Factors influencing managers' decisions to continue/discontinue capital budgeting projects
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Published: 2 November 2016

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Normative decision theories stipulate that rational economic decisions (including investment decisions) are made based on the assessment of the expected outcomes. Accordingly, if available feedback information about an investment project indicates at any given point in time that the expected outcome would be negative, one would expect that such an investment project would be immediately terminated. This implies that any prior funds spent on an investment project that cannot be recovered (known as sunk costs) are considered irrelevant to the decision to terminate. However, the decision-making literature provides instances of entrapment or escalation where decision makers were influenced by sunk costs in their decisions. The psychology literature provides two basic explanations for this entrapment or escalation behavior. The first explanation attributes the escalation behavior to the notion of self-justification and asserts that a decision-maker who is associated with the initial decision to invest in a project will elect to commit additional resources to the investment project as a way to justify past decisions, even when the available information indicates that the project should be terminated. The second explanation is rooted in prospect theory, which postulates that decision-makers tend to evaluate choices as gains and losses in relation to a neutral reference point and that decision-makers are generally risk seeking when faced with possible losses. That is, a risk-seeking person would reject a certain loss in favor of a gamble with equal or even "lower" expected value. Thus, for commitment escalation, the theory asserts that decision makers would view sunk costs as a sure loss and they would

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prefer to engage in the escalation of prior commitments with the possibility of incurring greater losses or recovering past investments. Agency theory provides a third explanation for escalation of commitments. When a manager posses private information on the state of the project, abandoning a potentially failing project would reveal this state and adversely affect the manager's reputation while further commitment of resources protects the manager's reputation. This paper extends previous work on the escalation of commitment by considering the effects of two additional variables that usually constrain managers' decisions. These variables are managers' potential liability for committing additional resources to a potentially failing project, and the level of credibility of a project's prospective information that the manager obtains. A between-subject experimental design is used where the three research variables (managers' responsibility, potential liability, and credibility of information about the prospects of a hypothetical project) are factorially crossed to obtain eight sets of experimental conditions (a 2x2x2 ANOVA design) The results indicate significant main effects of initial responsibility, potential liability, and information credibility. In addition, there were significant two-way interaction effects between initial responsibility and potential liability and information credibility.

keywords: Factorial Design, Normative Decision Theory, ANOVA, Potential Liability, and Information Credibility.

1 Introduction

Managers' escalation of commitment to potentially failing projects has attracted attention in past years. For example, the Taurus project at the London Stock Exchange involved about 600 million of investment before it was cancelled. Likewise, Daiwa Bank of New York incurred about 1 billion in cumulative currency trading losses over a few years before their strategy was abandoned.

Normative decision theories stipulate that rational economic decisions (including investment decisions) are made based on the assessment of the expected outcomes. Reviews of investment projects usually proceed in the same manner. If at any given point in time available information indicates that the project is no longer worth of continuation (e.g., net present value of its future cash flows is negative), one would expect the manager to immediately terminate it. This implies that any prior investment funds that cannot be recovered (known as sunk costs) are irrelevant to the decision to terminate. However, the decision-making literature provides instances of entrapment where decision-makers were influenced by sunk costs in their decisions (Staw, 1976; Staw, 1981; Staw and Ross, 1978; Arkes and Blumer, 1985; Brockner et al., 1984; Whyte, 1986; Garland and Newport, 1991; Harrison and Harrell, 1995). Thus, there is an inconsistency between the normative models of decision theory and management actual decision behaviour. This inconsistency has been used to either discredit the normative decision

models or as evidence of entrapment and "irrational" behaviour.

Over the years, researchers have attempted to find an answer to the question of what causes managers to escalate their commitments to failing projects. The psychology literature provides two possible explanations for this entrapment or escalation behaviour. The first explanation attributes the escalation behaviour to the notion of self-justification and asserts that a decision-maker who is associated with the initial decision to invest in a project will elect to commit additional resources to the investment project as a way to justify past decisions, even when available information indicates that the project should be terminated. Although this explanation emphasises the responsibility of the decision maker regardless of the amount of the sunk cost involved, Garland and Newport (1991) noted that the decision to continue or discontinue an investment project may also depend on the proportion of planned expenditures to the original sunk costs. The theoretical work of **Shoemaker (1987) and Hogarth and Einhorn (1988)** also indicate that decision makers may be fixated on the size of a decision outcome or its probability and not the expected value.

