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Decision-making and behavior fluidity: How focus on completion and emphasis on safety changes over the course of projects

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Abstract

We present the results of two longitudinal studies that examine how the level of project completion affects decisions and worker outcomes. In a lab study, we find that as a project approaches completion, task completion is rated as increasingly more important and economic motives (e.g., finishing on budget) as increasingly less important. We also find that incremental resources dedicated to safety demonstrate a curvilinear relationship with level of completion, with the least resources dedicated to safety in the middle of projects. In an archival field study, we use data from the road construction industry to find additional support for the curvilinear relationship between safety and level of completion found in the lab study, with worker accidents peaking near the midpoint of projects. Our results demonstrate that attentional focus and behavior are fluid over the course of a project, specifically in response to the level of completion of that project.

Keywords: Decision-making; Project completion; Safety; Time; Goal substitution

"The highest priority we have set for NASA is to complete development of the Shuttle and turn it into an operational system. Safety and reliability of flight and the control of operational costs are primary objectives as we move forward with the Shuttle program" (NASA Administrator James Beggs, May 5, 1982, p. 1029).

Ross and Staw (1993) detail the exorbitant waste associated with the Shoreham nuclear power plant: a project that was supposed to be completed in 4 years at $75 million instead took 23 years, cost over $5 billion, and was ultimately closed without ever generating power. The city of Boston is currently constructing a large-scale underground highway (the "Big Dig"), which promises to alleviate traffic congestion. Originally estimated to cost $3 billion, current expenditures have risen to $14 billion with no certainty as to when the project will be finished (Palmer, 2000). These are examples of questionable judgment in what has been referred to as progress-related decisions (i.e., decisions that involve continuation of courses of action already underway, Beach & Mitchell, 1990). The introductory quote was in reference to the Space Shuttle Program before the decision sequence leading to the disastrous Challenger accident (Esser & Lindoerfer, 1989; Vaughan, 1996). As common as progress decisions are in organizations, there has been a noticeable lack of attention paid by decision researchers toward examining such decisions longitudinally. We feel that the role of time (McGrath & Rotchford, 1983; Mitchell & James, 2001) in such decisions has not been adequately integrated into empirical tests of theory in this area.

This manuscript is devoted to the examination and testing of temporal decision-making in organizations. Specifically, this paper documents how people and organizations systematically change their emphasis on both completing a project and on safety in the project as a function of the stage of completion. That is, we argue that priorities are fluid and malleable and that this explains how progress-related decision-making leads people and organizations to systematically change allocation preferences at different points in time. We test our

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theory using two studies: one experimental and one using archival data from a large road construction company. We provide initial evidence of this fluidity using two constructs: need to complete and emphasis on safety.

First, the desire to complete what was started has gained attention as a force that drives continued investments in dubious projects (Conlon & Garland, 1993; Moon, 2001). We examine whether a desire to complete a project increases in importance as the level of completion increases. We simultaneously test whether other goals (namely economic and safety motives) change in importance in response to the change in the project completion goal. Second, safety has become an important construct in the organizational sciences due to its impact on organizations. For example, the National Safety Council (2001) noted that in the year 2000, there were 5200 workplace deaths and 3.9 million disabling injuries with the overall cost of these injuries estimated to be $131.2 billion. Because of the frequency of injuries as well as the associated costs, researchers and organizations have tried to identify contributing factors (Hofmann & Morgeson, 1999; Hofmann & Stetzer, 1998).

Although some prior work has examined the effect of time and level of completion on allocation and production behaviors (e.g., Conlon & Garland, 1993; Gersick, 1988), we do not know whether safety behaviors change similarly over the lifetime of a project. Most decision makers assume that the emphasis on safety is uniformly high over the course of a project. However, as the introductory quote shows, the relationship between safety and other priorities is more complex. Borrowing from a variety of theories, we pose a curvilinear hypothesis, which we then test longitudinally in both a lab and field context.

Cognitive limitations and hierarchy of goals

Goals are an important motivational component of behavior, as humans often conceptualize desired states in goal form (Locke & Latham, 1990). Over the past 40 years, researchers have elaborated on the goal setting process. Although the initial work on goal setting focused on the relationship between one goal and one outcome, a more complex relationship emerged as the literature developed. First, it became apparent that a person maintains multiple goals, embedded in a hierarchy (Austin & Vancouver, 1996). At the highest levels, a few sets of goals influence the long-term direction of the person, such as life orientation (Rokeach, 1973) or cultural context (Cropanzano, James, & Citera, 1993). These high-level goals impact a set of sub-goals, which in turn impact another set of sub-goals, and so on (Lord & Levy, 1994). Lower on the hierarchy, more proximal goals (e.g., the quantity of sales for a week by insurance salesmen, Brief & Hollenbeck, 1985) are focused upon (Carver & Scheier, 1990). However, all of these goals coexist within any one person.

Second, as research has noted that people only possess a limited pool of cognitive resources that they can devote to fulfilling these different goals (Kanfer & Ackerman, 1989), there must be a selection process by which people determine which goals to focus on and which goals to ignore. Markman and Brendl (2000) posited that the environment is interpreted in response to only those goals that are currently active. *Active goals* are goals that are presently influencing the cognitive system. The activity of a goal has practical implications upon behavior. The more active goals will dominate behavior, such that a person's focus will be on satiating those goals. As a person moves towards completing the goal, goal activation increases and the motivation to complete a goal increases (Brown, 1948; Lewin, 1935). As the strength of one goal increases, other goals within the hierarchy will decrease in attention (Brockner, Shaw, & Rubin, 1979; Garland & Conlon, 1998) as the person focuses on completing that specific goal.

The limit on the number of cues that can be simultaneously considered (G. A. Miller, 1956) and the propensity for the level of attention we afford to different cues to wax and wane (Hull, 1932) is well established. Because of these factors, we argue that the natural dynamics of progress-related decision-making causes the focus of people to change over the course of the project. In the following section, we specifically detail how the level of completion of a project should change the importance of two goals: a completion goal and a profit goal.

