general, it has been found that characteristically more responsible individuals take fewer risks in an attempt to minimize their potential losses (Daniel, & Dropova, 1979; Morris, 1975; Sarmany, 1977; Weekes, 1993).
However, while this personality trait is expected to be a constant and an anchor for subjective personal responsibility, the relationship between responsibility and risk taking is dynamic. While Slovic (1972) found that there are consistent individual differences in risk taking propensity, he also found that when the two measures of risk assessment used in his study were compared, the mean inter-task correlation was .46. Slovic argued that even though the correlation between the two risk taking indices was large enough to suggest inter-task generality, the modest size of the variance accounted for suggests that situational differences also have a large effect on risk-taking propensity.

The importance of situational differences has been supported by a lack of convergent validity within a variety of risk taking measures. Slovic (1964) contends that a factor underlying the lack of consistency of the “risk relevant” measures is the multidimensionality of the concept. He argues that there are many factors that contribute to the assessment of risk, and that measures may be tapping these factors differently.

The lack of convergent validity between these situations may stem from the way that risk is perceived and how this relates to the decision makers’ responsibility. In some situations, a certain amount of risk may be expected or even desired, whereas in other situations risk is avoided. For example, a mutual fund manager is expected to take a certain amount of risk in order to provide a gain. It would not be responsible if the fund manager did not take any risks (i.e. put the holdings in a money market account) because the fund would not make money, and the manager could lose his/her job. Similarly, a responsible manager should not make too many risky investments because this could result in a loss of money. The relationship between responsibility and risk in this fund manager situation is different than in a situation that involves a life or death decision. In
a life or death scenario, it is considered more responsible to minimize the risk of death. A person who participates in activities that seemingly increase this risk is said to be irresponsible. The difference in these two situations illustrates the point that the relationship between responsibility and risk varies depending on the potential outcome of the risky endeavors. An individual with a certain level of responsibility would be risk seeking in one situation, but may be risk averse in another.

Since the perception of risk, and its relationship to a responsible decision, vary in different situations, it is necessary to define risk within a situation to gain an understanding of what a responsible decision maker would do. In sunk cost situations, understanding which option is more risky is difficult. The classic way that risk has been identified in sunk cost scenarios stems from Kahneman and Tversky’s Prospect Theory (1979). They argued that when decision makers are in a loss frame, they will be risk seeking and therefore choose to gamble. Applied to sunk cost scenarios, once the initial investment has been made and negative feedback received, decision makers are shifted into the loss frame. Based on the large expected value of potential gains once in the loss frame, according to Prospect Theory these decision makers will demonstrate risk seeking behavior; therefore choosing to continue the endeavor is seen as risk seeking.

However, a second definition exists that identifies risk based on the chance or probability of suffering a loss (Costello, 1991). According to this view, the less risky option is the one that gives the decision maker the best opportunity to minimize their losses. In terms of a traditional sunk cost decision task, ceasing the endeavor is a sure loss of the original investment. Reinvesting becomes the less risky, and more
responsible, option because it allows decision makers that opportunity to minimize their
losses. Therefore, choosing to continue the project is seen as the risk averse alternative.

Schaubroeck and Davis (1994) have supported the notion that decision makers in
sunk cost scenarios are actually risk averse. They illustrated this point by providing
subjects with alternative investment options. In their study, subjects were faced with a
sunk cost decision in which they could continue the investment or allocate the funds to
another project. The two alternatives were each presented with an assessment of risk that
was defined by an expert estimate of the probability of a technological advance. The
authors found that when subjects were responsible for the initial decision, they preferred
the less risky of the investment options, regardless of whether or not it was the original
investment. Participants who were not responsible for the initial investment
demonstrated no risk preference or proclivity for reinvestment. The different patterns
among the responsible and non-responsible subjects indicate that when decision makers
are responsible for the initial investment, they will attempt to minimize risk and therefore
be risk averse.

This finding is similar to the conclusions that have been drawn in the risk-taking
research previously reviewed. When faced with a decision in which there are several
options of varying risk, the responsible decision maker is likely to choose the option that
will minimize losses and increase the opportunity for gains. In a sunk cost decision task,
the only way to limit losses (and to potentially receive a gain) is to continue with the
endeavor. Therefore, it is argued here that responsible decision-makers fall prey to the
sunk cost bias more frequently than non-responsible decision makers because they are
attempting to limit their losses.
The concept of an intrinsic responsibility trait that affects participants’ decisions has not been addressed in the past and cannot be easily incorporated into the theories that have been used to explain sunk cost decisions. For example, Prospect Theory is unable to deal with individual differences, because it assumes that all decision makers have value functions as shown in Figure 1. If the responsibility trait does influence investment decisions, Prospect Theory would not be able to account for this effect without addressing reference point shifts at an individual level. The inability of Prospect Theory to account for individual differences in sunk cost is similar to its inability to account for different patterns of reflection in a recent study by Gonzalez-Vallejo, Reid, and Schiltz (2003). The reflection effect is defined as a switch from risk aversion in gains to risk seeking in losses. This standard definition of the reflection effect is well accounted for by Prospect Theory, but recently a reverse reflection effect has been found, with decision makers shifting from risk seeking in gains to risk averse in losses. In the study by Gonzalez-Vallejo et al., the occurrence of various reflection patterns was related to subject’s risk taking propensity. It is unclear how Prospect Theory can explain the different patterns, and since the occurrence of this pattern was related to the risk-taking propensity, this provides further support that Prospect Theory may be insufficient.

In addition, if the intrinsic responsibility trait is a factor in investment decisions, the proposed theoretical framework provides a better explanation for this effect than the wastefulness hypothesis, self-justification, or the learning theory. All of these theories attempt to explain the underlying causes behind the demonstration of the sunk cost effect; however, neither the wastefulness hypothesis nor self-justification can explain why some decision makers are influenced by a previous investment while others are not. Similarly,
the learning theory is unable to explain why some individuals learn and use this rule while others do not. Identifying participant’s responsibility trait aids in the explanation and prediction of this effect at the individual level.

These theories may be valid descriptions of the motivation to continue investing, but the foundation of these explanations lies in the responsibility of the decision maker. Specifically, it is possible that the aversion to waste and the need to justify one’s failing decisions are behaviors that are a manifestation of the decision maker’s responsibility trait. This intrinsic responsibility is what children learn through experience, and it develops into a constant personality trait. Therefore, decision makers who have a high intrinsic responsibility, and are more likely to commit the sunk cost bias, will display these behaviors, while decision makers with a low intrinsic responsibility, those who ignore a previous investment, will not. By knowing the intrinsic responsibility of participants, it may be possible to accurately predict who will commit the sunk cost effect.

*Subjective Potential Gain*

The subjective potential gain construct represents subjects’ perceived likelihood of profiting if they reinvest in the failing endeavor (See Figure 2). Evidence suggests that when subjects are told the expected return profit of continuing the investment, the sunk cost effect can be lessened (Tan, & Yates, 1995). Tan and Yates conducted two experiments in which they presented subjects with a typical sunk cost scenario, having either $7 million or $0 previously invested in a mobile phone program. Subjects were told that a competitor had completed a mobile phone that was more effective and cheaper than the one they were working on, and that the expected amount for completion of the
project was $3 million. In the first experiment they found typical sunk cost results; subjects who had incurred a previous investment decided to re-invest (80%) more frequently than subjects who had no prior expenditures (20%). In the second experiment, subjects were told that completion of the project would result in an expected profit of $8 million. Tan and Yates found that the inclusion of the expected sales almost eliminated the sunk cost effect. Subjects who had made a previous investment were not significantly more likely to continue the endeavor (80.8%) than subjects without a previous investment (66.7%). The lack of effect in the second study clearly results from the “no previous investment” group increasing their likelihood of investing in the endeavor. It is obvious that this increase is the result of the inclusion of the expected sales profits; subjects who did not have a previous investment in the project could fund the program for $3 million and receive an $8 million profit, resulting in a net gain of $5 million. Knowing the expected sales made the subjects more willing to invest, because they were confident that they would gain from the project.

In most situations, the net profit is not readily available to decision-makers; rather this is a construct they must estimate on their own. Two variables are believed to influence person’s feelings about the likelihood of receiving a gain; specifically, the proportion of the budget already invested and the degree of completion (See Figure 4).
Garland and Conlon (1998) examined these variables, and contended that the sunk cost effect was due to the influence of project completion, not an estimation of the profitability of the endeavor. However, their studies did not empirically investigate whether completion of the project was indeed the driving factor, or rather if the effect of this variable was witnessed through a construct such as participants’ estimates about the likelihood of the project being successful. When decision makers are not told the probability that the endeavor will be successful, they must estimate this probability from the provided information. In the study by Garland and Conlon, both the degree of project completion and the proportion of the budget invested were available and potentially influenced participants’ estimations of the probability of success, and therefore their ultimate decision. A project that is close to completion or has allocated the majority of its budget is presumably closer to producing positive results (Garland and Conlon, 1998; Garland et al., 1990; Tan and Yates, 1995).

However, Garland and Conlon found that when both of these variables were provided, the proportion of the budget expended was not a predictor of the sunk cost
effect. Even though these variables are closely related to decision-makers’ beliefs about the profitability of the project, the authors concluded that the driving factor behind sunk cost decisions was a person’s desire to see the project complete. The truth may lie in the similarities of the two variables. Both the degree of completion and the proportion of the budget expended are logically related to subjects’ perceptions of success. If perceived success is in fact a relevant aspect of the sunk cost decision, then this multi-collinearity may explain why Garland and Conlon failed to find a relationship between the proportion of the budget expended and the sunk cost effect, even though the degree of completion was significant. Another explanation for a lack of an effect for previous expenditures may be the result of incongruities between the two manipulated variables, as opposed to the importance of project completion. Participants had to make their own estimation of the success of the endeavor; however, this estimation was difficult because of contradictory information. For example, subjects were not instructed that it is possible for a business to spend 80% of its budget and only be 20% completed with the project. This lack of instruction would lead the subjects to assume that it was impossible for the company to finish its project with the remaining 20% of the budget; therefore, they would have a very low estimation of the probability of success of the investment. However, this is the case in some endeavors. In the real world it is possible to have two values that seem contrary to each other. An example of a project that may have exhausted 80% of the total budget while only being 20% complete is the development of a computer processor. The majority of expenditures occur in the initial research and development stages of the project; large amounts of money are invested in employing experts and
designing, testing, and developing the product. However, once designed the costs for producing a large number of microchips is minimal.

Thus, it is important to reassess the effect of the proportion of the budget expended and the degree of completion in relation to the sunk cost bias, via the notion of probability. It is argued here that the degree of completion affects the investment decision by altering the subject’s estimation of the probability of success. Much like the proportion of the total budget already invested, higher levels of the degree of completion will lead to higher estimates of the probability of success, and this will lead to an increased likelihood to continue investing. Therefore, it is important to separate the role that the proportion of the budget invested and the degree of completion have on the decision to invest, via their effect on the subjective probability of success.

*General Predictions*

*Overall Goals:*

Demonstrate that individual differences, specifically personal responsibility, are an important factor in the continuation of a decision.

Explore the relationship between individual differences and other variables related to the sunk cost phenomenon.

Investigate the importance of the potential for gain, the proportion of the budget expended, and the degree of project completion on decision-makers proclivity for sunk cost decisions.

Determine the pervasiveness of individual differences in sunk cost scenarios; specifically, measure the consistency of decisions within individuals in the face of
dramatically different decision tasks, and explore how this relates to their responsibility trait.