The second explanation is rooted in prospect theory (Kahneman and Tversky, 1979), which has been suggested as a sound theoretical foundation to understand commitment escalation (Arkes and Blumer, 1985; Whyte, 1986). Prospect theory postulates that decision makers tend to evaluate choices as gains and losses in relation to a neutral reference point and that decision makers are generally risk- seeking when faced with possible losses. That is, a risk-seeking person would reject a certain loss in favour of a gamble with equal or even lower expected value. Thus, for commitment escalation, the theory asserts that decision makers would view sunk costs as a sure loss and they would prefer to engage in the escalation of prior commitments with the possibility of incurring greater losses or recovering past investments.

Brockner (1992) pointed out that escalation of commitment appears to be the result of numerous factors and processes and recommended that future research seek competing explanations. This study extends previous work on escalation of commitment by considering the effects of two additional variables that usually constrain managers decisions: (1) managers' potential liability for committing additional resources to a potentially failing project, and (2) the level of credibility of a project's prospective information. The inclusion of these variables in the experimental design would approximate a real-life situation and enhance the level of realism in the experiment.

The paper is organized as follows. The next section reviews relevant prior studies. The second section deals with the research method and data collection. The third section provides the results. The final section presents summary and conclusion.

2 Literature Review

Prior research on escalation of commitment addressed the underlying factors of such a phenomenon by focusing on different possible explanations. Early stream of research used the psychological notion of self-justification or personal responsibility to explain escalation of commitments (e.g. Staw, 1981). This explanation posits that individuals

use their prior association with a project to justify further commitment to such projects even in the face of potential project failure. Individuals become more committed to affirm that their past decisions were correct. The results of Caldwell and O'Reilly (1982) and Whyte (1993), among others, indicate that personal responsibility is positively associated with escalation of commitments. However, Brockner and Rubin (2012) indicate that personal responsibility appears to have several other dimensions those prior studies did not address (e.g., loss of reputation, denial of promotion or bonuses). Consistent with this line of thought, Brockner (1992) indicate that the findings that personal responsibility increases escalation of commitment could be subject to alternative explanations as many factors contribute to such escalation behaviour. A second stream of research on escalation of commitments used prospect theory. In prospect theory, each decision is made after information has been filtered through a decision maker's "decision frame" or conception of the acts, outcomes, and contingencies associated with a particular choice (Kahneman and Tversky, 1979). This line of research focuses on how framing of information affects the escalation behaviour. Whyte (1986; 1993) indicates that escalation of commitment is the natural choice of negatively framed decisions. A third line of research on escalation of commitment used agency theory framework (e.g., Harrison and Harrell, 1995; Harrell and Harrison, 1994; Chow et al., 1997). Agency theory postulates that managerial and ownership interests can diverge in the face of adverse selection. Therefore, managers are likely to make decisions that maximize their personal utility and not that of the firm (Jensen and Meckling, 1976). For such a divergence to take place in connection with escalation of commitments, the following two conditions are necessary (known as adverse selection):

1. The manager has more information than the firm owner. This is known as the condition of information asymmetry.

2. The manager's reward to escalate commitment to a project is greater than that of terminating the project. This is known as the condition of incentive to shirk.

Kanodia et al. (1989) developed an analytical model indicating that a rational manager would escalate commitment to a project if its abandonment adversely affects his/her reputation as a competent manager, and that the manager possess private information regarding the state of the project. Abandonment of a potentially failing project would reveal this state while escalating it by further commitment of resources protects the manager's reputation. The results of Harrison and Harrell (1993), Harrell and Harrison (1994) and Chow et al. (1997) provide empirical support for the agency theory model.