Need to complete

Lewin (1926) postulated that there is a tendency towards equilibrium within a person. However, tensions (i.e., something pushing the system out of equilibrium) still exist within the system. In response, people seek to re-establish equilibrium. He proposed that one of these tensions is created when a person starts a task. This tension is expected to exist until the task is completed. Lewin labeled this tension a "quasi-need," meaning that an intention (in this case, the intention to complete the task) acts like a need within the person, driving this person to act on the need. Zeigarnik (1927) subsequently tested the impact of interrupting a person while performing a series of tasks. Across a series of experiments, she found that subjects recalled more of the uncompleted tasks than the completed tasks. These results spurred a great deal of research over the next several decades. The Zeigarnik effect (as the effect was later labeled) was replicated in many settings and in the

presence of many potential moderators (Butterfield, 1964; Prentice, 1944).

Recently, Conlon and Garland (1993) initiated a string of studies examining the impact of the level of completion on commitment levels of decision makers in escalation of commitment dilemmas. These studies demonstrated that in projects that are progressing badly, the level of completion is a powerful predictor of subsequent decision-maker commitment (Boehne & Paese, 2000; Conlon & Garland, 1993; Garland & Conlon, 1998; Keil, Mann, & Rai, 2000; Moon, 2001). Taken together, the volume of literature supports the contention that as a task approaches completion, there is a greater emphasis on completing that task (which often includes allocating additional resources even when it is irrational to do so, Boehne & Paese, 2000). Moreover, Waller, Zellmer-Bruhn, and Giambatista (2002) noted that there is an increased focus on time as a project approaches completion, which can be interpreted to mean that people become more cognizant of the level of completion as a project progresses.

It is important to note that if the strength of the completion goal is positively related to the level of completion, this may influence other goals. Garland and Conlon (1998) theorized that the effects of project completion lead to *goal substitution*—that is, the increasing attention devoted to completion comes at the expense of other goals. However, none of the studies discussed above have actually measured a decision maker's need to complete (or its manifestation as a completion goal), nor have they measured the importance of other goals vis-à-vis the completion goal as a project progresses.

In the case of the completion goal (i.e., the need to complete), it should be activated at the start of the project. Because tension is introduced into the cognitive system when a task is started but not yet finished (Lewin, 1926), decision makers should begin to focus on that goal at the project's outset. Moreover, as the level of completion of the project increases, this implies that the decision-maker is making progress towards completing the goal. As a person approaches goal completion, goal activation increases (Hull, 1932; Miller, 1944), leading the person to become more motivated to complete the goal (Brown, 1948; Lewin, 1935; Schweitzer, Ordonez, & Douma, 2002). Therefore, the completion goal should increase in importance to the decision-maker as the level of completion increases.

Staw and Ross (1987) offered some insight into what goals may be traded off as emphasis on completion increases. They noted that economic determinants are critical at the onset of a course of action as decision makers consider utility-based outcome projections (i.e., a decision maker's assessment of whether the project will turn a profit determines whether the project will begin). They stated, "we would expect that project variables are the most salient determinants of decision making at the initial stage of a venture, because it would make little sense for an administrator to pursue a project that did not, at least on the surface, have potential merit" (p. 45). Although the economic project determinants are expected to be the initial drivers of resource investment into a project, Staw and Ross (1987) noted that other factors are more important later in a project (e.g., self-justification, face-saving, and institutionalization). A decade earlier, Brockner et al. (1979) foreshadowed this comment, as they argued that the reasons for investment in a project shift from economic motives at the start of the project to other motives as the project continues. However, Brockner et al. (1979) did not specify what these other goals or motives might be. Garland and Conlon (1998) suggested that the completion goal is the goal that increases and that it "substitutes" for an economic motive for resource investment as the level of completion increases. Based on the above arguments, we argue that as the level of completion of a project increases, it forces a change in attentional focus—specifically, we expect that the completion goal will become more important, which in turn causes the economic goal to decrease in importance. The fluidity of the two goals is highlighted in the following hypotheses:

H1: As level of project completion increases, the completion goal will increase in importance, while the economic goal will decrease in importance.

Safety goals and allocation behavior

In the previous section, we addressed how level of completion should influence a decision-maker's psychological state in relation to economic considerations of profitability. We now turn our attention to examining how a project's level of completion influences attention to safety on that project in relation to economic considerations of productivity. In this section, we conduct a theoretical inquiry on the different ways in which safety emphasis might evolve over the course of a project.

The difficulties in balancing production and safety are a constant challenge for organizations. The lack of organizational support for an emphasis on safety is likely to result in an increase in costly injuries, as well as potentially costly equipment damage, project delays and reputational harm in the local community. Consequently, it seems reasonable that organizations would seek to emphasize safe performance on the job. However, pressures within organizations to complete work as quickly as possible can result in safety receiving a lower priority in light of these more salient goals (Wright, 1986). Evidence exists, both within (e.g., Hofmann, Morgeson, & Gerras, 2003; Hofmann & Stetzer, 1996, 1998; Zohar, 2000) and between organizations (e.g.,

Zohar, 1980), that safety is emphasized to differing degrees in situations where there are significant safety concerns. It is not clear from this literature, however, if the relationship between production and safety is fluid over time as a result of level of completion. There are three possible relationships that could exist.

Negative monotonic. First, there could be a negative relationship between safety and progress (i.e., as level of completion increases, the importance of safety and the attention to safety in the form of allocating resources to safety decreases), which follows logically from the arguments above regarding cognitive resources and the completion goal. According to that argument, a decision-maker has a limited set of cognitive resources that must be divided amongst various goals at the beginning of a project. However, as the level of completion increases, the decision-maker's focus changes from balancing several goals (including safety) to focusing increasingly on finishing the project. If there is a fixed pool of financial resources to allocate towards production and safety, the growth of the completion goal will lead to an increased investment in production and a decreased investment in safety.