Experiment 1 was designed to investigate the relationship between the internal factor of responsibility, measures of subjective personal responsibility, and sunk cost. Subjects were presented with repeated sunk cost scenarios, which assigned no responsibility for the previous decision. In order to determine if there was consistency within decision-makers, and if the personal responsibility trait affects individuals choice of the sunk cost option, it was necessary to ask participants repeated investment decisions involving sunk cost scenarios. This strategy has been used infrequently in the past literature, and when used, responses have been dependent. For example, when subjects had to respond to multiple sunk cost decisions, the sunk cost effect dramatically decreased in the later trials (Garland et al., 1990; Garland & Conlon, 1998). In these studies, however, the multiple decisions were all based on one problem, requiring participants to answer repeated trials of the same question as the manipulation of the amount invested decreased systematically. Therefore, decisions made in later trials were related to those of earlier trials, more specifically, as the number of the trials increased, the probability of success decreased. Based on the lack of a true independent repeated measures test of the sunk cost effect, the present experiment attempted to determine consistency by having the participants respond to several sunk cost problems that were independent of each other.

Participants were asked to complete a responsibility scale, and to give ratings of their subjective personal responsibility and their investment decision for several decision tasks. The only difference between the decision tasks was the proportion of the budget previously invested. This manipulation was included to verify the typical sunk cost
It was expected that a higher proportion of the total budget invested would lead to an increased likelihood of continuing the endeavor, replicating the typical sunk cost effect.

It was also expected that for all levels of the proportion of the budget invested, subjects’ intrinsic responsibility would have a significant effect on the investment decision. A higher level of intrinsic responsibility should lead to a higher rating of subjective personal responsibility, and therefore an increased likelihood of continuing the endeavor (See Figure 2). Since subjective personal responsibility is considered solely a factor of the responsibility trait in this study, the responsibility ratings served as a manipulation check, to validate if the scale was measuring responsibility, as it was operationally defined in this study.

Experiment 2, manipulated other key variables that have been shown related to the likelihood of continuing the endeavor. In particular, the goal of this experiment was to observe how subjective personal responsibility is affected by an external responsibility manipulation (See Figure 3).

It was expected that manipulating the responsibility for the initial decision in this study would have similar effects as those found in the sunk cost literature. However, it was believed that this effect was due to the changes that this external manipulation creates in the subject’s feelings of responsibility for the decision. This responsibility construct is anchored by each individual’s personality trait and was expected to shift according to the external manipulation. The change in the levels of personal responsibility state was predicted to be equal for all levels of intrinsic responsibility. In other words, when subjects were made personally responsible for the initial decision their
subjective personal responsibility ratings would increase, and the difference between this heightened rating and that under a no personal responsibility situation was expected to be the same for all levels of intrinsic responsibility. Furthermore, higher levels of personal responsibility were expected to lead to more investing (See Figure 2).

Another goal of Experiment 2 was to demonstrate that subjects who commit the sunk cost bias weight the proportion of the budget expended and the degree of project completion differently than those who avoid this entrapment. Responsibility has been linked to a tendency to avoid risks and minimize potential losses, and in sunk cost scenarios the basis for evaluating potential loss is the budget already invested. Responsible decision makers, those more prone to continue investing, are expected to be disproportionately affected by the amount of budget already spent in their ratings of potential gain because it is an indicator of the potential investment they could lose. Conversely, the subjective potential gain of participants who have a low level of responsibility and do not exhibit the sunk cost effect was expected to be better predicted by the degree of completion than the amount of money invested. For all individuals, the potential for gain should be highest when both the proportion of the budget expended and the degree of completion are high. It was expected to be the lowest when both of these variables are low.

This expectation stemmed from the results of Garland and Conlon (1998). In their study, when faced with an inconsistent interaction between these two variables, some subjects chose to continue the endeavor while others chose to cease investing. It is possible that the subjects who chose to continue investing did so because they felt responsible for the decision, an aspect that Garland and Conlon did not measure.
In an attempt to expound on the impact of the responsibility trait, Experiment 3 was conducted to determine consistency within individuals when undertaking a variety of decision tasks. As Arkes and Blumer (1985) have demonstrated, the occurrence of the sunk cost bias is commonplace across many scenarios. The goal of this study was to show that this effect occurs in many scenarios because it is related to the decision maker, not the framing of the task. Certain participants will be more likely to demonstrate this bias due to their responsibility trait. Considering they carry this trait into all of their decisions, it is expected that there will be subjects who consistently choose the sunk cost alternative, even when presented with vastly different decision tasks, and those who consistently avoid it.

Experiment 1

Goal: The goal of Experiment 1 was to show the importance of personal responsibility when investigating sunk cost decisions.

Hypotheses

1.1 There will be a positive, monotonic relationship between scores on a responsibility scale and ratings of responsibility.

1.2 a) Higher ratings of responsibility will result in a higher likelihood of continuing the investment.

b) Higher scores on the responsibility scale will result in a higher likelihood of continuing the investment.

1.3 There will be a positive, monotonic relationship between the proportion of the budget expended and the likelihood of continuing the investment.
Method

Participants

Fifty Ohio University students participated in this experiment. Subjects were recruited through volunteer sign-ups, and participants received experimental credits for their time.

Procedures

The level of an individual’s personal responsibility trait was measured by the CPI (Gough, McClosky, & Meehl, 1952). The Responsibility Scale of the California Psychological Inventory was designed to identify individuals who show a ready willingness to accept the consequences of their own behavior, dependability, self-discipline, and a sense of responsibility to the self and others (Weekes, 1993). The current version of the test includes 36 self-report questions that require true or false answers (Appendix A). The responsibility scale has a coefficient of reliability that is reported to have a median of .71. However, many reviewers have reported that this measurement of reliability was achieved under very stringent conditions and a better estimation of the internal consistency is a median of .80 (Kramer & Conoley, 1992). Weekes (1993) assessed the predictive criterion validity of the CPI Responsibility Scale using a lottery game, which measured the tendency to choose the risky alternative when the consequences only affect the decision-maker. He compared participant’s standard scores on the CPI Responsibility Scale with the lottery nominated pay-offs, which were the index of risk taking behavior. He found that with 70 undergraduate students, the scores on the Responsibility Scale correlated significantly (r=-.37) with risk taking behavior, demonstrating that the CPI Responsibility Scale has some predictive validity.
for behavior in risky decision tasks. Higher scores on the CPI Responsibility Scale, suggestive of higher responsibility, predicted less risk taking. Based on the reliability and predictive validity of this test, the CPI was used in this study to measure the intrinsic personal responsibility trait.

When subjects arrived, they entered into a private room. In this room they completed the CPI Responsibility scale, and upon completion of the scale they completed the sunk cost decision tasks, first rating their subjective personal responsibility (1-100) and then their likelihood of continuing the investment for each of the 12 decision tasks (1-100). The experiment was conducted on Authorware, an interactive computer program that presented the subjects with instructions and practice trials to assure that all aspects of the experiment were clear.

Six sunk cost scenarios were created similar to those found in the literature (See Appendix B). These six scenarios were presented twice to each individual, once in the low proportion of budget expended condition and once in the high proportion of budget expended condition. The high and low levels were obtained by creating pairs of low and high values. Three such pairs (10-90, 20-80, 25-75) were each randomly assigned to two scenarios.

**Results**

Internal consistency of the Responsibility Scale of the CPI was assessed using Cronbach’s alpha (1951). The scale had an alpha of .72, indicating that it was performing reliably.

Participants’ CPI scores (range: 0 – 36) had a mean of 22.4 and a standard deviation of 4.66, while their ratings of responsibility had a mean of 76.24 and a standard
deviation of 23.10. Participant’s ratings of their likelihood to continue investing had a mean of 54.31 and a standard deviation of 12.10.

In order to test Hypothesis 1.1, a mean subjective personal responsibility rating was computed over the 12 tasks. However, since both the proportion of the budget expended and the scenario were manipulated within-subjects, it was necessary to verify that these independent variables did not affect responsibility ratings. To examine if either of these variables had an effect on ratings of responsibility, two repeated-measures analyses were conducted. The first analysis collapsed over scenarios with the 6 values of the proportion of the budget expended (10%, 20%, 25%, 75%, 80%, 90%) as the independent variable. The second repeated-measures collapsed over pairs and used the scenarios as the independent variable. In both tests, the rating of personal responsibility was the dependent measure. There was no effect of these either the proportion of the budget expended ($F_{(5, 45)}=1.27, p=.293$) or the scenario ($F_{(5, 45)}=1.71, p=.152$) on the ratings of responsibility. The mean responsibility ratings for the 6 levels of the independent variable, and the 6 scenarios are presented in Table 4.

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1 All repeated-measures analyses were conducted using Wilk’s Lamda as the multivariate statistic.
Table 4.
Experiment 1: Table of Means

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Proportion of the Budget Expended</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10%</td>
</tr>
<tr>
<td><strong>Airplane</strong></td>
<td></td>
</tr>
<tr>
<td>Mean Rating of Responsibility</td>
<td>70.9</td>
</tr>
<tr>
<td>Mean Rating of Investment</td>
<td>37.4</td>
</tr>
<tr>
<td><strong>Building</strong></td>
<td></td>
</tr>
<tr>
<td>Mean Rating of Responsibility</td>
<td>73.4</td>
</tr>
<tr>
<td>Mean Rating of Investment</td>
<td>39.0</td>
</tr>
<tr>
<td><strong>Loan</strong></td>
<td></td>
</tr>
<tr>
<td>Mean Rating of Responsibility</td>
<td>71.9</td>
</tr>
<tr>
<td>Mean Rating of Investment</td>
<td>39.3</td>
</tr>
<tr>
<td><strong>Phone</strong></td>
<td></td>
</tr>
<tr>
<td>Mean Rating of Responsibility</td>
<td>81.6</td>
</tr>
<tr>
<td>Mean Rating of Investment</td>
<td>16.7</td>
</tr>
<tr>
<td><strong>Computer</strong></td>
<td></td>
</tr>
<tr>
<td>Mean Rating of Responsibility</td>
<td>74.2</td>
</tr>
<tr>
<td>Mean Rating of Investment</td>
<td>55.8</td>
</tr>
<tr>
<td><strong>Repairs</strong></td>
<td></td>
</tr>
<tr>
<td>Mean Rating of Responsibility</td>
<td>73.1</td>
</tr>
<tr>
<td>Mean Rating of Investment</td>
<td>48.9</td>
</tr>
</tbody>
</table>
Due to the lack of an effect of the within subjects factors, the personal responsibility ratings were averaged within subjects and correlated with the CPI. The correlation between the mean rating of subjective personal responsibility and the CPI Responsibility Scale was .18 ($p = .207$). The lack of a significant relationship between these two variables indicates that the CPI was not measuring responsibility, as it was operationally defined in this study.

To test Hypotheses 1.2a, ratings of personal responsibility were correlated with ratings of the intention to invest. Since the relationship between feelings of responsibility and the ultimate decision was assumed related at the level of the individual, correlations were calculated for each participant across the six scenarios and the proportion of the budget expended (two levels within each scenario), resulting in 12 data points per person. Averaged across participants, the correlation was .111 ($SD = .371$). In order to perform a significance test on the correlations, they were transformed into Fisher’s Z-scores so they would fit the assumptions of a t-test. A significant relationship was found between participants’ ratings of responsibility and their ratings of their intention to invest ($t_{(48)} = 2.20, p = .033$).

Using CPI scores to test Hypothesis 1.2b, the analysis showed a non-significant correlation between CPI and the average of the investment decision rating ($r = -.052$, $p = .203$). However, due to the relationship between personal responsibility ratings and the investment decision, the lack of a relationship between the CPI and the investment decision provides further support that this scale was not validly measuring responsibility as it was defined in the contexts of this study.
To further explore the relationship between the measured variables, a regression model was built to determine if CPI scores added any predictability, in the presence of responsibility ratings, to participant’s average investment decision (Average Investment Decision = CPI Scores + Average Responsibility Rating). The overall model was marginally significant ($F_{(2,47)}=3.04$, $p=.057$), with an $R^2$ of .115. Ratings of responsibility had a significant effect on the decision ($t=2.25$, $p=.029$), however, CPI scores added no predictability to the dependent measure ($t= -.14$, $p=.168$).

