CHAPTER ONE

The Planning Fallacy: Cognitive, Motivational, and Social Origins

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Contents

Abstract

The planning fallacy refers to a prediction phenomenon, all too familiar to many, wherein people underestimate the time it will take to complete a future task, despite knowledge that previous tasks have generally taken longer than planned. In this chapter, we review theory and research on the planning fallacy, with an emphasis on a programmatic series of investigations that we have conducted on this topic. We first outline a definition of the planning fallacy, explicate controversies and complexities surrounding its definition, and summarize empirical research documenting the scope and generality of the phenomenon. We then explore the origins of the planning fallacy, beginning with the classic inside–outside cognitive model developed by Kahneman and

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Tversky [Kahneman, D., & Tversky, A. (1979). Intuitive prediction: biases and corrective procedures. *TIMS Studies in Management Science, 12*, 313–327]. Finally, we develop an extended inside–outside model that integrates empirical research examining cognitive, motivational, social, and behavioral processes underlying the planning fallacy.

Why do academic papers take longer to write than expected? Why do home renovation projects take longer and cost more than expected? Why do major public construction projects take longer and cost more than expected, even though their scope and innovative features are typically reduced along the way? The phenomenon of optimistic time predictions undoubtedly comes in many forms and has many causes. Through a series of programmatic investigations, we have been exploring one particular form of optimistic time prediction that Kahneman and Tversky (1979) originally termed the *planning fallacy*. In this chapter, we first outline the basic definition of the planning fallacy, explicate controversies and complexities surrounding its definition, summarize evidence supporting the classic *inside–outside* cognitive model of Kahneman and Tversky (1979) and Kahneman and Lovallo (1993), and then describe recent work that enriches the classic cognitive model with motivational, social, and behavioral extensions.

1. Defining the Planning Fallacy

The planning fallacy refers to a readily observable phenomenon: the conviction that a current project will go as well as planned even though most projects from a relevant comparison set have failed to fulfill their planned outcomes. The term was first introduced to the psychological literature by Kahneman and Tversky (1979, 1982a, p. 415) to describe people's tendency "to underestimate the time required to complete a project, even when they have considerable experience of past failures to live up to planned schedules."

Kahneman and Tversky did not conduct empirical studies of the planning fallacy, but offered a single case study that still stands as a defining test case for theory and research on this phenomenon.

> In 1976, one of us was involved in a project to develop a curriculum for a new subject area for high schools in Israel. . . . Everyone on the team was asked to write on a slip of paper the number of months that would be needed to finish the project defined as having a complete report ready for submission to the Ministry of Education. The estimates ranged from 18 to 30 months.
>
> One of the team members—a distinguished expert in curriculum development—was then posed a challenge by another team member: "Surely, we're not the only team to have tried to develop a curriculum where

> none existed before. Try to recall as many such projects as you can. Think of them as they were in a stage comparable to ours at present. How long did it take them at that point to reach completion?'' After a long silence, the curriculum expert said, with some discomfort, ''First, I should say that not all the teams that I can think of, that were at a comparable stage, ever did complete their task. About 40% of them eventually gave up. Of the remaining, I cannot think of any that completed their task in less than seven years, nor of any that took more than ten.'' He was then asked if he had reason to believe that the present team was more skilled in curriculum development than the earlier ones had been. ''No,'' he replied, ''I cannot think of any relevant factor that distinguishes us favorably from the teams I have been thinking about. Indeed, my impression is that we are slightly below average in terms of resources and potential. (Lovallo & Kahneman, 2003, p. 61; see also Kahneman & Tversky, 1982b)

Note that in this example so far, the narrator has assembled the ingredients of the planning fallacy—a set of optimistic estimates for the current task juxtaposed with the knowledge of a rather more pessimistic history of such tasks—but the fallacy itself did not occur until the members of the team ignored or neglected the lessons of the past. In this case, the planning fallacy occurred when ''. . .the members ignored the pessimistic information and proceeded with the project. They finally completed the initiative 8 years later, and their efforts went largely for naught—the resulting curriculum was rarely used.'' (Lovallo & Kahneman, 2003, p. 61)

The signature of the planning fallacy, then, is not that planners are optimistic but that they *maintain* their optimism about the current project in the face of historical evidence to the contrary. So, for example, even though Denver's ambitious Stapleton international airport project opened 16 months later than planned at a cost of at least $2 billion over budget, it can only be defined as a case of the planning fallacy if the planners had knowledge of a set of similar projects that had taken longer than planned (which they surely did). Similarly, the fact that NASA's most recent space project has shown marked overruns in time and cost is not enough to define it as a case of the planning fallacy without the knowledge (as summarized in a recent U.S. General Accounting Office report) that 10 of the 13 preceding projects had also been marked by time and cost overruns. A frustrated project manager captures this point clearly: ''A recent example I've had was a task that the programmer promised he was going to finish it first in 2 days, I told him to be overly pessimistic, he said 2 weeks. The task was scheduled for 4 [weeks]. Now, after 5 weeks, the programmer says he's 2 days away from finishing.'' With the planning fallacy, the future *continues* to look rosier than the past, even as the future becomes the past.