3 Development of the Research Hypotheses

This study posited three hypotheses. The first deals with the effect of the manager's potential personal liability on the project evaluation decision. It is hypothesized that managers who assess a low level of potential personal liability for a failing project are likely to engage in escalation behavior by committing additional resources than managers who assess potential personal liability at higher levels. This hypothesis is supported by

the economic notion of utility maximization as well as agency theory where managers will avoid solutions that reduce their own wealth (in the form of higher potential liability). The hypothesis is stated in the null form as follows:

H_{01}. The mean score of escalation for subjects who assess higher levels of personal liability is not significantly different from that of subjects who assess lower levels of personal liability. The second hypothesis deals with the effect of information reliability on the decision to engage in escalation behavior. It is hypothesized that managers receiving reliable information about the potential failure of a project are less likely to commit additional resources to such projects. It is assumed that reliable information is available to the market while less reliable information (although relevant) is not completely known to the market. As indicated earlier, Managers will attempt to maintain their reputation and maximize their own wealth by avoiding potentially failing projects where abandoning the project is the rational behavior based on available reliable information. This hypothesis is stated in the null form as follows:

H_{02}. The mean score of escalation for subjects who receive highly reliable information is not significantly different from that of subjects receiving less reliable information. The third research hypothesis deals with the effect of initial responsibility. As indicated earlier, prior research has posited that managers responsible for the initiation of the project are likely to escalate their commitments than those who did not initiate the project. This research is stated in the null form as follows.

H_{03}. The mean score of escalation for subjects who initiated the project is not significantly different from that of subjects who did not initiate the project. The above research hypotheses are testing using t-tests and analysis of variance techniques.

4 Research Method

4.1 Research Design

This research adopts a between-subject experimental design. The three research variables (managers responsibility to initiate a project, potential liability of managers for committing additional resources to a potentially failing project, and credibility of available information on the project) are factorial crossed to obtain eight sets of experimental conditions (a 2x2x2 ANOVA design). The choice of a between-subject design over a within-subject design is mainly motivated by the desire to avoid the demand effects associated with within-subjects designs.

4.2 Subjects

The author contacted an initial sample of 275 managers of companies located in Hong Kong and North America for possible participation in the study. A total of 102 managers agreed to participate in the study (45 from Hong Kong and 57 from North America).

Subjects' age across the sample ranged from 28 to 46 with an average of 35.5 years. About 68 per cent of the sample was male and 32 per cent was female. Six subjects were eliminated from the analysis to equalize cells. Thus the final sample was reduced to 96 subjects. One can question the sufficiency of the sample for the experimental task. With large sample size (e.g., a sample of 30 for each experimental group) would enable the researcher to get better results and study the differences among the experimental groups. Alternatively, one can pool all the data and have analysis of variance for the main variables and their interactions. This is the approach that the author follows in this paper.

4.3 Experimental Task

The study used a capital budgeting project, which is summarized in the appendix, as the decision setting. The experimental materials were pilot-tested before conducting the experiment using a large number of managers in both locations. Data from pilot-testing were not included in the data analysis. Subjects were provided with background information on the nature of the project, its product and market conditions. They were also told about the company's policy to accept projects that meet or exceed an established targeted rate of return. The project under consideration did meet the company's criteria and has been under construction for the past two years. Subjects were also told that existing company's policies require each manager to review projects underway at the end of its second year. The experimental instrument provided additional information on amounts already spent on the project and the additional resources needed to continue with the project. Subjects were further provided with additional information on assessed cash flows after taxes before engaging in the project and at the time of the project's review. Each of the three research variables was presented to the subjects in one of two forms. For the initial responsibility variable, one version of the instrument informed the subjects that they initiated the project while the other version of the instrument informed the subjects that a former manager initiated the project. The second research variable (personal liability) was used as a dichotomous variable (high liability or low liability), where one version of the instrument conveyed to the subject the existence of high level of personal liability while the other version conveyed a lower level of personal liability. The third research variable (information credibility) was also used as a dichotomous variable (low credibility or high credibility) in a fashion similar to that of the second research variable Subjects were also provided with additional information on the re-assessed cash flows after taxes at the time of the review where two possible scenarios were provided. The data of the best possible scenario provided the basis to support the continuation of the project where the re-assessed net present value of the project was still positive although at a lower level than the original analysis. The worst-case scenario provided subjects with the basis to support the decision to abandon the project where the re-assessed net present value of continuation was negative (the appendix contains one version of the instrument). Subjects were asked to assess the likelihood of committing the additional resources to the project in its third year based on the information provided on a scale ranging from zero (definitely not) to 100 (definitely yes). This rating