Hypothesis 1.3 predicted that the typical effect for the proportion of the budget invested would be replicated in this study. To verify this, a repeated-measures analysis was performed on the likelihood of continuing the endeavor using all six values of the proportion of the budget invested as independent variables. A linear trend was found ($F_{(1, 49)}=31.48$, $p<.001$); the proportion of the budget expended had a significant impact on the likelihood of continuing the failing endeavor ($F_{(5,45)}=9.24$, $p<.001$) (See Table 5), providing more support for the typical sunk cost effect.
Table 5.

Propensity to Re-Invest as a Function of the Proportion of the Budget Expended

<table>
<thead>
<tr>
<th>Proportion of the Budget Expended</th>
<th>10%</th>
<th>20%</th>
<th>25%</th>
<th>75%</th>
<th>80%</th>
<th>90%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Rating of the Likelihood of Investing</td>
<td>40.7</td>
<td>45.0</td>
<td>44.8</td>
<td>65.9</td>
<td>62.4</td>
<td>67.2</td>
</tr>
</tbody>
</table>

Discussion

As expected, the typical effect of the proportion of the budget expended was replicated in Experiment 1. As the proportion of the budget invested increased, so did the likelihood of a sunk cost response. While demonstrating this “typical” sunk cost effect, this study also attempted to identify the relationship between personal responsibility ratings, and the decision to continue investing in a failing endeavor. The main goal was to show that responsibility affected the propensity to demonstrate the sunk cost effect.

The experiment provides mixed results regarding the importance of responsibility. Support was found for the notion of a responsibility construct, as the relationship between the responsibility ratings and the likelihood of investing was demonstrated. However, the personality trait, as measured by the CPI, was found to be unrelated to ratings of responsibility as well as to the decision to invest.

The lack of an effect for this variable could have been the result of the CPI incorrectly measuring personal responsibility. In the current study, individuals provided ratings of their responsibility for each task. If scores on the CPI did not have a
relationship with the average responsibility that each participant felt towards the decisions, this could indicate that the scale is measuring a different facet of responsibility. Britt (1999) has indicated that there are many facets to this personality trait, so it is possible that the CPI is tapping a facet of this trait other than that which relates to sunk cost decisions. The relationship between responsibility and risk taking behavior is what is important in a sunk cost decision, and the CPI does not appear to accurately measure the risk-taking facet of responsibility. Therefore, further studies should include an additional scale of responsibility that more accurately measures the risk-taking facet of responsibility.

Experiment 2:

Goal: The goal of Experiment 2 was to further delineate the relationship between responsibility and sunk cost decisions, specifically in the presence of an external assignment of responsibility, and to understand situational factors that influence sunk cost choices. As part of this study, “generic” sunk cost tasks had to be created to gain an independent measure of subjects’ propensity for committing the sunk cost error. These six tasks lacked information about the degree of completion, proportion of the budget spent, or responsibility for the initial decision.

Hypotheses

2.1 Two scales used to assess responsibility will have a positive monotonic relationship between them. They will also be related to the ratings of subjective personal responsibility even in the presence of an external responsibility manipulation.
2.2 The rating of subjective personal responsibility will be shifted higher or lower according to the personal responsibility manipulation. This shift will be approximately equal at all levels of the intrinsic responsibility trait, as measured by two responsibility scales.

2.3 Individual’s propensity to commit the sunk cost effect, measured by the generic sunk cost tasks, will be well predicted by participants’ scores on two responsibility scales.

2.4 For participants who commit the sunk cost bias more often in the generic tasks, the proportion of the total budget previously invested in the endeavor will have a larger influence on the individual’s subjective potential gain ratings than will the degree of completion. For individuals who are less likely to commit the sunk cost bias, the degree of completion will have a larger influence on ratings of subjective potential gain than will the amount invested.

2.5 Higher ratings on the subjective personal responsibility measure will result in an increased likelihood of investment.

2.6 Higher ratings on the subjective potential gain measure will result in an increased likelihood of investing.

Method

Participants

One hundred and nineteen Ohio University students participated in this experiment. Subjects were recruited through volunteer sign-ups, and participants received experimental credits for their time.
Due to the inadequacy of CPI Responsibility Scale, a second measure of responsibility was added to the second experiment. The Pervasive Responsibility Measure (Appendix C) (Wilson & Chambless, 1999) is a relatively new scale that was designed to assess individual’s beliefs about their power to provoke harm or loss in a variety of contexts. Although on the surface the CPI Responsibility Scale and the Pervasive Responsibility Measure (PRM) seem to tap drastically different constructs, the PRM was included because of its emphasis on the importance of the notion of loss and responsibility for this loss, which is expected to be a key factor in sunk cost scenarios. The internal consistency of the PRM is excellent ($\alpha=.81$), and it has been shown to have convergent validity with two other measures of responsibility. Wilson & Chambless gave their subjects 3 scales (PRM, Responsibility Questionnaire, and the Obsessional Beliefs Questionnaire Responsibility Subscale) that were designed to measure responsibility. The correlations between the PRM and the two other scales were significant ($r=.27$ with the RQ; $r=.29$ with the OBQ-R), although not strong enough to claim they were measuring the same aspect of the construct. The lack of a definitive relationship between these scales further demonstrates the difficulty of assessing participant’s responsibility. In an attempt to further understand this trait in the current study, as well as to examine the validity of the CPI, the PRM was administered to all subjects.

This study was conducted as a 2 (proportion of the total budget invested) x 2 (degree of completion) within-subjects design, again utilizing the 3 pairs of high and low values used in Experiment 1. Each of these pairs was randomly assigned to two of six
scenarios (See Appendix D), and the high and low values of this pair were used for both the proportion of the budget invested and the degree of project completion. Within each scenario these two variables were independently manipulated as either high or low. All possible combinations of the pair of values and the independent variables were presented within one scenario, resulting in four presentations of each scenario; i.e., (proportion=low, degree=low), (proportion=low, degree=high), (proportion=high, degree=low), and (proportion=high, degree=high). These four combinations were presented consecutively, but in a random order, meaning that participants responded to each scenario four times in a row, with the independent manipulations varying randomly.

This experiment also included personal responsibility as a between-subjects factor with two levels. For the personal responsibility manipulation, participants were informed either that they were responsible for choosing the initial endeavor, or that the choice had been previously made by another person. Sixty people were assigned to the not responsible group, and 59 were told they were responsible for the initial investment. Subjects rated the levels of subjective personal responsibility, subjective potential gain, and the likelihood of continuing the endeavor for each of the 24 decision tasks using a 1 to 100 scale.

As previously stated, it is hypothesized that participants who are more likely to commit the sunk cost bias will be influenced by the within-subjects variables differently than participants who do not commit the sunk cost bias. Because there needs to be an independent measure of this propensity, participants responded to six generic sunk cost decision tasks (Appendix E), which were presented immediately after the CPI scale. These six tasks lacked information about the degree of completion, proportion of the
budget spent, or responsibility for the initial decision. For each individual, the number of sunk cost responses for these six scenarios was recorded, and this frequency was used as a moderator for the interaction between the independent variables.

When subjects arrived, they entered into a private room. In this room they completed the CPI Responsibility scale and the Pervasive Responsibility Measure. Upon completion of these scales they completed the generic sunk cost questions followed by the 24 decision tasks.

Results

Internal reliability of the CPI and the PRM were assessed using Cronbach’s alpha (1951). The CPI had an alpha of .63, while the PRM had an alpha of .75. The mean and standard deviation for both of the responsibility scales are included in Table 6. The correlation between these two measures of responsibility was .09 \( (p=.347) \), indicating that these two scales were not measuring the same construct. When the effect of the external manipulation of responsibility was controlled for, the partial correlation between the CPI Responsibility Scale and participant’s ratings of responsibility was significant \( (r=.19, p=.042) \). The PRM did not have a relationship with responsibility ratings. The partial correlation (controlling for external responsibility) between these two variables was -.01 \( (p=.990) \).
Table 6.

Descriptive Statistics of Responsibility Scales

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPI</td>
<td>23.24</td>
<td>4.10</td>
<td>13.00</td>
<td>30.00</td>
</tr>
<tr>
<td>PRM</td>
<td>87.71</td>
<td>25.83</td>
<td>41.69</td>
<td>151.36</td>
</tr>
</tbody>
</table>

Hypothesis 2.2 predicted that ratings for subjective personal responsibility would be higher for subjects who were responsible for the initial investment decision than for subjects who were not responsible for beginning the endeavor. Since all of the independent variables could influence these responsibility ratings, a repeated-measures analysis was conducted to determine the effect of these variables on the feelings of responsibility. The degree of project completion (high vs. low), the percentage of the budget expended (high vs. low), and the pair (10-90, 20-80, or 25-75) were all within-subjects factors, while the assignment of responsibility was a between-subjects factor. In the presence of the other variables, the assignment of responsibility had an effect on participants ratings of the perceived responsibility ($F_{(1,117)}=4.52$, $p=.036$). Participants who were told they were responsible for the initial investment provided higher ratings of their perceived responsibility than non-responsible participants (See Table 7).
Table 7.
The Effect of Assigned Responsibility on Ratings of Responsibility

<table>
<thead>
<tr>
<th>Responsibility Ratings</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Responsible Participants</td>
<td>75.04</td>
<td>13.36</td>
<td>48.33</td>
<td>100.00</td>
</tr>
<tr>
<td>Non-Responsible Participants</td>
<td>68.02</td>
<td>20.28</td>
<td>2.33</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Note: See Appendix F for complete Experiment 2 Table of Means.

The degree of completion of the project also had an effect on responsibility ratings ($F_{(1,117)}=17.61$, $p<.001$), with a higher level of completion leading to a higher rating of responsibility (See Table 8). None of the other variables or interactions had a significant relationship with ratings of responsibility.
Table 8.

The Effect of Degree of Completion on Ratings of Responsibility

<table>
<thead>
<tr>
<th>Degree of Completion</th>
<th>Responsibility Ratings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
</tr>
<tr>
<td>10%</td>
<td>69.94</td>
</tr>
<tr>
<td>20%</td>
<td>69.14</td>
</tr>
<tr>
<td>25%</td>
<td>70.21</td>
</tr>
<tr>
<td>75%</td>
<td>72.62</td>
</tr>
<tr>
<td>80%</td>
<td>72.67</td>
</tr>
<tr>
<td>90%</td>
<td>74.42</td>
</tr>
</tbody>
</table>

Note: See Appendix F for complete Experiment 2 Table of Means.

To test hypothesis 2.3, participant’s responses to the 6 generic tasks were recorded. It was found that 117 of the 119 students (98.3%) chose the sunk cost option at least one time, however there were no individuals who chose the sunk cost option every time. (See Figure 5) On average, participants committed 2.29 sunk cost errors (SD=1.05), with 75% of participants committing at least two errors, and 25% committing four or more.

Contradictory to hypothesis 2.3, neither the CPI nor the PRM responsibility scales had a relationship with participant’s proclivity for choosing the sunk cost option. There was actually a negative relationship (r=-.042, p=0.648) between the CPI and the decision,
and a .089 \((p=0.347)\) correlation between the PRM and the likelihood of continuing the endeavor.

The frequency of choosing the sunk cost option was also examined at the level of the scenario. A repeated measures was run on responses to each of the 6 scenarios, revealing that in the generic tasks the scenario had an effect on the decision to continue the endeavor \((F_{(5,114)}=12.18, p<.001)\). Of the 119 participants, 21.8% choose the sunk cost option on the ski trip task, 20.2% on the TV dinner task, 36.1% on the retirement task, 60.5% on the hike task, 52.1% on the paper task, and 38.7% on the movie task (See Figure 6).
Hypothesis 2.4 concerned the variables that were expected to influence ratings of subjective potential gain. Two of the 119 participants had to be dropped from all analyses on the potential for gain because they had no variability in these ratings. A repeated-measures was run with the potential for gain rating as the dependent variable, the proportion of the total budget invested (high vs. low), the degree of completion of the project (high vs. low), and the pair as the within-subjects factors, and the assignment of responsibility as the between-subjects factor. The assignment of responsibility did not have an effect on potential gain ratings ($F_{(1,115)}=2.04, p=.156$). Significant main effects were found for both the proportion of the budget expended and the degree of completion ($F_{(1,115)}=29.57, p<.001, F_{(1,115)}=183.85, p<.001$ respectively). Project completion had a positive relationship with the potential for gain; however, contrary to expectations, higher
levels of the proportion of the budget expended led to a lower estimate of the potential for gain. Descriptive statistics for the significant factors are detailed in Table 9.