Of course people can also underestimate the time required to complete a task in contexts where they have no access to relevant historical base rates, and there is value in understanding the causes and consequences of this more general "optimistic bias" or "underestimation bias." However, we believe it is the remarkable combination of realistic knowledge about the past and continuing optimism about the future that gives the planning fallacy its bite. Definitions that do not acknowledge the paradoxical combination of optimism about the future with realism about the past miss much of the richness of the phenomenon. We were drawn to studying the planning fallacy because in these types of predictions people do not forget history but because people *confidently* make predictions that go against the history that they know and remember. The study of the planning fallacy digs into the deep psychology of George Bernard Shaw's claim that "We learn from history that we learn nothing from history." (Shaw, 1903/1948, p. 485)

The lessons about when people do—and do not—learn from history also make the study of the planning fallacy extremely relevant for social psychologists. The challenge of integrating memories of the past into our understanding of the present and our expectations for the future is a central human problem that we face in every domain of our social lives. Studying the planning fallacy provides insights about how hope, fear, disappointment, and reason combine to shape not only time predictions but also many other expectations for the future.

2. Documenting the Planning Fallacy

To identify examples of the planning fallacy requires two related but separable findings. First, predictions of current task completion times must be more optimistic than beliefs about the distribution of past completion times for similar projects; second, predictions of current task completion times must be more optimistic than actual outcomes. A high degree of confidence is also diagnostic, but is not required by the classic definition.

The Standish Group publishes an annual survey about the success of information technology projects in the United States; in 2009, they classified 32% of surveyed projects as successes, meaning they were delivered on time, on budget, and with required features and functions; 44% were challenged, which meant that they were delivered late, over budget, or with less than required features; and 24% failed and were canceled or never used (The Standish Group, 2009). In an earlier study (The Standish Group, 1995), the average time overrun was 222%, with 47% of all projects reporting at least a 100% overrun. In a review of software estimation studies, Molokken and Jørgensen (2003) report that between 65% and 85% of software projects are completed after the predicted date; furthermore, poor estimation was noted as the most common reason for IT project failure (Nelson, 2007). In a comprehensive study of private sector planning and forecasting, Norris (1971) compiled forecasted and completed times and costs for close to 300 industrial research and design (R&D) projects (these 300 projects were taken from a larger pool of 475 projects—the balance of the projects were abandoned or changed. Notably, projects were generally abandoned *after* the estimated point of completion). He found that projects were, on average, about 250% over time budget and about 125% over cost budget. In a more detailed study of 50 R&D projects, Wilkes and Norris (1972) found that substage estimates were just as optimistic as whole-project estimates. Furthermore, there is ample historical evidence that cost and time overruns have been characteristic of public works projects in both the United States (Engerman & Sokoloff, 2004) and Europe (Flyvbjerg et al., 2005) for hundreds of years.

The tendency for project time estimation to show marked optimism seems to hold for projects in the private and public sectors, as well as for projects estimated to take from a few days to years to complete, and with budgets from a few thousand to millions of dollars. However, there are two major barriers to interpreting these applied real-world data in terms of the planning fallacy. First, we have no direct measures of planners' beliefs about the distribution of relevant past outcomes. Although many surveys indicate cost and time overruns are considered to be endemic in the high-tech and project-management world, we are lacking the data that would tie beliefs about the past to predictions about the future.

Second, the apparently optimistic time estimates for commercial projects may represent duplicitous attempts to manipulate an audience for political ends rather than true predictions about the future. Flyvbjerg et al. (2003, 2004, 2005) have argued that large public works are plagued by estimates that are deliberately deceptive, either because politicians wish to develop major projects but know that their true cost will not be borne by the taxpayer, or because contractors lowball the estimated cost or effort prediction to gain the contract, or because employees underestimate the cost and scope of projects to gain political favor and project approval from their managers. Flyvbjerg and colleagues provide anecdotal reports indicating that employees are at least sometimes implicitly or explicitly rewarded for deliberately underestimating project magnitude. Flyvbjerg also argues that because the history of project overruns is so well-known, the continuing pattern of optimistic forecasts in large-scale public projects has no other reasonable explanation other than fraud and deception. Importantly, this line of argument denies that people can honestly hold simultaneous beliefs in a pessimistic past and an optimistic future. Whatever the role of the "honest" planning fallacy in project overruns, there is undoubtedly a strong case for the role of deception and corruption in the underestimation of time and cost in public works and private industry projects.

