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ESCALATION OF COMMITMENT IN SOFTWARE PROJECTS: AN EXAMINATION OF TWO THEORIES

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Abstract

Escalation of commitment is common in many software projects. It stands for the situation where managers decide to continue investing in or supporting a prior decision despite new evidence suggesting the original outcome expectation will be missed. Escalation of commitment is generally considered to be irrational. Past literature has proposed several theories to explain the behaviour. Two commonly used interpretations are self-justification and the framing effect. While both theories have been found effective in causing the escalation of commitment, their relative effect is less studied. The purpose of this study is to further investigate the primary factor that causes the escalation of commitment in software project related decisions. An experiment was designed to examine whether the escalation of commitment exists in different decision contingencies and which theories play a more important role in the escalation. One hundred and sixty two subjects participated in the experiment. The results indicate that both self-justification and problem framing have effects on commitment escalation in software projects but the effect of self-justification is stronger. Significant interaction effect is also found. A commitment is more likely to escalate if the problem is framed positively.

Keywords: Self-justification theory, framing effect, escalation of commitment, software project management.

1 INTRODUCTION

Escalation of commitment is a common behaviour observed in project management, including business investment (Schoorman et al. 1994), group discussions (Rutledge 1994), and software project management (Keil et al. 2003; Lee et al. 2012). It occurs when individuals who are responsible for an initial decision tend to commit more resources to an apparently failing course of action (Newman & Sabherwal 1996; Staw 1976). Prior studies on commitment escalation have tried to explain why project managers would continue expanding resources on projects regardless of signals indicating that their projects were poorly performed.

Literature in information systems (IS) indicates that software project escalation is a common problem (Keil 1995; Keil et al. 2000; Mähring & Keil 2008), and software projects are more likely than other types of project to be escalated (Abdel-Hamid 1988; Zmud 1980). Existing case and field studies show that the escalation of software project is not only an investment issue but also issues related to many psychological, social, or organizational factors. (Keil 1995; Keil et al. 2000; Keil et al. 2003; Mähring & Keil 2008). When software project managers decide to continue or abandon a project, they usually take one or more of the following factors into consideration: cost, schedule, functionality, or quality (Keil et al. 2000).

Prior research has proposed a few theories to interpret why the escalation of commitment exists in project management. Two prevailing ones are the self-justification theory (Staw 1976) and problem framing (Kahneman & Tversky 1979). The self-justification theory posits that high personal responsibility associated with the initial decision motivates a manager to escalate their commitments because abandoning the project may indicate his/her poor prior decision. The framing effect focuses on the effect of the message that portrays the decision situation. It argues that positive or negative framing of the problem affects the escalation of commitment. Although both factors have been found effects in commitment escalation, it's unclear which one plays a more important role and how they interact with each other, particularly in software projects (Davis & Bobko 1986; Dunegan 1993; Harvey & Victoravich 2009; Schoorman et al. 1994; Sivanathan et al. 2008). It's also unclear whether the effect would differ in different types of decisions.

The objective of this study is to investigate the above issues. That is, whether both personal responsibility and framing effect would lead to the escalation of commitment in software projects and which factor has the higher influence. In order to answer our research questions, we created different software project management scenarios and conducted an experimental study. The decision scenarios include technological platform, outsourcing, and project manpower decisions (shown in Appendix A). Our findings support the hypothesis that both self-justification and framing affect the escalation of commitment and a strong interaction effect exists. Decision makers are more likely to escalate their commitment when the decision situation is presented in a positive way.

2 LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

2.1 Self-justification theory

Self-justification is a major theory for explaining the escalation of commitment. It argues that individuals continue to commit resource to a failing project in order to justify their earlier decisions (Staw 1976). In the self-justification theory, individuals' behavior of escalating commitment is a means to rationalize their previous behaviour against a perceived error of judgment" (Keil et al. 2000). Individuals want to prove to themselves or others that they are rational. Thus, they tend to make the decision in a way that is consistent with the prior decision even when it is viewed as inappropriate for external decision makers who are not involved in the prior decision.