Table 9.
Descriptive Statistics of Factors Influencing Ratings of Potential Gain

<table>
<thead>
<tr>
<th>Proportion of the Budget Expended (%)</th>
<th>Mean Rating of Potential Gain</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>52.6</td>
<td>18.3</td>
</tr>
<tr>
<td>20</td>
<td>54.3</td>
<td>19.1</td>
</tr>
<tr>
<td>25</td>
<td>51.9</td>
<td>17.3</td>
</tr>
<tr>
<td>75</td>
<td>46.5</td>
<td>18.6</td>
</tr>
<tr>
<td>80</td>
<td>47.2</td>
<td>19.1</td>
</tr>
<tr>
<td>90</td>
<td>44.7</td>
<td>18.9</td>
</tr>
</tbody>
</table>

Table 9.
Descriptive Statistics of Factors Influencing Ratings of Potential Gain

<table>
<thead>
<tr>
<th>Degree of Completion (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Rating of Potential Gain</td>
</tr>
<tr>
<td>10</td>
</tr>
<tr>
<td>20</td>
</tr>
<tr>
<td>25</td>
</tr>
<tr>
<td>75</td>
</tr>
<tr>
<td>80</td>
</tr>
<tr>
<td>90</td>
</tr>
</tbody>
</table>

Note: See Appendix F for complete Experiment 2 Table of Means.
Another repeated-measures analysis was conducted to explore the effects of these variables on the likelihood of investing, revealing that the assignment of responsibility did not have an effect on the investment decision \(F(1, 117)=2.87, p=.093\). Significant main effects were found for both the proportion of the budget expended and the degree of completion \(F(1, 117)=5.82, p=.017, F(1, 117)=419.50, p<.001\) respectively, while the interaction of these two variables was not significant \(F(1, 117)=1.31, p=.312\). Descriptive statistics for the significant factors are detailed in Table 10. Project completion had a positive relationship with the likelihood of continuing the investment, but higher levels of the proportion of the budget expended led to a lower propensity to continue the endeavor.

Table 10.

Descriptive Statistics of Factors Influencing Likelihood of Investing

<table>
<thead>
<tr>
<th>Proportion of the Budget Expended (%)</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10</td>
<td>20</td>
<td>25</td>
<td>75</td>
<td>80</td>
<td>90</td>
</tr>
<tr>
<td>Mean Rating of Investing</td>
<td>55.2</td>
<td>55.5</td>
<td>54.7</td>
<td>50.7</td>
<td>50.5</td>
<td>52.6</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>21.9</td>
<td>21.2</td>
<td>19.7</td>
<td>21.4</td>
<td>22.9</td>
<td>22.3</td>
</tr>
<tr>
<td>Minimum</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Maximum</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Degree of Completion (%)</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10</td>
<td>20</td>
<td>25</td>
<td>75</td>
<td>80</td>
<td>90</td>
</tr>
<tr>
<td>Mean Rating of Investing</td>
<td>35.0</td>
<td>40.0</td>
<td>39.6</td>
<td>65.8</td>
<td>66.1</td>
<td>72.7</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>22.3</td>
<td>22.5</td>
<td>21.2</td>
<td>19.9</td>
<td>20.8</td>
<td>21.9</td>
</tr>
<tr>
<td>Minimum</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Maximum</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Note: See Appendix F for complete Experiment 2 Table of Means.
To directly test Hypothesis 2.4, which stated that participants who commit the sunk cost effect would have a different interaction pattern than individuals who avoid this bias, another repeated-measures was conducted including the number of times participant’s committed the sunk cost bias in the generic tasks as an independent variable. Significant main effects were found for both the proportion of the budget expended and the degree of completion \((F_{(1, 113)}=8.25, p=.005, F_{(1, 113)}=46.50, p<.001\) respectively) on the likelihood of continuing the investment. Again, the degree of completion had a positive relationship with the likelihood of investing while the proportion of the budget expended had a negative relationship with the investment decision. There were no significant interactions; the proportion of the budget invested by degree of completion by propensity to commit sunk cost interaction (as measured by the generic tasks) was not significant \((F_{(5, 113)}=.680, p=.639\), indicating that the interaction pattern among the proportion of the budget expended and the degree of completion was not different for individuals who were likely to commit the sunk cost effect and those who were not.

Due to the strength of relationship between the degree of completion, ratings of gain, and the investment ratings, these variables were examined using a series of correlations. Both the gain ratings and degree of completion had a significant correlation with the investment ratings \((r=.682, p<.001, r=.493, p<.001; \text{respectively})\). When controlling for the potential gain ratings, the correlation between the degree of completion and the investment ratings was weakened \((r=.389, p<.001)\). When controlling for the degree of completion, the correlation between the gain ratings and investment ratings was remained consistent \((r=.655, p<.001)\).
Hypotheses 2.5 and 2.6 made predictions about the effects of subjective personal responsibility ratings and subjective potential gain ratings on the likelihood to continue investing. Similar to Experiment 1, the relationship between the responsibility ratings and the investment decision was tested by correlating these two variables for each individual (i.e., 24 data points per person). Higher ratings of responsibility were associated with a higher likelihood of continuing the investment ($M_r=.128$, $SD=.328$). These correlations were transformed to Fisher z’s, and a significant relationship was found ($t_{116}=3.93$, $p=.002$).

Similarly, participants ratings of the potential for gain were correlated with their decision to invest ($M_r=.645$, $SD=.230$). When transformed to Fisher z’s, a significant relationship was found between the gain ratings and the investment decision ($t_{116}=19.29$, $p<.001$).

**Discussion**

The main findings of the current study were that both the subjective potential for gain and the subjective responsibility were significant predictors of the likelihood of investing in an endeavor. While previous research has indicated that felt responsibility is a factor in the decision to invest, the present study extended these findings to indicate that the amount of responsibility that a decision maker feels is not simply a function of an external assignment of responsibility, but also depends on situational factors such as the degree of completion of the project, with higher felt responsibility as the project moves towards completion. There is also an indication that individual differences can predict felt responsibility and therefore risk taking behavior, even in the presence of situational factors.
While this study provides further support that situational factors, especially those regarding the potential for gain, are extremely important in sunk cost decision tasks, the implications for the role of responsibility and individual differences is less clear. The most discouraging finding regarding the responsibility trait was the lack of agreement between the CPI and the PRM. While the reliability of each scale was adequate, the lack of a relationship between the two responsibility scales indicates that they are measuring different constructs. If each scale is indeed measuring responsibility, they could be measuring different facets of this trait, thus supporting the multidimensionality of responsibility. The fact that the PRM did not have a relationship with any of the variables in this experiment (including subjective responsibility) speaks to a lack of validity of this measure. While this relatively new scale was designed for the general population, it has primarily been tested in conjunction with Obsessive Compulsive Disorder participants. The previous success and convergent validity of this scale could be due to a facet of responsibility that is overemphasized in subjects with OCD, which could explain its lack of validity when used in a sample of undergraduate students.

The relationship between the CPI and the investment decision (via responsibility ratings) indicates that personality differences have an effect on decisions; but as Slovic (1972) found, these differences are minimal compared to the effect of situational factors. This does not indicate that individual differences are unimportant when investigating decisions; rather, these results show that there are certain situations in which personality variables may be significant predictors of individual’s decisions. Determining what situations accentuate the importance of these individual differences, and how consistent the differences are will be the focus of Experiment 3.
The importance of ratings of the potential for gain suggests a new direction for research in this area. Although it is a seemingly important construct, feelings about the potential for gain have been studied infrequently in the past. One article that has investigated this notion was a study by Arkes and Hutzel (1999) in which they attempted to determine the relationship between the probability of success and the decision to continue investing. In their first experiment, the authors found that even when the probability of success was provided to decision-makers, a sunk cost effect was still observed. Specifically, when the probability of success estimate were held constant, participants who had incurred a previous investment were more likely to continue investing, and they also rated their subjective probability of success higher, although the latter trend was not significant.

Arkes and Hutzel also conducted a second experiment to see if the timing of the probability of success estimates had an affect on the sunk cost effect. In their second experiment, participants were asked to rate the probability of success of the endeavor either before or after the decision to invest. Similar to their first experiment, decision makers who had a larger previous investment gave higher ratings of the probability of success, and these ratings had a positive monotonic relationship with the decision to invest. Arkes and Hutzel claimed that the most interesting finding in their second experiment was that the timing of subject’s ratings had an affect on their estimates of the probability of success. Specifically, participants who were asked to estimate the success after the decision to invest gave higher ratings than participants who estimated the success before the investment decision (.57 and .50 respectively). Based on this result, the authors concluded that increased probability of success estimates were not a precursor
to continuing the endeavor, rather they were a product of the decision to invest. In other words, decision makers do not continue investing when they have incurred sunk costs because they have a higher estimate of the probability of success, rather these estimates were higher after the decision to invest because they were a post hoc rationalization of the choice.

While Arkes and Hutzel used this post-hoc rationalization as a way of explaining their obtained pattern of results, they argued that heightened estimates of success after the decision ruled out any effect that this estimate could have had on the decision. That is, they contend that participants have already made their decision by the time they supply estimates of success, even if this response is elicited before the decision itself. However, as evidenced by the Tan and Yates (1995) study, providing success information prior to a decision does indeed affect the pattern of the sunk cost bias. By telling participants that they would definitely witness a positive return, Tan and Yates increased the non-prior investment group’s likelihood of continuing the endeavor to the point where it was equivalent to that of the sunk cost group. The results of the Tan and Yates study combined with the current study’s importance of participants’ ratings of the potential for gain, provide substantial evidence that decision-makers’ beliefs about the success of the endeavor shapes their eventual choice. The findings by Arkes and Hutzel, that participants heighten their success estimates after the decision, illustrates the dynamics involved with decision making tasks, and that decision makers likely convince themselves they are correct even after a choice has been made. However, it does not indicate that success estimates have no influence on the ultimate decision. Future research should be conducted to identify the importance of subject’s perceptions of
success, especially in the face of both congruent and incongruent expert success estimates.

In the current study, while the degree of project completion had a significant impact on the ultimate investment decision, a reverse sunk cost effect was found. As seen in Table 10, the proportion of the budget invested had a negative relationship with the investment decision, while the degree of completion had a positive relationship with the investment. The pattern replicated earlier findings by Garland and Conlon (1998). They contended that the proportion of the budget expended has only been a significant factor in the past when the degree of completion was not included. Garland and Conlon believed that participants used the proportion invested in these situations as a proxy for information about the completion status of the project. They explained this pattern as supporting the project completion hypothesis; that participants were more likely to invest because as the endeavor progresses the completion of the project itself becomes the most important influence.

While the current results do not contradict the earlier findings by Garland and Conlon, the importance of the potential gain construct does provide an alternate explanation to their project completion theory. The degree of completion did have an effect on the ratings of the likelihood of investing, but this effect was weakened when controlling for the variance in the potential for gain ratings. The potential for gain is obviously a very significant factor when evaluating a sunk cost decision (accounting for 47% of the variance), and it is possible that the degree of completion is more important than the budget invested because it is the best indicator of participants ratings of the potential success of the endeavor. Since Garland and Conlon did not measure
participants’ estimates of success, it is possible that the relationship between the degree of completion and the likelihood of investing in their study was actually due to the effect that project completion has on success estimates.