score is used as the measure of the dependent variable, which represents the manager's commitment to escalation.

5 Results

Table 1 shows descriptive statistics of the dependent variable for both sub-samples. The table shows that the average estimate of escalation of commitment among the North American subjects is lower than that of the Hong Kong subjects (0.332 as compared to 0.348). However, this difference is not statistically significant (t = 0.340, p = 0.734).

Table 1: Descriptive Statistics of the Dependent Variable

Sub-sample	Mean	Standard Deviation	Range
North American Sample	0.332	0.223	0.0 - 0.90
Hong Kong Sample	0.348	0.235	0.0 - 0.85
Difference	0.016		

The following two graphs present the mean plots of the two groups (North American Sample and Hong Kong Sample).
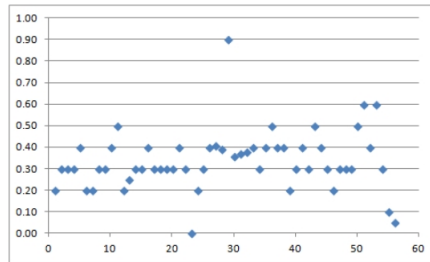

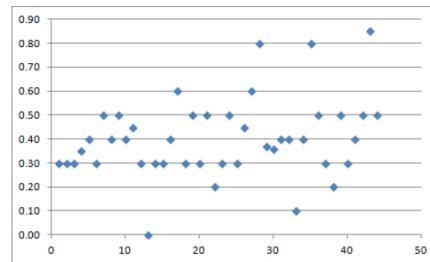Figure 1: Plots of Means of North American Sample (n=57)

Figure 2: Plots of Means of Hong Kong Sample (n=45)

The graphs show almost similar distribution between the two samples. However, one

can notice that subjects of Moth American sample may seem to be more conservative in their estimates of probabilities than those of Hong Kong. Because of the relatively small sample size for each of the eight experimental group, the author looked at the results of the pooled sample to identify the effects of the three variables and their interactions on the decision to escalate commitment to a capital budgeting project. With large sample size, one can look at the analysis of variance by groups between and within each sample. Table 2 presents the analysis of variance results of the pooled sample. The table shows statically significant main effects for each of the three variables (p < 0.0001). This indicates that each of the three variables by itself has an effect on subjects' decisions to escalate their commitment to the project. These results would fail to reject all of the hypothesized relationships.

Table 2: Analysis of Variance

Source	Sum-of-squares	df	Mean-Square	F-ratio	p
Responsibility	0.970	1	0.970	33.882	0.000
Liability	0.381	1	0.381	13.318	0.000
Information	0.675	1	0.675	23.578	0.000
Interaction 1	0.216	1	0.216	7.533	0.007
Interaction 2	0.131	1	0.131	4.585	0.035
Interaction 3	0.016	1	0.016	0.569	0.453
Interaction 4	0.002	1	0.002	0.074	0.787
Error	2.519	88	0.029		