There are two sources of self-justification (Staw 1976): internal and external. Internal self-justification is the situation where decision makers desire to demonstrate rationality to themselves. It may be based on human's cognitive needs of keeping consistent behavior (Festinger 1957). External self-justification indicates that decision makers attempt to demonstrate rationality to others. It is related to people's desires for social approval (Staw 1976). Empirical literature has shown that escalation of commitment is stronger when the level of personal responsibility is higher (Harvey & Victoravich 2009; Sivanathan et al. 2008). Hence, our first hypothesis is posited below:

Hypothesis 1: Subjects are more likely to escalate their commitment if personal responsibility is involved in a project.

2.2 Decision frames and escalation of commitment

Another factor that may affect human decision is the framing of the decision problem. A decision frame is a specific description of the decision situation. It helps a decision maker form a concept associated with a particular decision (Tversky & Kahneman 1981). Prospect theory, which analyzes the human decision under risks, is usually adopted to explain the framing effect (Kahneman & Tversky 1979). It indicates that individuals are conservative when they have certain gains, while they would be risk-seeking when they face certain losses.

Framing effects may differ in different contexts. Previous studies have reported that decision frames may be divided into three major types, and their effects differ (Levin et al. 1998). One follows the prospect theory to define positive and negative frames, and the other two use different operational definitions and thus have different effects on the decision process. These three types of decision frames are introduced in the following.

2.2.1 Risky choice framing

Risky choice framing comes from the Tversky & Kahneman (1981)'s study. The risky choice framing involves a hypothetical decision scenario with two choice options. One is a sure or riskless option and the other is a two-outcome risky option in which the probabilities are specified numerically. In the positive frame, both sure and risky options are described in terms of gains, and in the negative frame, both options are described in terms of losses. According to the prospect theory, the positive frame would lead to risk-averse behavior, and negative frame would lead to risk-seeking behavior or decisions. In other words, subjects tend to choose the sure option in the positive frame while choosing the risky option in the negative frame (Kahneman & Tversky 1979; Kuhberger 1998; Tversky & Kahneman 1981). In most escalation of commitment studies, the decision behavior was reinvestment in the failing course of action (Bazerman 1984).

2.2.2 Goal framing

Goal framing does not involve different risks in different frames but provides different possible outcomes. The positive message of the goal framing stresses the positive consequences of performing an act, and the negative message stresses the negative consequences of not performing the act. The question in goal framing is which frame, positive or negative, will have a greater persuasive impact on achieving the same behavior. For example, Thaler (1980) investigated the effect of positive and negative messages on credit card purchases. The positive frame showed messages like "if you pay cash, you will receive a discount price," whereas the negative frame showed messages like "if you do not pay cash (i.e., if you use a credit card), you will have to pay an additional surcharge." The result showed that consumers were more willing to use credit card for the wordings of not paying additional money than for the wordings of receiving additional discounts.

2.2.3 Attribute framing

Attribute framing manipulates different values of one or more decision attributes relevant to a decision in a given context. One example is that the success rate of an event (e.g., 0.6) is described in the positive frame, but the failure rate of the event (e.g., 0.4) is described in the negative frame. Comparing with the risky choice framing, attribute framing is not focused on the risk itself but different perceptions of the same risk. In general, the positive frame is more preferable than the negative one in this condition. Moreover, attribute framing is different from the goal framing in that two framing conditions of attribute framing do not promote the same action. In studies on approving a surgery, for example, the survival rate (positive frame) and the mortality rate (negative frame) are used to create the attribute framing. The results showed that when the survival rate was emphasized, individuals were more likely to approve of the surgery than when the mortality rate was emphasized (Marteanu 1989; Wilson et al. 1987).