Moreover, recent research has noted that as people approach a goal, they become more motivated to reach the goal and that this effect can even increase the propensity to engage in unethical behavior (Schweitzer et al., 2002). One might construe eschewing additional allocations to safety as being consistent with this focus on goal attainment. Based on this, it is possible that safety is of a lower importance to decision makers near the end of the project. Based on the above two arguments, it is therefore possible that investment of resources in safety could decrease as the level of completion increases.

Positive monotonic. Although it is possible that safety decreases as completion increases, it is also possible that the importance of safety and the resulting investment in safety will increase as the project approaches completion. This logic stems from research integrating the prospect theory and goal setting literatures (e.g., Heath, Larrick, & Wu, 1999). Heath et al. (1999) argued that goals serve as reference points, and as such are subject to prospect theory propositions involving the interpretation of value, loss aversion, and diminishing sensitivity. Of particular interest is their assertion that goals alter the psychological value of outcomes. Heath et al. (1999) reviewed prior studies and presented new research documenting that people who miss achieving their goals by a small amount experience more distress or negative emotion than do people who miss their goals by a large amount (for another example, see Medvec, Madey, & Gilovich's, 1995 study of the affective reactions of Olympic medalists, where bronze medalists were seen to be more satisfied with their outcomes than silver medalists). This finding has important implications for how we expect safety to be influenced by project completion. If a completed project is the goal, having an accident occur near the completion of the goal should be viewed as more distressing to decision makers than would a similar accident occurring earlier in time, because both the proximity to the goal and the value associated with the goal is lower in the latter case. When a project is near completion, decision makers should be more concerned with safety due to their proximity to the goal. Said differently, if little progress had been made in completing a project (or meeting a goal), concerns related to avoiding losses should be minimal—as there is little to lose—and thus attention to safety should be low. However, as time elapses, a project consumes resources and (hopefully) begins to approach completion. As this occurs, the value of the goal (i.e., the completed project) increases, concerns related to avoiding losses should become more salient (i.e., the decision maker should become more risk averse, Sitkin & Pablo, 1992), and thus attention to safety behaviors (which seek to avoid losses) should increase.

Curvilinear. Although both of the above possibilities have merit, there is a third possibility that also may exist. Specifically, there may be a curvilinear relationship between level of completion and allocations to safety, with safety allocations highest near the beginning and end of the project, and lowest in the middle of the project. This relationship borrows logic from the first two possibilities—adopting the point at which safety is highest for each—and from the punctuated equilibrium literature (Gersick, 1988), which proposes that productivity concerns are highest in the middle of a project. First, we might expect the importance of the safety goal (and the economic goal) to be high early on, as decision makers are not yet concerned with the completion of the project. In addition, decision makers would be expected to desire that those working on projects develop good work habits at the beginning of a project, which would be more likely to occur if significant resources are allocated to safety.

In the middle of the project, however, we expect that the focus will begin to change. Gersick (1988) noted that over the course of a project, team productivity changed near the midpoint of the project, at which point production emphasis increased dramatically. In a qualitative study, she found evidence of urgency in finishing on time, the formation of new roles, and an emphasis on getting things done across all teams. As people often become energized in the middle of a project and focus their attention on task completion, at that point they are likely to concentrate more on production. That is, although there is reason to believe that emphasis on safety might be higher at the beginning, the middle stages might be marked by an increased focus on productivity.

Consistent with the arguments detailed in the positive monotonic section, the decision-maker should become more risk averse as the project nears completion (Heath

et al., 1999; Medvec et al., 1995). This risk aversion should result in a focus on less risky behavior (Sitkin & Pablo, 1992), such as increasing the focus on safety, thereby inducing an increase in safety resource investment. Thus, safety investment should begin to increase, returning to a level near what was seen at the beginning of the project. This would lead to a hypothesis that is curvilinear in nature such that:

H2: The importance of safety is related to the level of completion in a curvilinear fashion, such that the importance of safety will be highest at the beginning and end, and lowest near the midpoint, of a progress-related project.

H3: Investments in safety is related to level of completion in a curvilinear fashion, such that safety investment is highest at the beginning and end, and lowest near the midpoint, of a progress-related project.

Study 1

Method

Participants

Study one was based on 288 observations garnered from 96 full-time MBA students at a large mid-western university who participated in this study as part of a month-long exercise. All study materials were completed at the beginning of a class period over four consecutive weeks. Participants were provided with introductory information during the first period and received scenarios and responded to questions over three subsequent periods, each one week apart. They were provided an unlimited amount of time to complete their packet. The average age of the participants was 27 years old, with an average of 4.5 years of full-time work experience before entering the MBA program. Approximately 25% of the participants were female, 50% of the sample was Caucasian-American, 8% were Asian American, 5% were African-American, and 37% were international students.

Task

The task that the participants responded to was developed specifically for this experiment, in consultation with experts working in the road construction industry. Participants were told that they would be participating in a management simulation that involved construction of a highway in Canada. We chose this specific industry and task because of the similarity between stages of highway construction. In some industries, the different stages of a progress decision involve very different behaviors. For example, flying a jet requires very different actions during takeoff (approximately 1 min of the total flight time) than those required during the flight (between 30 min and 10 h) or those required in landing the plane (about 10 min of descent time followed by 30 s of maneuvering as the plane touches down). However, the nature of the work on highway construction is sequentially repetitive over the course of the project. That is, the work performed at the end of the project is similar to that performed in the middle and beginning of the project. Thus, we felt that using this context for testing our hypotheses helped minimize a potential confound inherent in other contexts.

In the scenario, participants acted as the supervisor of a fictitious highway construction company, Horizon Highway Construction (HHC). During the first class period, the participants were given an introduction to the scenario that they would be completing, including the construction project that they would supervise and the rewards that they could receive as the supervisor. As the supervisor, the participants were told they could receive two $10,000 bonuses, one for completing the project on time and one for completing the project without any serious (lost time) worker accidents. They were told that their responses would be entered into the simulation system and they would receive updates on their project each week based on their responses.