1. Responsibility x liability.

2. Responsibility x information.

3. Liability x information.

4. Responsibility x liability x information.

The significant results for the three main variables indicate that subjects are aware of the role of a manager's responsibility when making a capital budgeting decision. Thus, if this responsibility is not discharged according to existing information, legal actions could be brought against such a manager. Table 2 also shows some significant interaction effects. The interaction of responsibility and liability is significant at the conventional levels ($F = 7.533$, p < 0.007). Also the interaction of responsibility and information is significant at the conventional levels ($F = 4.585$, p < 0.035). These interaction effects seem to be in line with the agency theory interpretation. The manager assesses potential personal liability and the degree of liability of available information on the potential failure of the project and makes the decision that maximises his/her interest

given the initial responsibility for the project. Absence of significant three way interaction effects ($F = 0.074$, p < 0.787) indicates that the decision to escalate is not affected by the three variables together. It seems that managers consider their responsibility in light of possible legal action (perhaps according to particular existing laws) or in light of available credible information from experts in the area. Existences of liability and credible information have the same effect on managers' behaviour to escalate. Absence of significant three way interaction indicate that one of the two variables) information or liability) mitigates the effect of responsibility or contains its effect a redundant variable.

6 Implications and limitations

One can point to two main implications for the results of this paper. The first has to do with the inclusion of management responsibility for failed projects when available information indicates that the project should be abundant. The commercial law or a similar legislation should incorporate the extent to which managers should be held responsible. The second major implication deals with forming project audit committee. Such committees should include managers who initiated the project. The paper is also subject to some limitations. The first one deals with the extent to which the experimental case materials have captured the real-world situation. By subjecting the experimental case materials to pilot testing for clarity and realize with a sample of 25 managers from both locations, the author believes that the effect of this limitation is minimized. A second limitation deals with the effect of sample selection. Absence of a population frame to select a random sample has forced the author to select a convenient sample. However, the author believes that the random assignment of the case materials to the sample members mitigates the effect of this limitation. A third limitation deals with the possibility of other social and cultural factors that may affect the escalation of commitments to a capital budgeting project (e.g., national pride, public relations).

7 Summary and Conclusions

Normative decision theories stipulate that rational economic decisions (including investment decisions) are made based on the assessment of the expected outcomes. Accordingly, if available feedback information about an investment project indicates at any given point in time that the expected outcome would be negative, one would expect that such an investment project would be immediately terminated. This implies that any prior funds spent on an investment project that cannot be recovered (known as sunk costs) are considered irrelevant to the decision to terminate. However, the decision-making literature provides instances of entrapment or escalation where decision-makers were influenced by sunk costs in their decisions. The psychology literature provides two basic explanations for this entrapment or escalation behavior. The first explanation attributes escalation behavior to the notion of self-justification. It asserts that a decision maker who is associated with the initial decision to invest in a project will elect to commit additional resources to the investment project as a way to justify past decisions, even

when the available information indicates that the project should be terminated. The second explanation is rooted in prospect theory, which postulates that decision makers tend to evaluate choices as gains and losses in relation to a neutral reference point and that decision-makers are generally risk seeking when faced with possible losses. That is, a risk-seeking person would reject a certain loss in favor of a gamble with equal or even lower expected value. Thus, for commitment escalation, the theory asserts that decision makers would view sunk costs as a sure loss and they would prefer to engage in the escalation of prior commitments with the possibility of incurring greater losses or recovering past investments. Agency theory provides a third explanation for escalation of commitments. When a manager possesses private information on the state of the project, abandoning a potentially failing project would reveal this state and adversely affect the manager's reputation while further commitment of resources protects the manager's reputation. This paper extends previous work on the escalation of commitment by considering the effects of two additional variables that usually constrain managers' decisions. These variables are managers' potential liability for committing additional resources to a potentially failing project, and the level of credibility of a project's prospective information that the manager obtains. A between-subject experimental design is used where the three research variables (managers' responsibility, potential liability, and credibility of information about the prospects of the project) are factorially crossed to obtain eight sets of experimental conditions (a 2x2x2 ANOVA design) The results indicate significant main effects of initial responsibility, potential liability, and information credibility. In addition, there were significant two-way interaction effects between initial responsibility and potential liability and information credibility Future research may include social and cultural factors in the study of escalation of commitment. Also a group comparison (assigned eight groups) may reveal some additional information that help in understanding escalation of commitment.

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