Past studies on framing effect and escalation of commitment focused more on the discussion of risky choice framing, which provided negative framing information in terms of money lost whereas provided positive framing information in terms of money gained (Barton et al. 1989; Bateman & Zeithaml 1989; Chow et al. 1997; Rutledge 1994). Most findings showed that people tended to allocate more resources to unprofitable projects in the negative frame than in the positive frame. For example, Rutledge (1994) reported that the framing of decision-relevant information affected groups' decisions. Subjects tended to make additional investments if the decision was framed negatively. Chow et al. (1997) extended the investment decisions to the cross-cultural setting and the results also demonstrated a significant impact of responsibility and framing on decision making.

Software project managers face issues different from these investment decisions. A great amount of issues such as the choice of information technology platform or whether to outsource system development have to be handled by project managers. Thus, we need more studies to investigate the specific tasks related to commitment escalation in software project management.

While risky choice framing is usually used in past literature of decision frames, the attribute framing also frequently occurs in the software project. In the attribute framing, decision frames are differentiated based on certain attribute levels and the outcome is measured by the level of willingness (e.g., rate the program on a scale from completely unacceptable to completely acceptable), or in terms of favorableness (e.g., would you be in favor of continuing the program?). It has been studied in various decision domains, such as the support of a job placement program, project funding allocations and evaluation of products division performance (Davis & Bobko 1986; Dunegan 1993; Schoorman et al. 1994). The results showed that, for attribute framing, people preferred positive framing to negative framing. Thus, the following hypothesis is posited.

Hypothesis 2: Subjects are more likely to escalate their commitment if the decision is framed positively than if it is framed negatively.

2.3 Relationship between Personal responsibility and message framing

Prior escalation studies found that the personal responsibility for a prior decision and the message feedback may follow different psychological paths in the process of affecting people's final decisions (Conlon & Leatherwood 1989; Harrison & Harrell 1995; Schoorman et al. 1994). For example, Davis & Bobko (1986) found significant interactions between responsibility and decision framing. Harrison & Harrell (1995) conducted two decision-making experiments to study the impact of personal responsibility and future-oriented framing information on participants' decisions. They found that the availability of future-oriented information substantially weakened the effect of personal responsibility. Schoorman et al. (1994) found that the amount of information systematically affected the framing effect, and that when the effect of responsibility was still significant in a large amount of contextual information, the framing effect decreased in the increasing amount of information.

These results show that participants consciously keep their promises or behaviour consistent (Keil 1995), but the framing of messages unintentionally influence participant’s decisions (Rutledge 1994). When individuals make decisions in escalation situations, their decision processes often involve the effect of different types of feedback messages. Thus, this study posits that the tendency of people to escalate commitment due to responsibility in escalation situations may be moderated by the framing of decision-relevant information.

Hypothesis 3: The effect of personal responsibility on the escalation of commitment will be moderated by the decision frame.

The research model for this study is depicted in Figure 1.

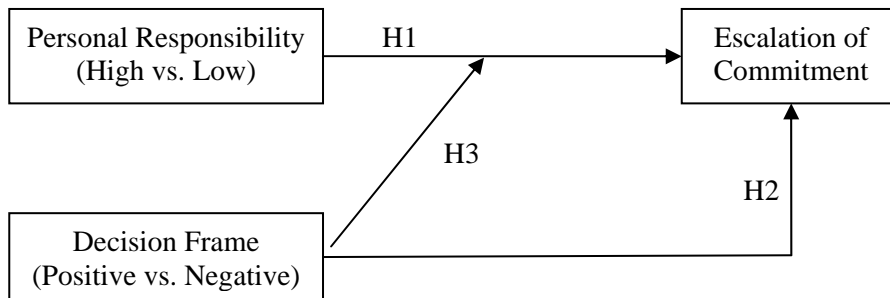


Figure 1. The Research Model

3 RESEARCH METHOD

3.1 Subjects and research design

A 2 x 2 within-subject experiment, which simultaneously manipulated responsibility (with vs. without) and framing (positive vs. negative), was conducted online. One hundred and sixty-two subjects participated voluntarily. 56 percent of their age were between 20 and 24, 62 percent of them were male, and 61 percent of them were university or graduate students. Every subject could get the entrance in a lottery that provided a list of gifts whose total value equals \$130. All of them already had at least taken a 3-credit MIS course to provide basic knowledge of software projects necessary for the study.