During each subsequent time period, the participants received an information packet about the project. The first part of the packet was an update on the progress of the project. This update contained information that would be relevant to a construction project. Each piece of information was drawn from conversations with subject-matter experts. Examples of information provided in each of these updates include: "You have had some trouble getting raw materials (including crushed rock and other hard aggregates) to the construction site. These materials are not available within easy reach and may have to be transported from long distances" (week 2); "Materials must arrive at the road surface at the correct temperature (±5%). Thus, it is important that the flow of materials to the augers is not interrupted otherwise it may lead to an uneven surface and poor compaction of materials" (week 3); and "The excavated dirt can be divided into three different categories—(1) historical fill, (2) clay fill, and (3) dredge materials. Each category has its own protocol for end use and placement. Most of the clay fill is used in landfills. However, historical fill and dredge cannot be used in just any landfill. Dredge actually needs to be stabilized before it can be used. Historical fill also needs to be treated" (week 4). The information was followed by the status of the project. All participants received a variant of the following statement, depending upon condition: "The highway construction project is 10% (50%; 90%) complete."

The second component of the questionnaire contained a section for the participants to choose the level of resource investment they wanted to make towards the project for the next time period. At each time period, decision makers had available a resource pool of $20,000 that they were free to allocate between *overtime*

(paying the workers for working extra hours) and *work pacing* (adding more breaks, thereby decreasing the amount of time that the workers are actually working on the project during a given day). It was explained that this money represented discretionary funds *above and beyond* the scheduled resources devoted to production and safety-related concerns about the project. This was done to insure that decision makers realized that the company was not skimping on allocations to production or safety, which might have skewed their preferences for spending the money in one area over another. The respondents were told that allocations to overtime were positively related to their production bonus whereas allocations to work pacing were positively related to their safety bonus (recall that the two bonuses were equal in amounts). The final component of the questionnaire contained several questions regarding the participants' goals and feelings about the project. These items were captured at all three stages of project completion.

Independent variable

Level of completion. Level of completion was manipulated by informing the participants that the project was 10, 50, or 90% complete. This manipulation corresponded with the week that the participant was completing the questionnaire, such that in the second week, all participants were 10% complete. In the third week, all participants were 50% complete. In the final week, all participants were 90% complete. This manipulation of completion was similar to how others have manipulated completion in the past, though prior manipulations were between-subjects and cross sectional, rather than within-subjects and longitudinal.

Dependent variables

Safety allocation. After reading the scenario, participants indicated the amount of money they would allocate to *work pacing,* which was described as a method of increasing safety on the project. The participants were asked to commit between 0 and 20,000 dollars. The remainder of the $20,000 (i.e., the money not invested in work pacing) was then invested in *overtime,* which was described as a method of increasing the production on the project.

Economics, safety, and completion importance. Following the safety allocation decision, the participants indicated how important several goals were on seven-point scales, ranging from (1) not-at-all important to (7) very important. We asked questions related to three goals. For the *economic* goal, we asked participants two questions about how important it was that "the project is completed with the maximum profit returned to the company?" and "the project makes money for the company?" For the *safety* goal, we asked participants two questions about how important it was that "the project is completed free of injuries?" and "the project is completed with the least risk to the workers?" The last question respondents answered was the *completion* goal question, which asked how important it was "to just get the project finished, regardless of the cost or accidents?" To test the reliability of the economic and safety measures, a coefficient alpha reliability was calculated for each period. Because the sampling distribution of a correlation becomes more skewed as it departs from zero, the aggregation of reliability scores across time cannot be properly calculated just as an average of the reliability scores. Therefore, we performed Fischer's z transformation on the reliabilities (Cohen & Cohen, 1983). The scores were averaged and converted back to reliabilities. The resultant average reliability for the economic scale over the three time periods was .82 and the reliability of the safety scale was .71.

Results

Table 1 presents the means, standard deviations, and intercorrelations for the variables of interest. The first set of hypotheses was tested using a linear trend analysis in order to address the question of whether the goals changed in importance across the three time periods. We tested the second set of hypotheses by examining both hierarchical regression results (in order to test for the curvilinear effect of level of completion) and the

Table 1
Descriptive statistics associated with variables in study 1

	Variable	Mean	*SD*	1	2	3	4
1.	Level of completion[a]	2.00	0.82	–			
2.	Completion goal	2.77	1.53	.18***	–		
3.	Economic goal	5.48	1.16	−.14**	.03	–	
4.	Safety goal	6.20	0.87	−.04	−.12**	.25***	–
5.	Safety allocation	9867.36	3200.48	−.10*	−.11*	−.14**	.30***

Note. $n = 288$

[a] Level of completion is coded as 1 = 10%, 2 = 50%, and 3 = 90%.

* $p < .10$.

** $p < .05$.

*** $p < .01$.

graphical representation of the data in order to understand the shape of any potential non-linear effects.

Hypothesis 1 predicted that as level of completion increased, the completion goal would increase in importance, while the economic goal would decrease in performance. Our results confirm the fluidity of goals in regards to completion and economic concerns as we find that the completion goal increased as level of completion increased, rising from $M = 2.44$ (at 10% complete), to $M = 2.77$ (50% complete), and $M = 3.09$ (90% complete), with the trend analysis documenting a significant linear increase in importance of the completion goal, $F(1, 287) = 9.05$, $p < .01$. Concurrently, we see that as level of completion increased, the importance of the economic goal decreased from $M = 5.67$ (at 10% complete), to $M = 5.50$ (50% complete), and finally $M = 5.27$ (90% complete), with the trend analysis this time documenting a significant linear decrease in importance of the economic goal, $F(1, 287) = 5.64$, $p < .05$. Thus, the results support hypothesis 1.

Our second set of hypotheses examined the relationship between the level of completion and both the importance of safety and the pattern of safety allocation behavior. First, hypothesis 2 predicted a curvilinear relationship between level of completion and the importance of safety. Similar to our test of hypothesis 1, we tested this hypothesis with a trend analysis. In this case, neither the linear, $F(1, 287) = .49$, *ns*, nor the quadratic, $F(1, 286) = .01$, *ns*, trends were significant, as the importance of the safety goal was fairly high and stable across levels of completion: $M = 6.24$ (10%), to $M = 6.19$ (50%), and $M = 6.16$ (90%). Thus, hypothesis 2 was not supported with this dataset.