The project completion hypothesis is closely allied to individual’s beliefs about the potential for gain. Specifically, as a project comes closer to completion, the expectations that it will be successful increase. Even though these two constructs are closely associated they are theoretically different, and a complete understanding of the sunk cost effect cannot be gained unless they are teased apart. While the current study, as well as those by Arkes & Hutzel and Tan & Yates, demonstrates that participant’s feelings about the potential for gain affected their investment decision, no research has established that decision makers continue the project solely to complete what they started. In other words, the project completion hypothesis is a theory that has not received direct empirical support, while several studies have found an effect for the potential for gain. Therefore, it is possible that the project completion hypothesis is just a manifestation of participant’s feelings about the potential for success, and to understand the real explanation of the sunk cost effect, these two must be separated.

While it was expected that the proportion of the budget expended would have a stronger relationship with the investment decision than the degree of completion among individuals who had a propensity for the sunk cost effect, this hypothesis was not supported even when the participants were instructed that the two variables could be incongruent and the project could still be considered “on schedule.” The failure to find a different interaction pattern among responsible and non-responsible participants suggests
that individuals do not weight these variables differently when estimating the potential for gain, and the degree of completion is a much stronger predictor of their estimates.

While these results replicate earlier findings and showed that there was no interaction between these variables, it must be considered that the between-subjects variable used to group participants consisted of generic sunk cost tasks. The 24 tasks in which participants were asked to provide a potential for gain rating were all based on business decisions, while the six generic tasks were markedly different. It is possible that the lack of a different interaction pattern among sunk cost and non-sunk cost decision makers was due to an inappropriate grouping. While Arkes and Blumer (1985) demonstrated that the sunk cost effect is present in business contexts, personal finance contexts, and social contexts, they never investigated if there was a relationship between the propensities to commit the sunk cost effect in these three categories. It is possible that due to a lack of consistency between the propensity for the sunk cost effect in these different contexts, the grouping of subjects based on the generic tasks is not relevant to their choices in the business scenarios (the lack of a relationship between business decisions context and sunk cost tasks in the personal finance and social context is investigated in Experiment 3). If this is the case, then the lack of different interaction patterns does not provide substantial evidence that individuals do not weight the degree of completion and the proportion of the budget expended differently in business decision tasks.

Experiment 3

Goal: The goal of Experiment 3 was to identify if there are consistent individual differences in the propensity to commit the sunk cost effect.
Hypotheses

3.1 There will be a positive monotonic relationship between the propensity to commit the sunk cost effect in the business scenarios, the personal finance scenarios, and the social scenarios.

3.2 Individuals who score higher on the CPI and PRM will be more likely to demonstrate the sunk cost effect in all 3 categories of decision tasks.

Method

Participants

Fifty-seven Ohio University students participated in this experiment. Subjects were recruited through volunteer sign-ups, and participants received experimental credits for their time.

Procedures

While the first two experiments attempted to detect consistency within individuals by using repeated sunk cost questions, due to the similarity of the decision tasks, a strong argument cannot be made solely on the findings of these studies. The resemblance of the tasks within these studies resulted from the necessity to include information about the proportion of the budget expended and the degree of completion. The inclusion of these variables dictated that the scenarios be based on a business decision. Since all of these scenarios dealt with business situations and emphasized the independent variables, the resulting demand characteristics could have influenced subjects to feel obligated to respond in a consistent manner.

In order to fully understand potential individual differences, participants’ propensity to commit the sunk cost effect had to be investigated across different types of
decision tasks, thus reducing demand characteristics. Sunk cost scenarios used in previous literature can generally be categorized into three groups: business finance, personal finance, and social. Scenarios categorized as business finance deal with a large-scale business project that the decision-maker is in charge of; personal finance scenarios deal with decisions about how the individual would spend their own money; and scenarios that are categorized as social deal with an investment of time or effort, but not of money. Fifteen decision task, five from each category (Appendix G), containing no information about the proportion of the budget expended or the degree of completion, were presented to the participants. The exclusion of these two independent variables made tasks from all of the three categories comparable, in that they contained no information about how much was invested, simply that there was a previous investment. Subjects were presented with these 15 tasks in a random order and asked if they would continue the original endeavor, or cease investing in the project.

When subjects arrived, they were entered into a private room. In this room they completed the CPI Responsibility scale and the Pervasive Responsibility Measure. Upon completion of these scales they completed the sunk cost decision tasks on Authorware. The program required the participants to decide if they would continue investing in a previously initiated endeavor.

*Results*

The total score for each decision category was obtained by summing the number of times within the category that the participant chose the sunk cost option, and these frequencies were used for all analyses. When correlated, there was no significant relationship between any of the categories. The correlation coefficient between total
scores on business finance scenarios and personal finance scenarios was .036 ($p=.788$),
between business finance and social scenarios it was .150 ($p=.267$), and between personal
finance and social it was .185 ($p=.169$). Since there was a lack of a relationship between
categories, the reliability within each category was investigated. As all of the items
within each category were dichotomously scored, the Kuder-Richardson Formula 20 was
used to ascertain the reliabilities. The business finance category had an alpha of .32, the
personal finance category had an alpha of .16, and the social category had an alpha of .09.

The mean number of sunk costs in the business finance category was 2.33
($SD=1.29$), in the personal finance category it was 2.74 ($SD=1.14$), and in the business
finance category the mean was 2.21 ($SD=1.11$). A repeated-measures ANOVA was
conducted to determine if the category of the decision task was an influencing factor in
the propensity to commit the sunk cost effect. Indeed, the framing of the questions
affected the likelihood of choosing the sunk cost option ($F_{(2,55)}=3.85, p=.027$).

Similarly, the scenario of the task was examined within each category. The mean
number of sunk cost responses for each scenario (grouped by category) is detailed in
Table 11. For both the social and the personal finance categories, scenario had a main
effect on the decision to invest ($F_{(4,53)}=6.18, p<.001$, $F_{(4,53)}=9.39, p<.001$; respectively).
However, within the business category there was no main effect for scenario ($F_{(4,53)}=1.74,$
$p=.154$).
Table 11.

The Effect Scenario on the Percentage of Participants who Committed the Sunk Cost Effect

<table>
<thead>
<tr>
<th>Category</th>
<th>Scenario</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
<tr>
<td>Social</td>
<td>31.6</td>
</tr>
<tr>
<td>Business</td>
<td>47.4</td>
</tr>
<tr>
<td>Personal</td>
<td>64.9</td>
</tr>
</tbody>
</table>

The internal consistency of each responsibility scale was assessed, with an alpha of .52 for the CPI, and alpha of .80 for the PRM. The correlation between these two measures of responsibility was .16 ($p=.250$), supporting the previous finding that these two scales do not measure the same construct.

The relationship between the responsibility measures and the demonstration of the sunk cost effect was examined by correlating the test scores with the number of times the participant committed the sunk cost error in each category. The PRM did not have a significant relationship with any of the three categories ($r=-.11$, $p=.416$, personal finance; $r=-.04$, $p=.755$, business finance; and $r=.17$, $p=.216$, social), or the overall propensity to commit the sunk cost effect ($r=.003$, $p=.985$). The CPI also had no relationship with personal finance decisions, business finance decisions, or the overall sunk cost effect ($r=-$-
but it had a positive relationship with decisions in social scenarios ($r=0.28, p=0.035$).

**Discussion**

The findings of this experiment raise some interesting questions for sunk cost research. Many previous studies have demonstrated that the scenario does not have an effect on the propensity to commit the sunk cost bias. However, there were scenario differences in the current study, as there was no relationship between the likelihood of choosing the sunk cost option in the business finance, personal finance, and social categories. It is possible that the lack of an effect for the scenario in previous research is due to the fact that most studies in the field have focused on a single category - business decision tasks. The scenarios selected for the business category in the current experiment had all been used multiple times in previous studies, and could explain why there have been no scenario differences in the past. While the scenario had a significant effect on the propensity to continue the endeavor in the social and personal finance categories, within the business category there was no such effect, which supports the typical lack of an effect for scenario. However, there were substantial differences between the propensities to choose the sunk cost options in the different categories, suggesting that there is not consistency within individuals when dealing with a variety of sunk cost decision tasks.

The lack of consistency within individuals again speaks to the relatively small effect of individual differences on participant’s decisions. The most interesting result of this study was that the responsibility trait did not have a relationship with business finance or personal finance decisions, even when the previous influential situational
factors (such as the degree of project completion, the proportion of the budget expended, and the responsibility for the decision) had been eliminated. It was hypothesized that the elimination of these variables would result in a stronger effect for the responsibility trait, but since there was no effect within these categories it could be argued that individual differences are not important. However, there was a relationship between the responsibility trait and the decision to continue the endeavor in the social category. This provides further support that although the effects of the responsibility traits are small, they are still present in some contexts, suggesting that individual differences may play a role in people’s decisions.

While the results of the present experiment did not support the hypotheses, they do lead to some interesting directions for future research. The first and most important to the sunk cost literature would be the investigation for the effect of the scenario. As previously mentioned, most studies have focused on the business category of sunk cost decision tasks, and found that the scenario was not important. However, based on these results, further studies should be conducted with a variety of scenarios. The findings of potential scenario differences could be important because this topic has long been ignored in the field.

General Discussion

The main finding of the three experiments was that the two proposed constructs (Subjective Responsibility, Potential for Gain) did indeed have a relationship with the decision to continue the endeavor in sunk cost situations. Clearly, the situational factors and the potential for gain had the strongest relationship with the eventual decision.
Participant’s feelings of responsibility also affected the decision, but did not account for a large amount of the total variance in the investment decision.

The model also predicted the importance of two key variables for each construct: the degree of completion and the percentage of the budget expended were expected to be related to participants’ ratings of gain, while a responsibility trait and an assignment of responsibility for the task were expected to have an effect on ratings of subjective responsibility. The predicted relationship was found for three of the four variables. The degree of completion was strongly related to participants’ beliefs about the potential for gain. However, the percentage of the budget expended did not impact this construct as was expected. As for the responsibility construct, it was clear that the assignment of responsibility had the predicted effect on these ratings, while the responsibility trait was found to be related to the construct in one of the two studies.

While the effects of intrinsic and felt responsibility were not robust, the presence of a relationship expands on the previous research regarding the external manipulation of responsibility. The fact that decision maker’s feelings of responsibility have an effect on the investment decision explains why the external responsibility manipulation has been successful, and indicates that future research should find other factors that will affect subjective responsibility.

Recently, Rao and Monk (1999) have investigated a factor that seems to be related feelings of responsibility in sunk cost decision tasks. They investigated the effect that anonymity (i.e., accountability) has on the propensity to commit the sunk cost effect. Anonymity refers to the lack of accountability of the decision maker for the consequences of their actions, which occurs when no external agency knows the identity
of the decision maker. Rao and Monk have shown that there is sufficient evidence to support the notion that anonymity leads to a lower level of responsibility. Because anonymous decision makers are not concerned with external justification of their choice, they have a low sense of responsibility for the outcome of the endeavor. In the current study, participants completed the study solely on the computer, and were told that all of their answers were confidential. Therefore, the anonymity embedded in the three current experiments could have caused an underestimation of the importance of responsibility ratings, because individual’s feelings of responsibility were lowered due to a lack of accountability.

However, in their study, Rao and Monk manipulated the anonymity of the participants, and found that there was no difference between individuals who were aware that the other group members knew their decision and individuals who were told that their decision was confidential. While the manipulation of anonymity/accountability seems inherently relevant to decision maker’s feelings of responsibility, the lack of support for its effect on the investment decision in the Rao and Monk study is similar to the small effect of responsibility ratings in the current study. In the presence of other situational factors, responsibility ratings did not account for a large amount of variance in the investment decision.