Subjects were given a brief introduction of a company and were told that their role was the IS manager of the company. Four decision scenarios were designed (shown in Appendix A). They were asked to make an initial decision for the tasks in Appendix A in the situation of self-responsibility, but they did not have to make an initial decision in the situation of no self-responsibility. The subjects were then given decision scenarios that the project was delayed and over-budgeted and asked whether they would support the request to extend the deadline and increase the budget. The escalation scenarios are shown in Appendix B.

3.2 Manipulation of personal responsibility and framing

According to the factors that caused the escalation of software project in previous studies (Keil 1995; Keil et al. 2000; Mähring & Keil 2008), scenarios involving personal responsibility and positive or negative descriptions to the decision were designed. For personal responsibility, four scenarios (shown

in Appendix A) require the subjects to make an initial decision and four scenarios that subjects did not have to do so.

These scenarios represent four types of decisions: in-house or outsourcing of a customer relationship management (CRM) system, database backup solution, choice of outsourcing firms, and choice of a project manager. In the no self-responsibility situation, subjects were informed that there were ongoing projects (the same four tasks but the initial decision was not made by the subject).

A pilot study was conducted to test the experimental manipulation. The results showed significant difference ($F=5.818$, $p<0.05$, $n=100$) between the experimental group (mean = 2.64, std. dev = 0.41) and the control group (mean = 2.57, std. dev = 0.40). Subjects involved in prior decisions were more likely to have escalation behavior.

The manipulation of different frames is as follows. The positively framed feedback was given as: "The software project requests a longer time and a budget increase to complete." The negatively framed message was given as: "The software project is having some problems. It misses the deadline and over spends the budget." In both framing conditions, the decision was whether the project should be continued.

3.3 Measures

Twenty-eight questions were designed to simulate different levels of personal responsibility and frames. Subjects responded to these questions repeatedly to decide whether to continue the project. The decision was measured on a 4-point scale. In the condition of positive frame with personal responsibility, a sample question is "*You may achieve self-fulfilment by completing the software project.*" In the negatively framed ones, a sample question is "*You may be held responsible if the software project is halted.*" In the setting of no personal responsibility and positive frame, a sample question is "*Completion of the software project has little to do with your self-fulfilment.*" Finally a sample question in the negative frame without personal responsibility setting is "*To stop the software project is not connected to your responsibility.*" A pre-test was conducted by a group of 9 subjects who have information systems background to examine the content validity of the questionnaire. They all had no problem understanding the questions. The questionnaires are listed in Appendix B.

4 DATA ANALYSES AND RESULTS

The subjects' responses were analyzed with the exploratory factor analysis. The result revealed that responses of twenty-eight questions were converged under the corresponding factors of personal responsibility and positive frame, personal responsibility and negative frame, no personal responsibility and positive frame, and no personal responsibility and negative frame. The results indicate acceptable convergent and discriminant validities of the measurements. The Cronbach's α values of these factors are all higher than 0.91, which shows an acceptable data reliability. Hence, each subject's level of willingness to continue the project was aggregated and computed as the average of seven questions in each setting.

Table 1 shows the descriptive statistics of the experiment. Based on data in Table 1, subjects in the responsibility condition had a higher level of escalating commitment to the delayed project than did subjects in the no-responsibility condition. Moreover, subjects in the positive framing condition also had a higher level of escalating commitment to the delayed project than did subjects in the negative framing condition. The two-way repeated-measure ANOVA on the level of escalating commitment (shown in Table 2) indicates that the differences in personal responsibility and framing are both statistically significant. Thus, Hypotheses 1 and 2 are supported.

The interaction between personal responsibility and decision frame is also significant statistically ($F(1,161)=21.192$, $p<0.001$). A further examination of the means in different settings show that

personal responsibility had a stronger impact on the escalation of commitment under the positive decision frame than its effect in the negative decision frame (see Figure 2). The difference between responsibility and no responsibility under the positive framing is 0.5 ($F(1,161)=102.112, p<0.001$), while the difference under the negative framing is 0.26 ($F(1,161)=21.607, p<0.001$). Thus, Hypothesis 3 is supported.