Thus, despite the applied importance of studying industrial and transportation projects, and the plentiful data on the magnitude and generality of optimistic biases in this domain, the cleanest laboratory for the study of the planning fallacy seems to lie in the study of everyday personal projects. Consider one familiar example: Academics who carry home a stuffed briefcase full of work on Fridays, fully (and confidently) intending to complete every task, are often aware that they have never gone beyond the first one or two jobs on any previous weekend. Once again, this illustrates the ability of people to hold two seemingly contradictory beliefs. Although aware that most of their previous predictions were overly optimistic, they believe (so it seems) that their current forecasts are realistic.

This phenomenon is universally recognized by academics, and so we have often put it to the test with university students. However, the translation and operationalization from long-term projects is not as straightforward as it might seem. For example, is the appropriate measure the duration of time that students spend on the task, or is it the temporal distance to the estimated completion time? We know from the literature on software development projects that overestimation is typically found when measured either way: as programmer hours or by the time to the completion of the project. Nonetheless, larger overruns are generally found in estimates of completion time (van Oorschot et al., 2002). Kahneman and Tversky's classic planning fallacy example was based on completion time: the curriculum team estimated their completion date but there is no report of the team jointly estimating how many hours they would spend on the task itself. Moreover, we suspect that most project teams and most students measure success in task completion by whether the product is delivered on time, and rarely look back to assess whether the task took surprisingly many hours or days of actual working time. Thus, in most of the studies we report here, the key outcome measure is completion time rather than time-on-task duration. Moreover, in most cases, we examine target tasks that are of sufficient magnitude that they require at least a full day of elapsed time between prediction and completion.

A second decision we have faced is whether we should include or exclude academic or personal tasks with a firm deadline. Strictly enforced deadlines minimize the scope of the planning fallacy as they provide a tight upper bound to the possible optimistic bias. Indeed, Tversky and Shafir (1992) offered students $5 for answering and returning a questionnaire within 5 days, 3 weeks, or with no deadline and observed return rates of 60%, 42%, and 25%, respectively, underlining the power of deadlines to enforce timely completion. Similarly, Silk (2010) found that consumers were much more likely to return mail-in rebates if given a 1-day or 1-week deadline rather than a more conventional 3-week deadline—even though the consumers preferred the longer deadline if given a choice. Furthermore, externally imposed deadlines are more effective in ensuring timely task completion than are self-imposed deadlines (Ariely & Wertenbroch, 2002). Thus, our decision to include projects with deadlines—and our general focus on academic projects with strict deadlines—undoubtedly has led to a conservative estimate of the magnitude of the planning fallacy in personal projects.

In one of our first assessments of the planning fallacy, we examined predictions for completion of a computer-based tutorial session. Students reported that they usually completed similar academic tasks about a day before the deadline; when asked to predict when they would complete the current tutorial, students estimated that they would be finished, on average, about 6 days in advance of the deadline (Buehler et al., 1994). In fact, and consistent with our two-point test for the planning fallacy, only about 30% completed by their predicted date—most finished, as usual, considerably closer to the deadline than they anticipated. We have obtained further evidence that student participants firmly believe in their forecasts by assessing their confidence (Buehler et al., 1994, Studies 2 and 3; Buehler et al., 1995). First, participants reported how certain they were that they would finish by the time they had predicted, on a scale ranging from 0% (not at all certain) to 100% (completely certain). The 50% or halfway mark on this scale indicated that respondents felt that it was a ‘‘toss-up’’ whether they would finish by the time they predicted. For the most part, participants were quite confident that they would meet their predictions: the average certainty rating was 74% for school assignments in one study, 84% in a second study, and 70% for household tasks. In each case, approximately 40% of the participants actually finished by the predicted time. It is notable that, in a class survey, students reported that they typically completed about 32% of their projects by their expected completion date, and were later than expected about 68% of the time. The belief in (or knowledge of) a ‘‘pessimistic past’’ seems to be widespread in this domain.