It could also be that participants did not feel particularly responsible for the tasks in the Rao and Monk study or the current studies because the situations were hypothetical and relatively unimportant to the subjects. Slovic (1964) found that emotional arousal is a prerequisite for excitation of a propensity for risk taking, believed to be a function of the responsibility trait. Specifically, Slovic believes that many negative findings may be
the result of failure to provide the decision makers with a true atmosphere of risk. He also stated that this emotional arousal depends, in part, on subject’s perceptions about the outcome of the task. If participants believe that the outcome of the task is based on skill rather than chance, their emotional arousal will be heightened. In the present studies, participants were not made aware of the outcome of their investment decision or how they would be evaluated, which would lead to a low level of arousal. According to Slovic, this atmosphere would not provide an accurate measure of individual’s risk taking behavior, and this could explain the relatively small effect of responsibility ratings and the responsibility trait.

The hypothetical nature of the tasks in these studies could also have affected the relationship between the responsibility trait (as measured by the CPI) and responsibility ratings. Weekes (1996) reported that the CPI Responsibility Scale has had good predictive validity in several studies that examined real risk-taking situations, but research has not supported the CPI’s predictive validity in hypothetical scenarios. This is not surprising due to previously mentioned findings by Slovic, that emotional arousal is necessary for excitation of risk taking propensity. The hypothetical situations used in the Weekes study did not arouse the participants into activating their risk-taking propensity, and therefore no relationship was found between the CPI and their behavior. These results are similar in the current study. Due to the hypothetical nature of the task, and thus the lack of emotional arousal, individual’s risk taking propensity, a function of responsibility, was not activated, resulting in an underestimation of the true effect of individual differences.
While the current study did reveal an effect of individual differences, the importance of this effect was minuscule when compared to the importance of situational factors. This should direct future research in this area towards the effect and interaction of situational factors, particularly the subjective potential for gain and the estimates of the probability of success, and the effect that this construct has on the investment decision. Although this topic has not been thoroughly investigated and is not completely understood, recent results have shown that it is a major contributing factor to sunk cost decisions. Both in the current studies, and the research by Arkes and Hutzel (1999), this construct was related to the investment decision. However, these two studies have generated different conclusions about the importance of estimates of success. While the present study indicates that participant’s estimates of success precede and influence the investment decision, Arkes and Hutzel contend that success estimates are a result of the decision and take place after the decision maker has chosen an option. These two explanations of the relationship between success estimates and the investment decision should be investigated in future research.

Future research is also needed to investigate other factors that contributed to feelings of the potential for gain. From the present studies, we observe that the degree of completion is related to feelings of profiting from the project, while the proportion of the budget expended is not related to estimates of success. That leads to the question of why is the degree of completion so important in ratings of the potential for gain; even in the presence of information regarding what was already spent. Future research should attempt to understand the relationship between these two variables in the context of estimates of success.
Expert estimates of the potential of success have also been shown to have an influence on decision maker’s estimations of the potential for gain. The effect of this variable seems to be straightforward, but as shown in the Arkes and Hutzel study, even when the provided probability of success is held constant, decision maker’s estimates of the probability of success were slightly higher when they had previously invested. Participants were told that there was a 34% chance of the project being successful, yet individuals who had incurred a previous investment provided higher estimates of the success of the endeavor than those subjects who had not already invested. This results shows that there are several known factors that work together to influence decision makers estimates of success, and there are undoubtedly more variables that can affect how decision makers feel about their chances at receiving a gain if they continue the endeavor. Based on the importance of the potential gain construct, future research should attempt to discover these variables.

The three current studies attempted to understand the factors that affected the sunk cost effect and how these factors worked together. The effect of both the feelings of responsibility and the potential for gain, suggests that the decision to invest is a multifaceted choice that is influenced by the situation as well as the individual. The present studies provided some support of previous results, as well as some new findings that suggest new areas for future research, indicating that while there has been substantial progress in the research on the sunk cost bias, there is still much more that needs to be understood before psychologists can claim a true understanding of this phenomenon.
References


Appendix A. Responsibility Scale of the California Psychological Inventory

1. When a person “pads” an income tax report so as to get out of some taxes, it is just as bad as stealing money from the government.
2. Every family owes it to the city to keep its sidewalks cleared in the winter and its lawn mowed in the summer.
3. I liked school.
4. I do not dread seeing a doctor about a sickness or injury.
5. Every citizen should take the time to find out about national affairs, even if it means giving up some personal pleasures.
6. When I work on a committee I like to take charge of things.
7. I would be ashamed not to use my privilege of voting.
8. I have never been in trouble with the law.
9. People have a real duty to take care of their aged parents, even if it means making some pretty big sacrifices.
10. We ought to pay our elected officials better than we do.
11. I can honestly say that I do not really mind paying my taxes because I feel that’s one of the things I can do for what I get from the community.
12. I always try to do a little better than what is expected of me.
13. If I get too much change in a store, I always give it back.
14. I like to read about science.
15. There’s no use in doing things for people; you only find that you get it in the neck in the long run.
16. I have had very peculiar and strange experiences.
17. It’s a good thing to know people in the right places so you can get traffic tickets, and such things, taken care of.
18. When I was going to school I played hookey quite often.
19. It’s no use worrying my head about public affairs; I can’t do anything about them anyhow.
20. When someone does me a wrong, I feel I should pay that person back if I can, just for the principle of the thing.
21. Maybe some minority groups do get rough treatment, but it’s no business of mine.
22. We ought to worry about our own country and let the rest of the world take care of itself.
23. As long as people vote every four years, they have done their duty as citizens.
24. I am fascinated by fire.
25. I was a slow learner in school.
26. I think I would like to drive a racing car.
27. It is all right to get around the law if you don’t actually break it.
28. My parents have often disapproved of my friends.
29. In school my marks for conduct were quite regularly bad.
30. I enjoy a race or game better when I bet on it.
31. I have often found people jealous of my good ideas just because they had not thought of them first.
32. When prices are high, you can’t blame people for getting all they can while the getting is good.
33. We ought to let Europe get out of its own mess; it made its bed, let it lie in it.
34. As a child I was suspended from school one or more times for disciplinary reasons.
35. I feel that I have often been punished without cause.
36. Police cars should be specially marked so that you can always see them coming.

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All items are true/false. Participants get 1 point for each true response on items 1 through 14. For items 15 through 36, participants receive 1 point for a false answer. The numbers of points are added to attain the individual’s responsibility score.

An individual who scores highly on this scale shows a ready willingness to accept the consequences of his/her own behavior and has a sense of commitment to the group and others (Gough, 1952). High responsibility subjects are willing to sacrifice their own satisfaction for the good of the group, and they honor any commitments they have made (Groth-Marnat, 1997). Those subjects in the moderate range are seen as conscientious and straightforward, but they are not willing to take responsibility for the actions of the group (Groth-Marnat, 1997). People low on the responsibility scale are described not as irresponsible, but rather as lacking the qualities mentioned in the high and moderate responsibility categories (Gough 52). They are mainly concerned with their own needs, and their perceptions are blurred by their own biases. (Groth-Marnat, 1997).
Appendix B. Decision Tasks for Experiment 1

1) You are the president of Aero-Flite Corporation, an airplane manufacturer. The company is in the middle of a project to develop a radar-scrambling device that would render a plane undetectable by conventional radar (in effect, a radar blank plane). The company has spent low % (high %) of the research budget. Another firm has begun marketing a similar device that takes up less space and is much easier to operate than Aero-Flite’s. You are in charge of deciding whether or not the company should continue investing in this project.

If you were in this situation, how responsible would you feel for the decision you are about to make (Please rate on a scale of 1 – 100).

Please rate, on a scale of 1-100, the likelihood that you would continue to invest in this project.

(Adapted from Garland & Newport, 1991)

2) You are the owner and manager of Security Tower, an older downtown office building that overlooks several square blocks in an area that has been slated for urban renewal over the next 3 years. The City Council has indicated that it would like to create a “greenway” with grass, trees, and a small lake networked with bicycle and jogging paths. The company has begun remodeling the building, anticipating renewed interest in downtown offices, with convenient parking, good access to the cross-town freeway, and a nice view. The company has spent low % (high %) of the remodeling budget. You have just learned that the “greenway” plan has been voted down in favor of a sports stadium that will give all 15 floors of the building a view of cement walls and/or parking lots. Additionally, the increased traffic in the area will clog the freeway access for years, even with the plans to widen adjacent streets.

You are in charge of deciding whether or not the company should continue investing in this project.

If you were in this situation, how responsible would you feel for the decision you are about to make (Please rate on a scale of 1 – 100).

Please rate, on a scale of 1-100, the likelihood that you would continue to invest in this project.

(Adapted from Garland & Newport, 1991)

3) You are a loan officer at a large commercial bank. Custom Molds Inc., a manufacturer of plastic injection molds for high tech precision parts, is one of the bank’s clients of long and good standing. About 1 year ago, the CEO of Custom Molds approached the bank with a request for funds in order to revamp his manufacturing capabilities in a manner that would allow the firm to gear up for new competition. After long discussion and detailed scrutiny of the project plans, the bank approved a multi-million dollar loan for this project, with an agreed schedule of disbursement. The covenants provide for bank monitoring of project progress. To date low % (high %) of the loan has been disbursed to the company. Over the past few months, industry data and market information have suggested
that the firm’s competitive position has been negatively affected by new entrants into this increasingly global market. In fact, just last week, a principal client of Custom Molds dropped the company from its approved vendor list. The CEO of Custom Molds has now asked you to authorize the next installment of the loan in order to continue with the revamping project. Failure to authorize the requested funds would place Custom Molds in a very precarious position, with a high probability of default on the outstanding loan. You are in charge of deciding whether or not the bank should continue investing in this project.

If you were in this situation, how responsible would you feel for the decision you are about to make (Please rate on a scale of 1 – 100).

Please rate, on a scale of 1-100, the likelihood that you would authorize the next disbursement of the loan.

(Adapted from Garland & Conlon, 1998)

4) You are the director of “Innovative Pte Ltd.” Your company has embarked on research and development for a new product—a mobile phone that allows communication to be made within 500 miles. The company has spent low % (high %) of the budget for this endeavor when one of your competitors comes out with a superior mobile phone that is lighter and that can communicate within 1000 miles.

You are in charge of deciding whether or not the company should continue investing in this project.

If you were in this situation, how responsible would you feel for the decision you are about to make (Please rate on a scale of 1 – 100).

Please rate, on a scale of 1-100, the likelihood that you would continue to invest in this project

(Adapted from Tan & Yates, 1995)

5) You are a market analyst, and the majority of the work you do takes place on a personal computer, an IBM with a Pentium II processor. Due to developments in technology, a new program is available that will allow you to complete your work more accurately, and in less than half of the time of the old program. However, this program can only be run on a Pentium III microprocessor. A project to upgrade the computer to a Pentium III is underway (a process that involves deleting all of your old programs and removing your Pentium II processor) when you read a new research study that shows that upgrades are not necessarily as good as new computers. In fact, even with the upgrade you may be unable to run the new program. The old processor has been removed, and low % (high %) of the upgrading budget has already been invested.

You are in charge of deciding whether or not to continue upgrading the computer.

If you were in this situation, how responsible would you feel for the decision you are about to make (Please rate on a scale of 1 – 100).

Please rate, on a scale of 1-100, the likelihood that you would continue to upgrade to a Pentium III.
6) You are in the process of applying for a new job. One of the requirements of the job is that you own a car and you are willing to make the appropriate repairs. You begin making the repairs in preparation for your final interview. You have spent low % (high %) of the budget that you set aside for these repairs when you learn that the company is having financial problems and is going to have to reduce the number of new employees it hires.

You have to decide whether or not to continue making the repairs.

If you were in this situation, how responsible would you feel for the decision you are about to make (Please rate on a scale of 1 – 100).

Please rate, on a scale of 1-100, the likelihood that you would continue to make the repairs.
Appendix C. Pervasive Responsibility Measure

1) You’re with a friend at a party and she’s had a lot to drink. She decides to drive home despite your offer to give her a ride. She gets pulled over for a DUI.

2) Your roommate leaves you a note to wake him up at a certain time, but you don’t see the note. Heoversleeps and misses a job interview.