Finally, we tested hypothesis 3. Hypothesis 3 predicted a curvilinear relationship between level of completion and safety allocation, such that safety allocation would be highest at the beginning and end of a project and lowest in the middle. To test this hypothesis, we ran a two-stage hierarchical regression in which safety investment was first regressed on level of completion. The results of this regression demonstrated that the effect of level of completion approached—but did not reach—statistical significance, $t(1, 286) = -1.69$, $\beta = -.10$, $R^2 = .01$, *ns*. Thus, there was neither a significant positive nor negative relationship between level of completion and safety allocation.

However, entering the squared version of level of completion into the second step of the hierarchical regression equation was significant and explained an additional 2.5% of the variance in safety investment, $t(1, 285) = 2.74$, $\beta = 1.12$, $p < .01$. This provides support for the existence of a non-linear relationship between safety behavior and level of completion. In addition, as seen in Fig. 1, safety investment is high at both the beginning ($10618) and end ($9838) of the project and minimized in the middle ($9147). Thus, the data supports the curvilinear relationship posited in hypothesis 3.

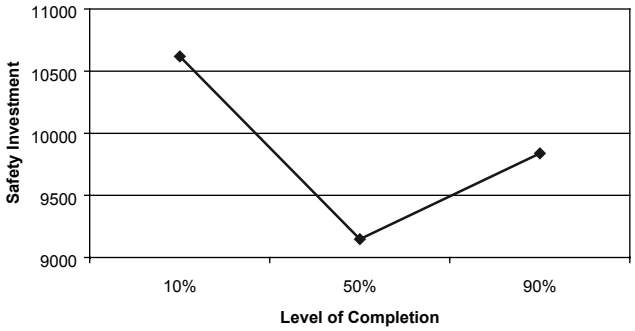

Fig. 1. Investments in safety by level of completion in study 1.

Discussion

The results of this study support three important conclusions. First, we find support for the notion that goal importance is fluid over time. Namely, we find that as level of completion increases, the importance of finishing the project (i.e., the completion goal) increases, while the importance of the economic goal decreases. We note that although our hypothesis was supported, the economic motive remained more important on average (average mean = 5.48 compared with an average mean for completion of 2.77). Thus, we clearly do not imply that economic concerns become *relatively* unimportant; rather we argue that they become less important over the life cycle of a project. However, we also believe that our support for this fluidity hypothesis is compelling in that we tested it in a conservative context. In our study, the importance of the economic goal decreased even though participants were not given information that the potential profitability of the project was decreasing, as is often the case in escalation of commitment scenarios. Moreover, the change in importance, although not a change in relative priority, should still indicate a change in behavior by the decision makers (i.e., the reduction of economic-driven behaviors and the increase in completion behaviors).

Second, we found that there is a significant curvilinear relationship between safety allocation and level of completion. Safety investment was highest at the beginning and end of the project and lowest in the middle. This finding is consistent with temporal work performance literature (Gersick, 1988; Okhuysen & Waller, 2002) that emphasizes the salience of productivity near the midpoint of a task life-cycle. We feel that this finding has critically important implications for how work is conducted.

Third, our results for hypotheses 2 and 3 point to some interesting attitude-behavior discrepancies with relation to the concept of safety. Recall that although

the economic goal decreased in importance over time as projects approached completion, the safety goal did not. In fact, the overall level of expressed importance was highest for safety (with means at all three time periods above six on a seven point scale). Yet our results show a paradox between participants' rated importance of the safety goal and their safety allocation behavior. Although the rated importance of the safety goal did not change across levels of completion, financial allocations dedicated to safety *did change*. Perhaps it was thought to be politically incorrect or socially undesirable to report that safety was becoming less important at certain times. It could also be that decision makers thought they were behaving one way, while in reality they acted differently (Boehne & Paese, 2000). Nonetheless, we remain convinced that actions speak louder than words, and in fact, participants were less concerned about safety in the middle stages of projects. Decision makers seemed unable to "walk the talk."

Based on the results of this study, we found that safety is de-emphasized in the middle of projects (as manifested via lowered allocations to safety). However, as these data were found in a laboratory study, we felt it important to support this finding with archival data from a real firm in order to increase our confidence in the stability and generalizability of the findings.

Study 2

As study 1 was the first demonstration that safety decisions could take on a curvilinear relationship over the life cycle of a project, we wanted to replicate this finding using both a different sample as well as one that might also enhance the external validity of our findings. In keeping with our focus on highway construction projects and the importance of safety (used in Study 1), we obtained archival safety data from a highway and road construction company.

In Study 1, we examined how allocations to safety varied as a function of project completion. In Study 2, we again focused on the relationship between level of completion and safety. However, in this study, safety was captured in terms of the number of accidents occurring per month during the lifespan of a project. Obviously, real-world accident data differs from laboratory data on expressed safety importance or dollar allocations to safety, but the relationship between the variables is straightforward in that accidents are an outcome of organizational goals related to safety or resource allocations devoted to safety. If, for example, we know from our first study that dollar allocations to safety were reduced in the middle stages of projects (demonstrating a reduction in emphasis at that point), we might expect the archival data to show that worker accidents in the middle stages of construction projects would be higher.

Although there are numerous reasons for hypothesizing that the number of accidents will increase (i.e., as level of completion increases, safety will decrease) or decrease (i.e., as level of completion increases, safety will increase) over time, we sought to replicate the curvilinear relationship observed in Study 1 between level of completion and safety. Specifically, consistent with the results found in study 1 for hypothesis 3, we predict that more accidents will occur toward the middle of the project as production takes priority over safety.

H4: The number of accidents on a project will exhibit a curvilinear relationship with the completion of a project, such that the fewest accidents will occur early and late in the project, and the most accidents will occur in the middle.