Figure 1.1 presents data from a related study (Griffin & Buehler, 1999, Study 1) where students reported probability estimates for their best guess completion times for 10 current projects across their academic and personal lives. Once again, about 45% of the projects were completed, compared to an average confidence level of 73%. The calibration plot reveals two interesting patterns: First, probability judgments are overly optimistic across the entire range; this does not match the canonical pattern of overconfidence in knowledge which is marked by underconfidence or underestimation at the low end of the probability scale and overconfidence or overestimation at the upper end, a pattern known as over-extremity (Griffin & Brenner, 2004). Thus, the phenomenon to explain is an optimistic bias, not an extremity bias. Second, the slope between confidence and likelihood of timely task completion is moderately steep, indicating that in a relative sense, the predictions contain considerable information about completion times.

As well as assessing judges' confidence in their ‘‘best guess’’ predictions, we have also employed a more demanding ‘‘fractile procedure’’ (Lichtenstein et al., 1982; Yates, 1990): In addition to their best guess

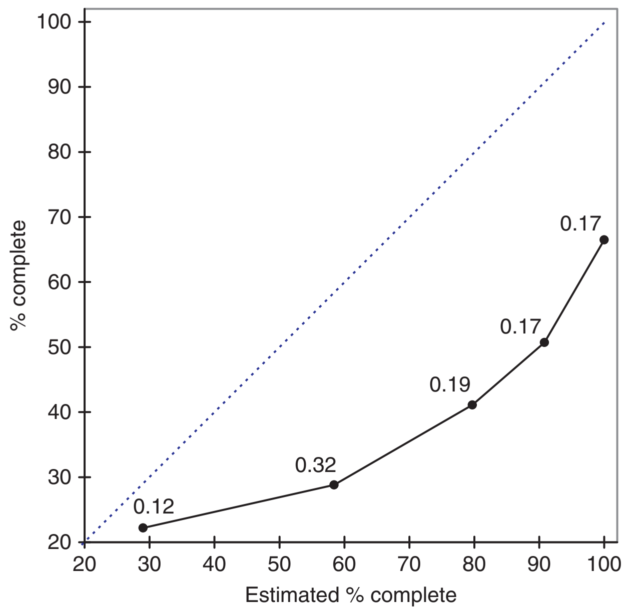

Figure 1.1 Calibration curve for estimated and actual probability of meeting task completion predictions. Numbers indicate the proportion of responses represented by each point on the curve. Dashed line represents perfect calibration (Griffin & Buehler, 1999).

predictions, participants indicated times by which they were 50% certain, 75% certain, and 99% certain that they would finish a project (Buehler et al., 1995). As seen in Fig. 1.2, the fractile measure revealed rampant optimistic overconfidence: Only 13% of the participants finished their academic projects by the time they reported as their 50% probability level, 19% finished by the time of their 75% probability level, and 45% finished by the time of their 99% probability level. The results for the 99% probability level are especially striking: Even when asked to provide a prediction that they feel virtually certain they will fulfill, students' confidence far exceeds their accomplishments.

We also documented a more dramatic example of optimistic time completion estimates by studying senior honors theses, a rare academic project without a binding deadline. We waited until most students were approaching the end of this year-long project, and then asked them to predict when they realistically expected to submit the thesis, as well as when they would submit it if "everything went as poorly as it possibly could." The students' realistic predictions were overly optimistic: Only 30% of the students finished the project by the predicted time. On average, the students took 55 days to complete their thesis, 22 days longer than they had anticipated, and

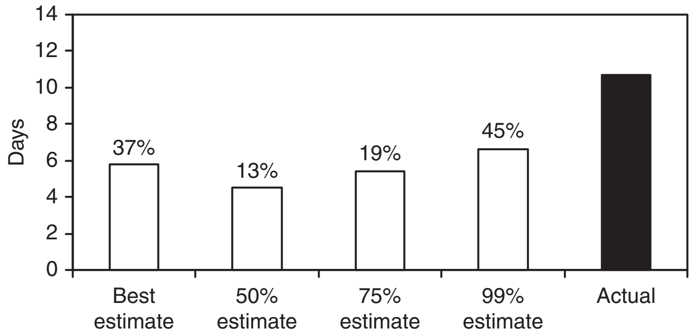

Figure 1.2 **Predicted completion times for academic tasks corresponding to specified probability levels. Numbers above bars represent the percentage of projects finished by predicted time (Buehler et al., 1995).**

even 7 days longer than the average worst-case prediction. Interestingly, despite the optimistic bias, the students' forecasts were accurate in a relative or ordinal sense: The predicted completion times were highly correlated with actual completion times ($r = 0.77$). Compared to others in the sample, then, the students who predicted that they would take more time to finish actually did take more time. Once again, we see that predictions can be informative even in the presence of a marked optimistic bias.