3) You are assigned a group project. You put in as much time as everyone else in the group but you know you could have put in more. The group receives a C-.

4) As a passenger in your friend’s car, you notice that the gas gauge is near empty, but you don’t mention anything. The next time she uses her car, she runs out of gas on I-40.

5) Your sister decides to marry her boyfriend. You don’t think he’s right for her, but you don’t say anything. The relationship turns bad and ends in a bitter, painful divorce.

6) Your friend doesn’t wear a seatbelt. After a while, you give up on telling him he should. He gets in a car accident and sustains injuries that could have been prevented if he had worn his seatbelt.

7) You notice that the steps to your friend’s house have a loose board but you don’t say anything. Later that day, she trips over it, falls, and breaks her leg.

8) Your friend is planning a trip to a city you’re familiar with that he’s never visited. You know that there are some particularly dangerous areas but you don’t tell him about these places. He ends up going to one of these areas and is mugged there.

9) You go running with someone who you know has weak ankles. You pick the route to follow. Her ankle turns on a rock and is sprained.

10) Your friend gives you a loan. He ends up depleting his checking account and then bounces a check.

11) You are driving a bit slow because you’re looking for a street address. Someone behind you tries to pass you. In doing so, he crashes into an oncoming car.

12) A friend lets you borrow her computer. When you try to open a file, the computer crashes and the hard drive is destroyed.
13) You give your friend flowers for her birthday. She brings the bouquet home. Her mother has a terrible allergic reaction to the flowers and ends up going to the hospital.

14) You agree to take care of a friend’s cat while she is away on vacation. When you open the door to get the morning paper, the cat runs out the door and becomes lost.

Participants are asked to rate, between 1 and 100, to what degree they feel responsible for each of the 14 outcomes. Higher ratings indicate more responsibility. The measure is scored by averaging the responsibility ratings.
Appendix D. Decision Tasks for Experiment 2

Responsible Condition

1) You are the president of Aero-Flite Corporation, an airplane manufacturer. You made the decision to begin a project to develop a radar-scrambling device that would render a plane undetectable by conventional radar (in effect, a radar blank plane). You have spent low % (high %) of your research budget, and the project is low % (high %) complete. Another firm has begun marketing a similar device that takes up less space and is much easier to operate than Aero-Flite’s.

You were responsible for initiating the development of the radar-blank plane, and now you are in charge of deciding whether or not the company should continue investing in this project.

If you were in this situation, how responsible would you feel for the decision you are about to make (Please rate on a scale of 1 – 100).

Please rate, on a scale of 1-100, the likelihood that the project will result in an economic gain if you continue investing.

Please rate, on a scale of 1-100, the likelihood that you would continue to invest in this project.

2) You are the owner and manager of Security Tower, an older downtown office building that overlooks several square blocks in an area that has been slated for urban renewal over the next 3 years. The City Council has indicated that it would like to create a “greenway” with grass, trees, and a small lake networked with bicycle and jogging paths. You have decided that the company will remodel the building, anticipating renewed interest in downtown offices, with convenient parking, good access to the cross-town freeway, and a nice view. You have spent low % (high %) of your remodeling budget, and the project is low % (high %) complete.

You have just learned that the “greenway” plan has been voted down in favor of a sports stadium that will give all 15 floors of the building a view of cement walls and/or parking lots. Additionally, the increased traffic in the area will clog the freeway access for years, even with the plans to widen adjacent streets.

You were responsible for initiating the remodeling of your building, and now you are in charge of deciding whether or not the company should continue investing in this project.

If you were in this situation, how responsible would you feel for the decision you are about to make (Please rate on a scale of 1 – 100).

Please rate, on a scale of 1-100, the likelihood that the project will result in an economic gain if you continue investing.

Please rate, on a scale of 1-100, the likelihood that you would continue to invest in this project.

3) You are a loan officer at a large commercial bank. Custom Molds Inc., a manufacturer of plastic injection molds for high tech precision parts, is one of the
your clients of long and good standing. About 1 year ago, the CEO of Custom Molds approached you with a request for funds in order to revamp his manufacturing capabilities in a manner that would allow the firm to gear up for new competition. After long discussion and detailed scrutiny of the project plans, you recommended that the bank approve a multi-million dollar loan for this project. The bank did approve the loan, with an agreed schedule of disbursement. The covenants provide for bank monitoring of project progress. To date low % (high %) of the loan has been disbursed to the company. Over the past few months, industry data and market information have suggested that the firm’s competitive position has been negatively affected by new entrants into this increasingly global market. In fact, just last week, a principal client of Custom Molds dropped the company from its approved vendor list. The CEO of Custom Molds has now asked you to authorize the next installment of the loan in order to continue with the revamping project. In his letter to you, he indicates that the revamping project is low % (high %) complete.

Failure to authorize the requested funds would place Custom Molds in a very precarious position, with a high probability of default on the outstanding loan. You were responsible for approving the loan to Custom Molds, and now you are in charge of deciding whether or not the bank should issue the next disbursement. If you were in this situation, how responsible would you feel for the decision you are about to make (Please rate on a scale of 1 – 100).

Please rate, on a scale of 1-100, the likelihood that the bank will be repaid if you authorize the next disbursement of the loan.

Please rate, on a scale of 1-100, the likelihood that you would authorize the next disbursement of the loan.

4) You are the director of “Innovative Pte Ltd.” Based on your projections for the future of the company, you have initiated research and development for a new product—a mobile phone that allows communication to be made within 500 miles. The company has spent low % (high %) of the budget and is low % (high %) completed with the project when one of your competitors comes out with a superior mobile phone that is lighter and that can communicate within 1000 miles. You were responsible for initiating the mobile phone project, and now you are in charge of deciding whether or not the company should continue investing in this project. If you were in this situation, how responsible would you feel for the decision you are about to make (Please rate on a scale of 1 – 100).

Please rate, on a scale of 1-100, the likelihood that the project will result in an economic gain if you continue investing.

As the director of the company, would you continue to invest in the mobile phone project?

5) You are a self-employed market analyst, and the majority of the work you do takes place on your personal computer, an IBM with a Pentium II processor. Due to developments in technology, a new program is available that will allow you to
complete your work more accurately, and in less than half of the time of the old program. However, this program can only be run on a Pentium III microprocessor. You have begun to upgrade your computer to a Pentium III (a process that involves deleting all of your old programs and removing your Pentium II processor) when you read a new research study that shows that upgrades are not necessarily as good as new computers. In fact, even with the upgrade you may be unable to run the new program. You have already removed your original processor, and have currently invested low % (high %) of the money you set aside for upgrading your computer. The upgrade is low % (high %) complete.

You decided to upgrade your only computer, and now you are in charge of deciding whether or not you should continue investing in this upgrade.

If you were in this situation, how responsible would you feel for the decision you are about to make (Please rate on a scale of 1 – 100).

Please rate, on a scale of 1-100, the likelihood that your computer will be able to run the new program if you continue to invest in the upgrade.

Please rate, on a scale of 1-100, the likelihood that you would continue to upgrade to a Pentium III.

6) You are in the process of applying for a new job. One of the requirements of the job is that you own a full size van and you are willing to make the appropriate repairs. After your first interview you decided to show initiative and a desire for the job before your final interview by getting a head start on the needed repairs. You have spent low % (high %) of the budget that you set aside for these repairs and you are low % (high %) complete when you learn that the company is having financial problems and is going to have to reduce the number of new employees it hires.

You decided to show initiative and begin the work on your van, now you have to decide whether or not to continue making repairs.

If you were in this situation, how responsible would you feel for the decision you are about to make (Please rate on a scale of 1 – 100).

Please rate, on a scale of 1-100, the likelihood that by continuing to fund the repairs you will receive an economic gain in the form of a new job.

Please rate, on a scale of 1-100, the likelihood that you would continue to make the repairs.

Non-Responsible Condition

1) You are the president of Aero-Flite Corporation, an airplane manufacturer. When you began your current job, a project to develop a radar-scrambling device that would render a plane undetectable by conventional radar (in effect, a radar blank plane) was already underway. You were not responsible for initiating this project, it was proposed by the former president. The company has spent low % (high %) of the research budget, and the project is low % (high %) complete. Another firm
has begun marketing a similar device that takes up less space and is much easier to operate than Aero-Flite’s. While the decision to fund this project was not yours, you are in charge of deciding whether or not the company should continue investing in this project. If you were in this situation, how responsible would you feel for the decision you are about to make (Please rate on a scale of 1 – 100). Please rate, on a scale of 1-100, the likelihood that the project will result in an economic gain if you continue investing. Please rate, on a scale of 1-100, the likelihood that you would continue to invest in this project.

2) You are the owner and manager of Security Tower, an older downtown office building that overlooks several square blocks in an area that has been slated for urban renewal over the next 3 years. The City Council has indicated that it would like to create a “greenway” with grass, trees, and a small lake networked with bicycle and jogging paths. The Board of Executives of Security Tower has decided to begin remodeling the building, anticipating renewed interest in downtown offices, with convenient parking, good access to the cross-town freeway, and a nice view. The company has spent low % (high %) of the remodeling budget, and the project is low % (high %) complete. You have just learned that the “greenway” plan has been voted down in favor of a sports stadium that will give all 15 floors of the building a view of cement walls and/or parking lots. Additionally, the increased traffic in the area will clog the freeway access for years, even with the plans to widen adjacent streets. While the decision to fund this project was not yours, you are in charge of deciding whether or not the company should continue investing in this project. If you were in this situation, how responsible would you feel for the decision you are about to make (Please rate on a scale of 1 – 100). Please rate, on a scale of 1-100, the likelihood that the project will result in an economic gain if you continue investing. Please rate, on a scale of 1-100, the likelihood that you would continue to invest in this project.

3) You are a loan officer at a large commercial bank. Custom Molds Inc., a manufacturer of plastic injection molds for high tech precision parts, is a long and good standing client of your banks. About 1 year ago, the CEO of Custom Molds approached the bank with a request for funds in order to revamp his manufacturing capabilities in a manner that would allow the firm to gear up for new competition. After long discussion and detailed scrutiny of the project plans, a former coworker recommended that the bank approve a multi-million dollar loan for this project. The bank did approve the loan, with an agreed schedule of disbursement. The coworker who approved the loan has recently left the bank. Even though you did not initiate the original loan, you have taken over the Custom Molds account. The covenants of the original loan provide for bank monitoring of project progress. To date low % (high %) of the loan has been
disbursed to the company. Over the past few months, industry data and market information have suggested that the firm’s competitive position has been negatively affected by new entrants into this increasingly global market. In fact, just last week, a principal client of Custom Molds dropped the company from its approved vendor list. The CEO of Custom Molds has now asked you to authorize the next installment of the loan in order to continue with the revamping project. In his letter to you, he indicates that the revamping project is low % (high %) complete. Failure to authorize the requested funds would place Custom Molds in a very precarious position, with a high probability of default on the outstanding loan. While the decision to approve this loan was not yours, you are in charge of deciding whether or not the bank should continue funding Custom Molds. If you were in this situation, how responsible would you feel for the decision you are about to make (Please rate on a scale of 1 – 100). Please rate, on a scale of 1-100, the likelihood that the bank will be repaid if you authorize the next disbursement of the loan. Please rate, on a scale of 1-100, the likelihood that you would authorize the next disbursement of the loan.