Method

Data

We were able to procure accident data—consisting of both OSHA recordable accidents as well as lost-time accidents—for 28 highway construction projects from a large internationally recognized highway and road construction company. The projects were of varying length, ranging from 5 to 63 months, and provided a cumulative total of 844 months of data. The mean duration of the projects was 30.21 months, with an *SD* of 16.36 months. The company provided us with information on the total length of each project, the amount of person-hours worked in each month of the project (which we refer to as work-hours), and the total number of accidents that occurred in each month of the project.

Independent variable

In order to make this study similar to the first study, we needed to create a measure of level of completion. Therefore, level of completion was created by dividing the cumulative number of work-hours in a given month by the total number of work-hours for the project. For comparison to study 1, a project 10% complete was roughly 3.2 months into the project, 50% complete was approximately 15.1 months, and 90% complete was about 27.2 months.

Dependent variable

Safety in this study was measured as the total number of reported accidents per month, which included OSHA reportable accidents and accidents that resulted in lost-time on the job.

Control variable

As noted above, the projects varied significantly in length and total number of hours worked. Moreover, project safety could vary as a function of a number of other variables such as geographic location of the project, weather conditions during the project, etc. Thus, in

order to control for between project variance, we included 27 dummy codes representing project (i.e., k-1 dummy codes). This effectively controlled for all between project variance.

Results

In order to test whether accidents were a function of level of project completion, we performed a three-step hierarchical regression where we regressed the number of accidents per month onto (1) the 27 dummy codes (representing project) to control for between project variance, (2) level of completion, and (3) level of completion squared. This analysis is empirically very similar to the analysis presented in study 1, providing us with a very easy way to compare the results across the two studies. The results of this analysis are presented in Table 2. As seen in Table 2, step 2, there was a significant negative linear relationship, $t(1,842) = -3.88$, $\beta = -.13$, $p < .01$, indicating that as a project moves towards completion, fewer accidents occur.

We then entered the squared term into the third step of the equation. This step was also significant, $t(1,841) = -8.04$, $\beta = -1.13$, $p < .01$, once again demonstrating a non-linear relationship. More importantly, the curvilinear component explained a greater percentage of the variance than the linear component ($R^2 = .06$ compared with $R^2 = .02$). To understand the shape of this relationship, we then plotted the regression results.

Table 2
Results of hierarchical regression in study 2

Step	Variable	β	Δ in R^2
1	Dummy 1–Dummy 27[a]		.14**
2	Completion	−.13	.02**
3	Completion squared	−1.13	.06**

Note. $n = 844$

[a] Due to space constraints, specific parameter estimates for each of the dummy codes have not been reported given that they are not central to the investigation.

** $p < .01$.

As shown in Fig. 2A, we again find support for the curvilinear model (H4), as accidents peaked near the midpoint (i.e., safety was minimized in the middle of the project). Looking at the figure, we also see why the significant negative linear relationship occurs, as accidents drop off near the end of the project.

Alternative analysis

Although the first analysis presented provides the most conceptually similar comparison to our results from Study 1, it is not without shortcomings. First, in creating the level of completion measure, we were forced to rely on a ratio variable. There is a great deal of literature pointing to the potential problems with ratio variables (Bradshaw & Radbill, 1987; Firebaugh & Gibbs, 1985; Kronmal, 1993), though this concern is lessened when the ratio variable only occurs on the independent variable side of the equation (Kronmal, 1993). Second, we note that the dependent variable in our data set, accident frequency (i.e., accidents per month) departed considerably from a normal distribution. This is not surprising, given that accidents are a low base-rate phenomenon. For example, of the 844 months included in the study, 578 (68.5%) had no accidents. Of the remaining months, 165 (19.5) had one accident, 71 (8.4%) had two accidents, 21 (2.5%) had three accidents, 4 (.5%) had four accidents, 3 (.4%) had five accidents, and 2 (.2%) had six accidents. Given these concerns, OLS regression may be considered inappropriate.

To overcome these concerns, we performed an alternative analysis using negative binomial regression, which is often used in accident research (e.g., Abdel-Aty & Radwan, 2000). Negative binomial regression is a more general version of Poisson regression, which assumes the mean and variance of the dependent variable are equal. Negative binomial regression is used when significant "overdispersion" is observed in a Poisson-shaped distribution; that is, when the variance is greater than the mean. Our accident dependent variable exhibited such overdispersion (i.e., mean of .49 and variance

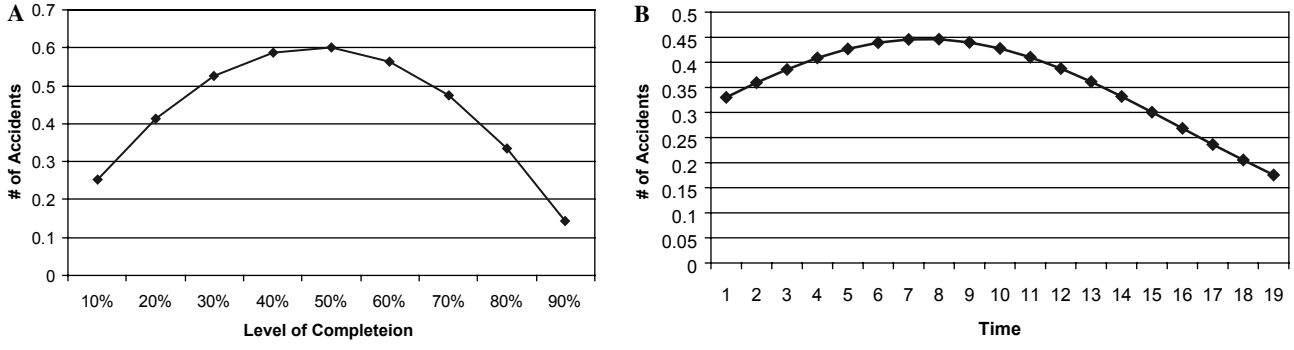

Fig. 2. Number of accidents by level of completion in study 2. (A) OLS regression results. (B) Negative binomial regression results.

of .77), thus, we utilized negative binomial regression to provide a statistically superior test of our hypothesis. (For a review of the differences between OLS regression, logistic regression, Poisson regression, and negative binomial regression, please see Cohen, Cohen, West, & Aiken, 2003, pp. 525–535.)