A telephone survey of Canadian taxpayers revealed that the planning fallacy is not limited to students and their school assignments (Buehler et al., 1997). Those surveyed expected to mail their tax returns about a week earlier than their typical date (3 weeks before the deadline rather than their usual 2 weeks), but in accord with the planning fallacy, history repeated itself: on average, reported typical behavior in the past accurately matched present behavior (forms were completed in the usual 2 weeks), so that the current predictions averaging 3 weeks before deadline were markedly optimistic.

We should note, however, that current completion times do not always match recollections of past behavior in our studies, nor does the definition of the planning fallacy require such a match. Across many of our studies, we find that the current task usually takes slightly longer than the recalled typical time, implying either that the world is becoming progressively more difficult or that people misremember the past in a somewhat positive light. For example, in a study of holiday shopping predictions (Peetz et al., 2010, Study 2), students reported that they typically completed their shopping about 6.2 days before Christmas, and predicted they would complete the current season's shopping about 7.5 days before Christmas, but actually completed it only 5.5 days before Christmas on average. Similarly, in studies of student predictions for academic projects conducted in both Canada and

Japan (Buehler & Griffin, 2003, Study 2; Buehler et al., 2003), we found that predictions were more optimistic than the recalled date of a typical project. Both Canadian and Japanese students predicted to finish about 2 days before the deadline and recalled that they typically finished about a day before the deadline, but the current tasks were completed only half a day before the deadline (see Fig. 1.3). In all cases, using recalled behavior to make predictions would have been more accurate, at least on a mean level, than using predicted behavior, but it would not have been perfect.

The evidence presented so far suggests that the tendency to underestimate task completion times is a robust phenomenon. To characterize the scope and generality of the prediction bias, we have also performed a more exhaustive review of research outcomes from controlled studies of project completion predictions and summarized these findings in Figs. 1.4 and 1.5 and associated Table 1.1. Our review builds upon previous summaries of the literature (Roy et al., 2005) and includes additional studies. We included all studies we could find that examined self-predictions (as opposed to observer predictions) and reported untransformed measures of both predicted and actual completion times. Because we were interested in characterizing people's natural ability to predict completion times, without assistance or manipulation, we included only studies (or control conditions within studies) in which participants' forecasts were not subject to experimental interventions designed to alter the information that predictors considered. In addition, we classified the target tasks as "in-session" or "out-of-session" tasks based on whether participants completed the task during the research

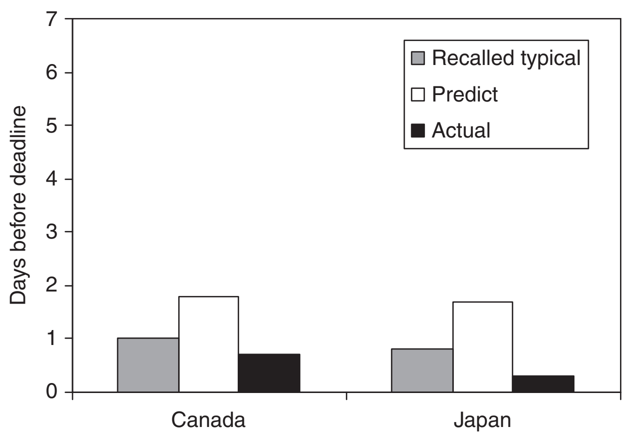

Figure 1.3 Recall of typical completion time, predicted completion time, and actual completion time for a self-nominated school assignment in Canadian and Japanese students (Buehler et al., 2003).

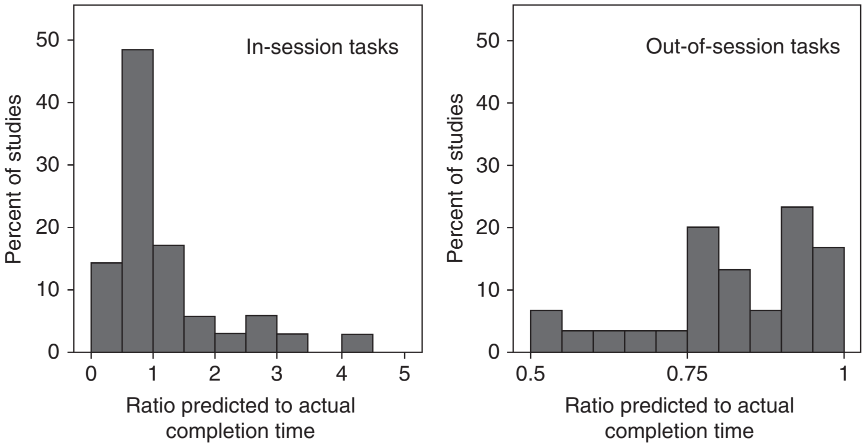

Figure 1.4 **Percent of studies finding underestimation (ratio < 1) and overestimation (ratio > 1).**

session (e.g., laboratory tasks) or completed it on their own time, outside the research session. The dependent variables of interest were the predicted and actual time to task completion, as opposed to the duration of time spent working on the task. These two measures can (and usually do) diverge markedly for out-of-session tasks (e.g., an essay with a 2-week deadline may take 12 days from prediction to completion yet require only 5 h of actual time on task), but are indistinguishable in the "in-session" tasks (e.g., a laboratory task that takes 10 min of actual working time also has a time to completion of 10 min). We include a total of 65 comparisons of predicted and actual outcomes, 35 from in-session tasks and 30 from out-of-session tasks.