4) You are the director of “Innovative Pte Ltd.” When you began your current job, a project to research and develop a new product—a mobile phone that allows communication to be made within 500 miles—was underway. You were not responsible for initiating this project, it was proposed by the former director. The company has spent low % (high %) of the budget and is low % (high %) completed with the project when one of your competitors comes out with a superior mobile phone that is lighter and that can communicate within 1000 miles. While the decision to fund this project was not yours, you are in charge of deciding whether or not the company should continue investing in this project. If you were in this situation, how responsible would you feel for the decision you are about to make (Please rate on a scale of 1 – 100). Please rate, on a scale of 1-100, the likelihood that the project will result in an economic gain if you continue investing. As the director of the company, would you continue to invest in the mobile phone project? (Adapted from Tan & Yates, 1995)

5) You work for Research Inc., a company that supplies market analysis. The majority of the work you do takes place on a personal computer, an IBM with a Pentium II processor. Due to developments in technology, a new program is available that will allow you to complete your work more accurately, and in less than half of the time of the old program. However, this program can only be run on a Pentium III microprocessor. The president of the company has decided to upgrade your computer to a Pentium III (a process that involves deleting all of your old programs and removing your Pentium II processor). You have discovered a new research study that shows that upgrades are not necessarily as
good as new computers. In fact, even with the upgrade you may be unable to run the new program. You have already removed your original processor, and have currently invested low % (high %) of the money you set aside for upgrading your computer. The upgrade is low % (high %) complete. While you were not responsible for the decision to upgrade your computer, the president has put you in charge of deciding whether or not to continue upgrading your microprocessor.

If you were in this situation, how responsible would you feel for the decision you are about to make (Please rate on a scale of 1 – 100).

Please rate, on a scale of 1-100, the likelihood that your computer will be able to run the new program if you continue to invest in the upgrade.

Please rate, on a scale of 1-100, the likelihood that you would continue to upgrade to a Pentium III.

6) You are in the process of applying for a new job. One of the requirements of the job is that you own a full size van and you are willing to make the appropriate repairs. After your first interview you were required by the manager to begin the repairs on your van if you wanted to be considered for a final interview. You have spent low % (high %) of the budget that you set aside for these repairs and you are low % (high %) complete when you learn that the company is having financial problems and is going to have to reduce the number of new employees it hires.

You began the work on your van at the managers request, now you have to decide whether or not to continue making repairs.

If you were in this situation, how responsible would you feel for the decision you are about to make (Please rate on a scale of 1 – 100).

Please rate, on a scale of 1-100, the likelihood that by continuing to fund the repairs you will receive an economic gain in the form of a new job.

Please rate, on a scale of 1-100, the likelihood that you would continue to make the repairs.
Appendix E. Generic Sunk Cost Decision Tasks

1) Assume that you have spent $100 on a ticket for a weekend ski trip to Michigan. Several weeks later you buy a 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? (Adapted from Arkes & Blumer, 1985)

2) On your way home you buy a tv dinner on sale for $3 at the local grocery store. A few hours later you decide it is time for dinner, so you get ready to put the tv dinner in the over. Then you get an idea. You call up your friend and ask if he would like to come over for a quick tv dinner and then watch a good movie on tv. Your friend says, “Sure.” So you go out to buy a second tv dinner. However, all the on-sale tv dinners are gone. You therefore have to spent $5 (the regular price) for the tv dinner identical to the one you just bought for $3. You go home and put both dinners in the over. When the two dinners are fully cooked, you get a phone call. Your friend is ill and cannot come. You are not hungry enough to eat both dinners. You cannot freeze one. You must eat one and discard the other. Which one do you eat? (Adapted from Arkes & Blumer, 1985)

3) You and your spouse have always planned to retire to a place up in the mountains near a lake. You looked for several years before you found the perfect site: a half-acre of wooded property at Shadow Mountain Lake. Your lot fronts on the main access road to the lake. It is near enough to the major resort businesses to make them convenient but just far enough to allow you freedom from the noise and garbage generated by year-round tourists. You are partially done building when your mail informs you that in spite of your strong opposition, the zoning committee of the Shadow Mountain Council has voted to rezone the lot next to yours so it can be used for a gas station/convenience store business. Do you continue building your retirement home on this lot? (Adapted from Garland & Newport, 1991)

4) You have driven 2 hours to a state park to go on a hike. When you arrive it has turned cold and rainy. You do not think you will enjoy the planned hike. Would you continue with your plans and go on the hike? (Adapted from Bornstein & Chapman, 1995)

5) For your psychology class, you have selected a topic to write a research paper on and you have gotten your professor’s approval. After working on the project for 4 days you think of an alternative topic that is more interesting. Would you continue to write the paper on your initial topic?
6) You have rented a movie for $4. After watching for 45 minutes, you realize that you are not enjoying the movie. Would you turn it off?
(Adapted from Bornstein & Chapman, 1995)
## Appendix F. Experiment 2: Table of Means

### Proportion of the Budget Expended (%) by Degree of Completion (%)

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<tr>
<th>Scenario</th>
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### Appendix F. Experiment 2: Table of Means (continued)

#### Proportion of the Budget Expended (%) by Degree of Completion (%)

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Appendix G. Decision Tasks for Experiment 3.

Business Finance Context:

1. You are the president of Aero-Flite Corporation, an airplane manufacturer. The company is in the middle of a project to develop a radar-scrambling device that would render a plane undetectable by conventional radar (in effect, a radar blank plane). Another firm has begun marketing a similar device that takes up less space and is much easier to operate than Aero-Flite’s. You are in charge of deciding whether or not the company should continue investing in this project. Please rate, on a scale of 1-100, the likelihood that you would continue to invest in this project. (Adapted from Garland & Newport, 1991)

2. You are the owner and manager of Security Tower, an older downtown office building that overlooks several square blocks in an area that has been slated for urban renewal over the next 3 years. The City Council has indicated that it would like to create a “greenway” with grass, trees, and a small lake networked with bicycle and jogging paths. The company has begun remodeling the building, anticipating renewed interest in downtown offices, with convenient parking, good access to the cross-town freeway, and a nice view. You have just learned that the “greenway” plan has been voted down in favor of a sports stadium that will give all 15 floors of the building a view of cement walls and/or parking lots. Additionally, the increased traffic in the area will clog the freeway access for years, even with the plans to widen adjacent streets. You are in charge of deciding whether or not the company should continue investing in this project. Please rate, on a scale of 1-100, the likelihood that you would continue to invest in this project. (Adapted from Garland & Newport, 1991)

3. You are a loan officer at a large commercial bank. Custom Molds Inc., a manufacturer of plastic injection molds for high tech precision parts, is one of the bank’s clients of long and good standing. About 1 year ago, the CEO of Custom Molds approached the bank with a request for funds in order to revamp his manufacturing capabilities in a manner that would allow the firm to gear up for new competition. After long discussion and detailed scrutiny of the project plans, the bank approved a multi-million dollar loan for this project, with an agreed schedule of disbursement. The covenants provide for bank monitoring of project progress. Over the past few months, industry data and market information have suggested that the firm’s competitive position has been negatively affected by new entrants into this increasingly global market. In fact, just last week, a principal client of Custom Molds dropped the company from its approved vendor list. The CEO of Custom Molds has now asked you to
authorize the next installment of the loan in order to continue with the
revamping project. Failure to authorize the requested funds would place
Custom Molds in a very precarious position, with a high probability of default
on the outstanding loan.
You are in charge of deciding whether or not the bank should continue investing
in this project.
Please rate, on a scale of 1-100, the likelihood that you would authorize the next
disbursement of the loan.
(Adapted from Garland & Conlon, 1998)

4. You are the director of “Innovative Pte Ltd.” Your company has embarked on
research and development for a new product—a mobile phone that allows
communication to be made within 500 miles. You have just learned that one of
your competitors has come out with a superior mobile phone that is lighter and
that can communicate within 1000 miles.
You are in charge of deciding whether or not the company should continue
investing in this project.
Please rate, on a scale of 1-100, the likelihood that you would continue to invest
in this project
(Adapted from Tan & Yates, 1995)

5. You are a market analyst, and the majority of the work you do takes place on a
personal computer, an IBM with a Pentium II processor. Due to developments
in technology, a new program is available that will allow you to complete your
work more accurately, and in less than half of the time of the old program.
However, this program can only be run on a Pentium III microprocessor. A
project to upgrade the computer to a Pentium III is underway (a process that
involves deleting all of your old programs and removing your Pentium II
processor) when you read a new research study that shows that upgrades are not
necessarily as good as new computers. In fact, even with the upgrade you may
be unable to run the new program.
You are in charge of deciding whether or not to continue upgrading the
computer.
Please rate, on a scale of 1-100, the likelihood that you would continue to
upgrade to a Pentium III.

Personal Finance Context:

6. You are in the process of applying for a new job. One of the requirements of the
job is that you own a car and you are willing to make the appropriate repairs.
You have begun making the repairs in preparation for your final interview, when
you learn that the company is having financial problems and is going to have to
reduce the number of new employees it hires.
You have to decide whether or not to continue making the repairs.
Please rate, on a scale of 1-100, the likelihood that you would continue to make the repairs.

7. Assume that you have spent $100 on a ticket for a weekend ski trip to Michigan. Several weeks later you buy a 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? (Adapted from Arkes & Blumer, 1985)

8. On your way home you buy a tv dinner on sale for $3 at the local grocery store. A few hours later you decide it is time for dinner, so you get ready to put the tv dinner in the over. Then you get an idea. You call up your friend and ask if he would like to come over for a quick tv dinner and then watch a good movie on tv. Your friend says, “Sure.” So you go out to buy a second tv dinner. However, all the on-sale tv dinners are gone. You therefore have to spent $5 (the regular price) for the tv dinner identical to the one you just bought for $3. You go home and put both dinners in the over. When the two dinners are fully cooked, you get a phone call. Your friend is ill and cannot come. You are not hungry enough to eat both dinners. You cannot freeze one. You must eat one and discard the other. Which one do you eat? (Adapted from Arkes & Blumer, 1985)

9. You and your spouse have always planned to retire to a place up in the mountains near a lake. You looked for several years before you found the perfect site: a half-acre of wooded property at Shadow Mountain Lake. Your lot fronts on the main access road to the lake. It is near enough to the major resort businesses to make them convenient but just far enough to allow you freedom from the noise and garbage generated by year-round tourists. You are partially done building when your mail informs you that in spite of your strong opposition, the zoning committee of the Shadow Mountain Council has voted to rezone the lot next to yours so it can be used for a gas station/convenience store business. Do you continue building your retirement home on this lot? (Adapted from Garland & Newport, 1991)

Social Context:

10. You have driven 2 hours to a state park to go on a hike. When you arrive it has turned cold and rainy. You do not think you will enjoy the planned hike. Would you continue with your plans and go on the hike? (Adapted from Bornstein & Chapman, 1995)
11. For your psychology class, you have selected a topic to write a research paper on and you have gotten your professor’s approval. After working on the project for 4 days you think of an alternative topic that is more interesting. Would you continue to write the paper on your initial topic?  
(Adapted from Bornstein & Chapman, 1995)

12. You have rented a movie for $4. After watching for 45 minutes, you realize that you are not enjoying the movie. Would you turn it off?  
(Adapted from Bornstein & Chapman, 1995)

13. You paid $100 to be added to the waiting list for season tickets to your favorite sports team. The $100 is non-refundable, but can be used toward the price of your season tickets when you reach the top of the list. When your name comes to the top of the waiting list, the ticket office calls to offer you the season tickets. At this time, the team has recently traded or released all of their good players in an attempt to rebuild the franchise. Would you purchase the season tickets?

14. You decide that you want to take up a new hobby that will allow you to spend more time outdoors. You decide on rock climbing, and so you purchase about half of the supplies necessary for the sport. However, after you spend the majority of your budget, you realize that this activity may be more of a commitment that you originally intended. You are not sure that you will go very often, or even enjoy the time that you spend climbing. Would you continue to invest in climbing gear?

15. You have decided to treat yourself to a long overdue vacation in the Caribbean during Christmas break. You have already provided a down payment to the travel agent. This morning, your aunt Helen called to say that she is giving your parents a special 40th anniversary party over the holiday, and that over 50 out-of-town guests have already made the plans to attend the party on December 28th. This date falls in the middle of your planned vacation but you could never forgive yourself if you missed this special event. The trip on which you have a deposit cannot be transferred or rescheduled because it was a special package of which you took advantage. Would you continue financing the trip so that you can go to the Caribbean over Christmas break, or would you attend your parents’ party?