In addition, we rely on time (i.e., a code representing month) as our independent variable—rather than the conceptually superior completion measure—in order to eliminate the concern with using a ratio variable. Because of this change, our analysis no longer included a control for the number of hours worked in a month through the completion variable. Therefore, we also added a separate variable (the numbers of hours worked in the month) to control for this month-to-month variation in hours worked.

In this alternative analysis, we performed a four-step negative binomial regression where we regressed accidents occurring per month onto: (1) 27 dummy codes controlling for between project variance, (2) hours worked that month, (3) time, and (4) time-squared. The results of the negative binomial regression are presented in Table 3. As can be seen in Table 3, in this analysis we do not find a significant linear relationship between time and accidents. However, we again demonstrate support for hypothesis 4, as there is a significant effect for time-squared (coefficient: $-.001$, $Z = 2.61$, $p < .01$). In order to further investigate the way in which accidents vary over time, we plotted the regression results holding constant the number of hours worked per month (i.e., holding hours worked per month equal to the mean number of hours worked across all months in the sample). As can be seen in Fig. 2B, the likelihood of experiencing an accident once again took on an inverted U-shaped distribution over time, replicating the curvilinear results from Study 1 and the first analysis in Study 2.

Discussion

In the second study, we again tested the relationship between level of completion and safety. However, this time we relied on archival field data rather than a laboratory experiment. We again found evidence for a curvilinear effect of project completion on safety behavior, this time measured using accident rates instead of hypothetical financial allocations to safety. Our confidence in this finding regarding project completion and safety is enhanced by the similarity of the results across two very different analyses (OLS and negative binomial regression).

General discussion

The purpose of our studies was to examine how both the attention to decision-making and behavior itself is fluid within progress-related decisions in response to the level of completion of a project. We found that attention to completion increases in importance and attention to profitability decreases in importance as a project nears completion. We also found that allocation to safety demonstrates a curvilinear relationship with level of completion, such that safety concerns are highest at the beginning and end of a project and lowest in the middle of a project. This second finding was replicated using an archival database of number of accidents as a function of level of completion in highway construction projects.

Level of completion and the completion goal

The goal substitution effect suggested by Garland and Conlon (1998) received support, as the objective level of completion increased the psychological importance of the goal to complete the project, whereas the initial motive for starting the project—turning a profit—actually decreased in importance. Our results provide a specific explanation for assumptions that have existed in the progress decision literature for 25 years. Brockner et al. (1979) noted that the economic motives for beginning a project seemed to decrease in importance, but they did not specify what motives take precedence. Garland and Conlon (1998) speculated that the completion goal was the construct that took precedence, but they did not test this assertion. The present study is the first to demonstrate that the decrease in economic goal importance coincides with the increase of the completion goal.

Table 3
Results of negative binomial regression in study 2

Step	Variable	Coefficient	*SE*	*Z*
1	Dummy 1–Dummy 27[a]			
2	Hours	.00008	9.73e − 06	8.30**
3	Time	.03	.02	1.47
4	Time squared	.001	.0005	2.61**

Note. $n = 844$; Overall model without Time^2: $\chi^2(29) = 281.88$, $p < .01$; Overall model with Time^2: $\chi^2(30) = 289.50$, $p < .01$. Difference in two models: $\chi^2(1) = 7.62$, $p < .01$.

[a] Due to space constraints, specific parameter estimates for each of the dummy codes have not been reported given that they are not central to the investigation.

** $p < .01$.

As we believe that many organizations would like their decision makers to maintain their focus on turning a profit, our findings offer challenges for organizations. What may be even more daunting is for organizations to design remedies to address this problem, assuming that our theory is correct. Decades of research on the Zeigarnik effect have shown that it is remarkably resistant to interventions. For instance, Bhavsar, Jha, Joshi, and Kelkar (1992) showed that the need to complete remained even when a physiological manipulation occurred (i.e., providing either caffeine, a stimulant, or diazepam, a depressant). Thus, the boundary conditions of the project completion effect are not clear, which limits the ability of organizations to impact the phenomena.

One managerial recommendation we can make is to encourage decision makers to consider the variety of goals that exist for projects. Certainly the scholarly literature on project completion and escalation tends to make financial information the centerpiece of decision-making. However, if decision makers are provided with information as to how well other goals are being met (e.g., safety goals, worker morale goals, public relations goals, stakeholder goals such as community excitement or goodwill created, broader financial goals such as shareholder value, etc), perhaps these may work to collectively restrain completion goals from leading to inappropriate resource allocations. Although our study was limited in that we only allowed the participants the ability to allocate discretionary funds to completion or safety, future research may want to investigate how the ability to either save discretionary funds for future projects, or allocate them towards the fulfillment of this wide variety of goals may change behavior over the course of a project.

Our results also suggest that organizational researchers should try to examine other goals or behaviors that change as a result of level of completion, as they could have serious implications for the firm. Approaching the completion of a project may result in a temptation to engage in unethical behaviors, such as concealing negative information or distorting information (Keil et al., 2000; Schweitzer et al., 2002). For example, in the road construction industry, the foreman may choose to bury leftover scrap rather than ship it out if engaging in this unethical or illegal action will facilitate the project being completed on time. Thus, we recommend that researchers actively search out and identify goals and other cognitions that may change as a function of level of completion, and examine their associated outcomes.

Limitations

As with any other research project, there are limitations with our studies. First, the initial study we conducted was a laboratory study. As with any laboratory study, there are questions as to the generalizability of the findings. There could be concern that participants who have not worked in the road construction industry were not able to make informed decisions regarding allocations to production and safety. In addition, our scenario study may have been less cognitively taxing than what would be seen in the real world. In the field, decision makers would likely have had to attend to more information from more sources about more projects than what they did in our study, which challenges the generalizability of our results. However, there are several reasons why we feel confident in our results. First, as the participants in our study were all MBA students, all of whom had previous business experience, we felt confident in their ability to make decisions that were comparable to decision makers on the job. In addition, Anderson, Lindsay, and Bushman (1999) showed that laboratory and field research have very similar effect sizes, increasing our confidence in the generalizability of our laboratory results. Finally, we provided two tests of our curvilinear hypothesis (one of which includes a field sample), further increasing our confidence in the appropriateness of our conclusions.