Figure 1.4 presents a pair of histograms that summarizes the frequency of studies showing underestimation bias versus overestimation bias separately for in-session and out-of-session tasks. Both histograms are presented as ratios (predicted time over actual time) to allow comparison between the short in-session tasks (measured in minutes) and the longer, more complex out-of-session tasks (measured in days). A ratio of 1 indicates a perfectly accurate prediction, with ratios larger than 1 indicating overestimation (a pessimistic belief that the task will take longer than it actually does) and ratios less than 1 indicating underestimation (an optimistic belief that the task will take less time than it actually does), consistent with the planning fallacy. The contrast in the pattern of results is striking: for in-session studies, where uncertainty is solely about the nature and difficulty of the target task, there is considerable variability on both sides of the accuracy ratio, indicating the presence of both overestimation and underestimation; for out-of-session studies, where uncertainty is greater and comes not only from the nature of the task but also from a host of other factors (e.g., competing tasks,

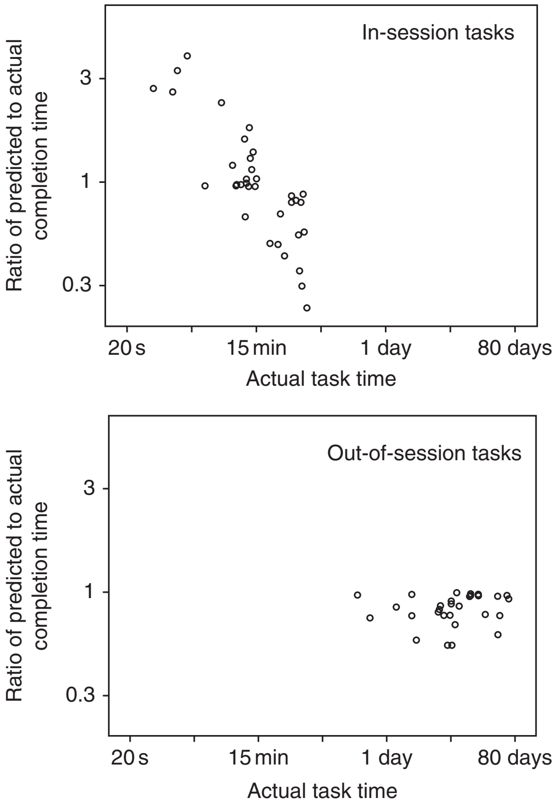

Figure 1.5 Ratio of predicted to actual completion time as a function of actual completion time.

unsuspected difficulties in locating task-relevant materials, unexpected interruptions, and self-control failure), underestimation is typical and over-estimation is never observed.

Figure 1.5 further unpacks the difference between in-session and out-of-session studies by plotting the same ratio of predicted to actual completion time (in original ratio units on the *Y*-axis) against the actual task completion time (in log units on the *X*-axis, to allow comparison between tasks taking minutes to complete with tasks tasking weeks to complete). The top panel presents the data from "in-session" studies, with actual times presented in minutes, and the bottom panel presents the comparable data from "out-of-session" studies, with actual times presented in days. For the in-session studies, the degree and direction of bias is clearly related to the actual length of the task, a relationship that has been documented previously (Roy & Christenfeld, 2008; Roy et al., 2005). Notably, for very short laboratory tasks, overestimation is characteristic, whereas for somewhat longer tasks,

Table 1.1 Summary of studies comparing predicted and actual task completion times