Table 1. Means and Standard Deviations

		Personal responsibility		
		Yes	No	Overall
Decision frame	Positive	n=162 3.09 (0.35)	n=162 2.59 (0.55)	2.84 (0.03)
	Negative	n=162 2.62 (0.50)	n=162 2.36 (0.59)	2.49 (0.03)
	Overall	2.85 (0.03)	2.47 (0.04)	

Note. Standard deviations are listed in parentheses.

Table 2. The two-way repeated-measure ANOVA result

Effect	Sum of squares	F	Sig.
Decision frame	23.266	68.893	<0.001
Personal responsibility	20.106	143.738	<0.001
Decision frame * Personal responsibility	2.347	21.192	<0.001

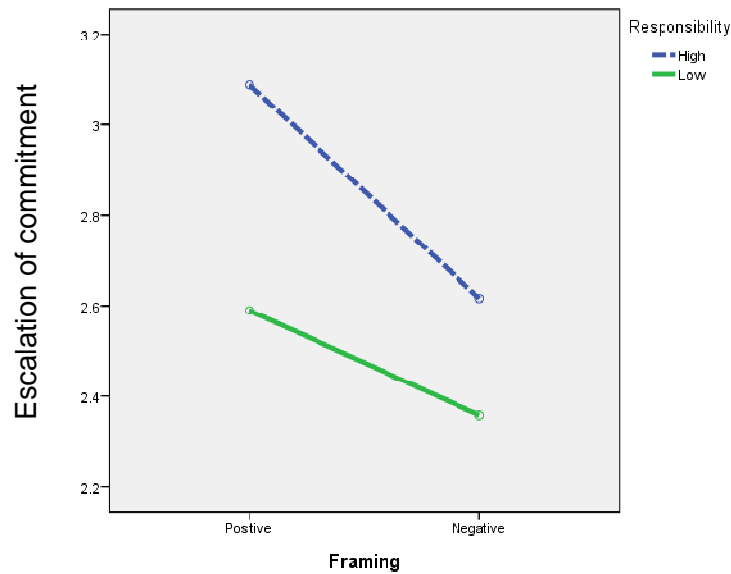


Figure 2. Interaction between Personal Responsibility and Decision Frame

5 FINDINGS AND DISCUSSION

Three major findings have been found in this research. First, personal responsibility is found to affect the escalation of commitment. The result supported the self-justification theory that argues escalation of commitment is due to people's intention to prove that their earlier decisions were right.

Second, the effect of decision frames on escalation of commitment exists but the effect is not consistent with the prospect theory. This may be due to different types of framing. A positively framed message tends to connect to favorable associations in memory, and a negatively framed message inclines to stimulate unfavorable evaluations. Thus, positive and negative decision frames may induce individuals to make different decisions even when the same situation is faced. While most

studies on the framing effect support the prospect theory, the attribute framing does not. The difference between attribute framing and other types of framing is subtle. This contributes to a further understanding of the framing effect on the escalation of commitment. This also points to the importance of message framing in software-related decisions.

Third, the interaction between personal responsibility and decision frame is significant. This suggests that the individuals' consideration about personal responsibility is often accompanied by the effect of feedback information. Positive framing often can increase the effect of self-responsibility in escalating prior decisions. This suggests that positive messages reinforce the effect of personal responsibility and negative messages reduce the effect of personal responsibility in the attribute framing setting.

The results of this study have several practical implications. First, for software project managers, the results imply that their involvement of personal responsibility may lead them to continuously support of a prior decision. Decision makers need to be careful to avoid over-committing to a potentially failing project. Second, since problem framing has a significant effect on decision making, software project managers should be sensitive to the way a decision situation is presented if continuous support is desired.