A second limitation to this study is that we did not examine the boundary conditions of our results. This is problematic, as past research finds that the Zeigarnik effect is moderated by personality factors, such as neuroticism (Inglis, 1961) and need for achievement (Atkinson, 1953). For example, as introverts have been shown to have a stronger need for completion in high stress situations than extroverts (Atkinson, 1953), it is likely that introverts will be more likely to ignore safety in these same situations. Thus, introverted decision makers in a safety-conscious situation that creates high levels of stress (e.g., working in a coal mine or at a nuclear power plant) may actually focus very little on safety. Although we did not capture these characteristics in our study, the fact that all participants responded to our scenario at all levels of our independent variable means that, assuming the sample was not biased on any specific dispositional characteristic, these characteristics did not create a threat to internal validity in our study. However, future research should endeavor to examine how these characteristics interact with different levels of completion to impact various processes and outcomes.

Third, we speculated that limited cognitive resources are the driver of the goal substitution effect, and that increases in attention to the need to complete will cause attention to other goals to decrease. Although this was our conjecture, we did not test this mediational process in our study. There may be other unmeasured goals (e.g., self-presentation concerns, a motivation to avoid embarrassment, etc.) that increase over time and are actually responsible for the effect we find. There also may be alternative explanations for the process by which

level of completion decreased the importance of profit. For example, self-efficacy may mediate the relationship between level of completion and the importance of profit. Moon (2001) found that as a project approaches completion, perceptions of success increase. This increase in the perception of success may lead the decision-maker to perceive him/herself as more efficacious. However, high self-efficacy has been shown to be negatively related to performance (Vancouver, Thompson, Tischner, & Putka, 2002; Vancouver, Thompson, & Williams, 2001).[1] Therefore, it may be that the decision maker's belief that he/she will be successful (i.e., high self-efficacy) leads to a decrease in attention to the behaviors that would result in success. Future research should specifically test how the level of completion impacts the importance of profit.

Level of completion and safety

A central goal across both of our studies was to examine whether attention to safety was differentially impacted through the life cycle of a project. Using both laboratory and field data, we found a consistent curvilinear relationship across three different analyses, such that safety was maximized toward the beginning and end of the project and minimized toward the middle of the project. The robustness of this finding becomes apparent when one considers the very different operationalizations used to measure safety and the different methods used to collect the data. The data from the field provide perhaps the most compelling and visceral example of the effects of project completion, as we find that accidents on highway construction projects are higher at the middle stages of completion.

With respect to organizational implications, we believe that these findings further emphasize the consistency with which organizations need to emphasize safe performance. Although previous research has found that the relative priority placed on safety can vary across work groups within an organization (e.g., Hofmann et al., 2003; Hofmann & Stetzer, 1996, 1998; Zohar, 2000), our findings also suggest that the relative priority placed on safety may, in fact, vary within groups over time throughout the life-cycle of a project. Moreover, although managers or organizations might claim that they attend to safety (i.e., the rated level of safety importance does not change), their behavior (safety allocations) in Study 1 suggests otherwise, and it may be the employees who pay in terms of injuries (as seen in Study 2). Given this, it is important for organizations to step up their emphasis on safety during periods where the priority given to safety may be waning. The results of the current studies suggest that this is likely to be in the middle of the project life cycle.

Regarding research implications, this study highlights the importance of longitudinally studying organizational phenomena (e.g., decision-making). For example, we provide additional empirical support for the tenets of the "punctuated equilibrium" model (Gersick, 1988) that proposes a jump in productivity emphasis toward the middle of a progress-related group project. Clearly, people respond in ways similar to groups. Perhaps by presenting employees with data showing that accidents occur more frequently in the middle stages of projects, employees might realize that their health is at risk and act in a safer manner.

Although our study draws from theory developed in the escalation of commitment paradigm, the study itself does not address one of the major tenets of this paradigm—specifically that the project is a failing course of action. Past research has provided participants with information regarding level of completion, amount of total budget, and percentage of total budget already spent (Boehne & Paese, 2000). If the project was losing profitability or behind schedule (which could be calculated from the aforementioned data), it is possible that safety would be further minimized. Future research should investigate whether these characteristics of projects impact attention and allocations to safety.

Conclusion

There is a substantial body of literature establishing that people are somewhat limited in what they can evaluate (Kanfer & Ackerman, 1989) and process at any given point in time, and that multiple goals tend to be structured in a hierarchy of importance (Austin & Vancouver, 1996; Markman & Brendl, 2000). In this paper, we posed that forces in progress decisions (such as the level of completion) can introduce changes in the goal hierarchy as a result of shifting attentions. Specifically, we demonstrated that the importance of completion systematically increases as a function of level of completion and that emphasis on safety systematically changes as a function of level of completion. Therefore, we advance the literature concerning goal hierarchy by empirically predicting the pattern of goal and behavior fluidity. Finally, this paper focused on—and empirically tested—the role of time in decision-making. Our work complements the recent focus on time in research (see the special issues in the Academy of Management

[1] There is currently a debate as to whether self-efficacy is positively or negatively related to performance. Drawing from control theory, Vancouver et al. (2002, 2001) demonstrated in a series of studies that self-efficacy negatively related to performance over time. However, drawing on a large volume of empirical research, other researchers (e.g., Bandura & Locke, 2003) have concluded that self-efficacy increases performance. Thus, although our logic for this alternative hypothesis draws from one side of this debate, our speculation may in fact be invalid if the true relationship between self-efficacy and performance is positive.

Journal, 2002; the Academy of Management Review, 2001; and the Journal of Behavioral Decision Making, 2000) by directly incorporating time into the development of the theory and the design of the experiment. Continuing this call for a focus on time (e.g., Mitchell & James, 2001; Staw, 1997), we encourage others who study decision-making to incorporate time into their research designs.

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