Reference	Study	Type	Task	Predicted	Actual	Unit
Buehler et al. (1994)	1	2	Honors thesis [best guess predictions]	33.9	55.5	days
	2	2	Self-nominated nonacademic project [partial information group]	5	9.2	days
	2	2	Self-nominated academic project [partial information group]	5.8	10.7	days
	3	2	Self-nominated school project	6.0	7.1	days
	4	2	Computer tutorial assignment [control group]	5.5	6.8	days
Buehler et al. (1997)	1	2	Income tax forms [across refund/no refund group]	22.2	14.0	days BDL
	2	1	Anagram word puzzles [no-incentive control group]	6.7	7	min
Buehler et al. (2010b)	1	2	Self-nominated school project	11.4	13.7	days
Buehler and Griffin (2003)	1	2	Christmas shopping [control group]	4.5	3.3	days BDL
	2	2	Self-nominated school project [standard control group]	1.5	0.3	days BDL
Buehler et al. (2005)	1	2	School group project [final individual predictions]	45.2	59.3	days
	2	1	Puzzle task [final individual predictions]	13.1	13.8	min
	3	2	Group take-home assignment [final individual predictions]	1.9	2.5	days
Buehler et al. (2003)	1	2	School assignment [Japanese sample]	1.7	0.3	days BDL
	1	2	School assignment [Canadian sample]	1.8	0.7	days BDL
		2	Summer research project	14.2	6.7	days BDL

(*continued*)

Table 1.1 (*continued*)

Reference	Study	Type	Task	Predicted	Actual	Unit
Burt and Kemp (1994)	1	1	Bookshop	120	44	s
	1	1	Cards	180	52	s
	1	1	Library form	300	74	s
	1	1	Library	133	139	s
	1	1	Walk	600	249	s
	2	1	Purchase	420	433	s
	2	1	Balance sheet	900	557	s
	2	1	Letter	600	611	s
	2	1	Proofread	900	690	s
	2	1	Library	840	734	s
Byram (1997)	1	1	Assemble computer stand [subset that performed the task]	65.7	76.1	min
	4	1	Origami task [final prediction, across immediate/delay group]	6.6	9.7	min
	5	1	Origami task [no-incentive control group]	10.1	9.8	min
Connolly and Dean (1997)	1	2	Programming assignment #1 [predict whole task first group]	8.3	8.7	h
	1	2	Programming assignment #2 [predict whole task first group]	9.9	13.4	h
Deslaurier (2002)	1	2	Single-submission essay task [control group]	7.72	10.2	days
	1	2	Multiple-submission essay task [control group]	8.85	10.4	days
Forsyth and Burt (2008)	1	1	Office tasks A [scheduled as group]	17.9	12.8	min
	1	1	Office tasks B [scheduled as group]	15	14.5	min
	2	1	Office tasks A [scheduled as group]	22.4	71.6	min
	2	1	Office tasks B [scheduled as group]	21.2	85.5	min

Francis-Smythe and Robertson (1999)	1	1	Spell-check	429	357	s
Hinds (1999)	1	1	Operate cell phone [novice sample, unaided group]	15.7	31.5	min
Josephs and Hahn (1995)	3	1	Read manuscript [short format, across slow/ fast readers]	35.8	65.0	min
	3	1	Read manuscript [long format, across slow/ fast readers]	25.5	68.6	min
	4	1	Read manuscript [short format, across slow/ fast readers]	55.5	69.8	min
	4	1	Read manuscript [long format, across slow/ fast readers]	44.2	77.6	min
König (2005)	pilot	1	Answer questions	49	59.9	min
Koole and Van't Spijker (2000)	1	2	Essay task [goal condition]	1.7	2.9	days
Kruger and Evans (2004)	3	1	Format document [packed group]	17.3	39.7	min
	4	1	Assemble food tray [packed group]	23.5	33.6	min
	5	1	Format document [simple; packed group]	7.9	8.1	min
	5	1	Format document [complex; packed group]	11.9	23.7	min
Newby-Clark et al. (2000)	1	2	Major school assignment [realistic scenario; final prediction]	1.1	0.3	days BDL
	3	2	Major school assignment [no scenario control]	2.0	0.8	days BDL

(*continued*)

Table 1.1 *(continued)*

Reference	Study	Type	Task	Predicted	Actual	Unit
Peetz et al. (2010)	1	2	Major school assignment	2.5	1.3	days BDL
	2	2	Christmas shopping [predicted in October]	9.2	5.7	days BDL
	2	2	Christmas shopping [predicted in December]	5.7	5.4	days BDL
	5	2	Essay task [predicted 3 weeks BDL]	1.6	0.6	days BDL
	5	2	Essay task [predicted 1 week BDL]	1.1	0.3	days BDL
Pezzo et al. (2006a)	1	2	Read story	8.2	12	days
	1	2	Proof-read lists	6.0	7.9	days
Roy and Christenfeld (2007)	1	1	Origami task [no prior experience group; prediction group]	20	11	min
Sanna et al. (2005)	1	2	Group research proposal [control group]	8.3	3.1	days BDL
	2	1	Group desk assembly [control group]	42.4	50.0	min
	3	1	Group desk assembly [control group]	42.3	53.2	min
Thomas and Handley (2008)	2	1	Build toy castle [no-anchor control group]	619	652	s
Thomas et al. (2003)	1	1	Tower of Hanoi [no-experience control group]	61.7	21.7	s
Zhang and Fishbach (2010)	5	2	GRE questions [estimate group; expect simple task]	59.7	62.4	h
	5	2	GRE questions [estimate group; expect difficult task]	29.3	35.1	h