Finally, this study has shown valuable new insight but is not without limitations. First, the experimental scenarios are simplified as compared with real world cases. In order for the subject to complete the study in a reasonable time frame, only limited information was provided to the subject. This may reduce the external validity of our research results. Second, most subjects of this study were students. Although it is not uncommon to use student subjects as surrogates for employees in organizational decision-making settings, the knowledge background and work experience of students are different from general managers and this experience difference may reduce the applicability of our findings in the real world.

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Appendix A. Experiment Tasks

You are an IS manager of a company. You are responsible for managing software projects, including project budget, manpower assignment, IT platform, and other related decisions. Your task is to decide whether a specific project is worth investment or continue when problems occur.

Scenario 1

The company needs to develop a Customer relationship management (CRM) system. You have two options: in-house development or outsourcing. The in-house option is to develop the CRM system internally, which allows your company to cumulate system development knowledge and experience. The outsourcing option is to hire an external firm that has good experience in the area to develop the system, which allows the company to benefit from outside knowledge experience. What is your decision?

Scenario 2

The company needs to find an outside firm to develop the company's website. Two firms are bidding for the project. Firm A is more experienced in website development, but the price is higher.. Firm B is less experienced but charges lower. What is your decision?

Scenario 3

The company has a large amount of data that needs a sound backup solution. You need to decide whether to adopt the cloud solution or to build a backup system internally. Adopting the cloud solution can reduce the development cost and get the project done faster, but the risk of information leakage is higher. Developing the backup system internally can reduce the data security risk, but will cost more and may take longer time to complete the project. What is your decision?

Scenario 4

The company needs to develop a Financial Information System. You have to choose a project manager for the project. Manager A has solid IT knowledge, but is weaker in coordination and management skills. Manager B is weaker in IT knowledge, but is better in coordination and management skills. What is your decision?

The above tasks were given to subjects who were assigned to the experimental group for building their initial commitment. For subjects in the control group, they did not have to make an initial commitment and hence were not asked to make these decisions.

Two different frames were designed:

Positive frame: The software project requests a longer time and a budget increase to complete. Will you approve to continue the project?

Negative frame: The software project is having some problems. It misses the deadline and over-spends the budget. Would you approve to continue the project?

Appendix B. Measurements

The decision scenario is the following:

Four sets of questions were designed to measure the decision under different hypothetical situations.

Personal responsibility means the subject would be held responsible for the success/failure of the project, and positive framing describes the situation from the angle of success (negative framing is from the failure angle).

A. Personal responsibility and positive framing

1. You may achieve self-fulfilment by completing the software project.
2. Your capability may be demonstrated by completing the software project.
3. You may show your outstanding performance by completing the software project.
4. Your knowledge and experience may be acknowledged by completing the software project.
5. Others may recognize your hard working by completing the software project.
6. Your opportunities of promotion may increase by completing the software project.
7. You may show your leadership by completing the software project.

B. Personal responsibility and negative framing

1. You may be held responsible if the software project is halted.
2. It may indicate your incompetence if the software project is halted.
3. It may show your poor performance if the software project is halted.
4. It may show your inadequate knowledge and experience if the software project is halted.
5. It may show your inadequate effort if the software project is halted.
6. It may decrease your opportunities of promotion if the software project is halted.
7. It may show your lack of leadership if the software project is halted.

C. No personal responsibility and positive framing

1. Completion of the software project has little to do with your self-fulfilment.
2. Completion of the software project has little to do with your capability.
3. Completion of the software project has little to do with your performance.
4. Completion of the software project has little to do with your knowledge and experience.
5. Completion of the software project has little to do with your effort.
6. Completion of the software project has little to do with your promotion.
7. Completion of the software project has little to do with your leadership.

D. No personal responsibility and negative framing

1. Halting the software project has little to do with your responsibility.
2. Halting the software project has little to do with your capability.
3. Halting the software project has little to do with your performance.
4. Halting the software project has little to do with your knowledge and experience.
5. Halting the software project has little to do with your effort.
6. Halting the software project has little to do with your promotion.
7. Halting the software project has little to do with your leadership.