Note. Type of task refers to whether the task was completed as part of the experimental session (1 = in-session, 2 = out-of-session). For studies with experimental manipulations, the control group selection is specified in brackets. BDL = before deadline.

underestimation becomes common. This is consistent with a floor effect on a bounded scale for these very short tasks. However, for out-of-session studies, the degree of underestimation is consistent across the range of task length, indicating that optimistic time predictions are characteristic of tasks carried out in a real-world context, whether they are relatively short-term or long-term projects. The starkly contrasting patterns between in-session and out-of-session prediction tasks shown in both Figs. 1.4 and 1.5 provide justification for our view that the planning fallacy is a phenomenon characteristic of familiar tasks carried out under conditions of considerable uncertainty—and should be studied under those conditions (Griffin & Buehler, 2005). Furthermore, these distinct patterns cast doubt on the utility of attempts to build a single account of prediction bias that applies readily to novel and familiar tasks, short and long tasks, and tasks performed in and outside of the laboratory (cf. Roy et al., 2005).

3. Explaining the Planning Fallacy: The Original Cognitive Model

3.1. The inside versus outside view

Given the prevalence of optimistic predictions, and ample empirical evidence of the planning fallacy, we now turn to examining the psychological mechanisms that underlie people's optimistic forecasts. In particular, how do people segregate their general theories about their predictions (i.e., that they are usually unrealistically optimistic) from their specific expectations for an upcoming task? Kahneman and Tversky (1979) explained the prediction failure of the curriculum development team through the *inside versus outside* analysis of the planning fallacy. This analysis builds upon a perceptual metaphor of how people view a planned project. In the curriculum development example, the group of authors focused on the specific qualities of the current task, and seemed to look *inside* their representation of the developing project to assess its difficulty. The group of authors failed, however, to look *outside* of the specific project to evaluate the relevant distribution of comparable projects. Even when they asked for information about the outside viewpoint, they neglected to incorporate it in their predictions or even to moderate their confidence. An inside or internal view of a task focuses on *singular* information: specific aspects of the target task that might lead to longer or shorter completion times. An outside or external view of the task focuses on *distributional* information: how the current task fits into the set of related tasks. Thus, the two general approaches to prediction differ primarily in whether individuals treat the target task as a unique case or as an instance of a category or ensemble of similar problems.

To explain the planning fallacy using this model, we need to account for two things: why people fail to incorporate the distributional or outside information in their completion estimates, and why the resulting focus on singular information through the inside perspective leads to overoptimism. For a number of reasons, the singular or ''narrow'' frame seems to be most natural when developing plans and predictions as well as making decisions about the future (Kahneman & Lovallo, 1993; Kahneman & Tversky, 1979). People tend to generate their predictions by considering the unique features of the task at hand, and constructing a scenario about their future progress on that task. This is, by and large, what ''planning'' means to most people: developing a series of steps that will lead from the beginning to a successful conclusion of the project. In deciding how much work to take home for the weekend, for example, individuals may try to imagine when they will start a particular project and how many hours of actual working time they will require. They may (or may not) also consider the other activities they have planned for the weekend and try to determine precisely when, where, and how they will find time to work on the project. They may (or may not) even try to envision potential obstacles to completing the project, and how these obstacles will be overcome. Essentially this inside or internal approach to prediction involves sketching out a scenario that captures how the specific future project is likely to unfold. Several theorists have similarly noted the tendency to construct scenarios, narratives, or mental simulations as a basis for predicting the future (Dawes, 1988; Dougherty et al., 1997; Dunning, 2007; Griffin et al., 1990; Kahneman & Lovallo, 1993; Kahneman & Tversky, 1982c).

3.2. Obstacles to using past experiences

Despite the predictive value of past experiences, our findings suggest that people neglect them while forming predictions. Why might this be so? One answer was suggested above: prediction, by its very nature, elicits a focus on the future rather than the past, and this future orientation may prevent individuals from looking backwards. However, a failure to use personal base rates need not always result from inattention to the past. People may sometimes attend to their past, but nevertheless fail to incorporate this information into their predictions because it does not seem relevant. People may have difficulty extracting an appropriate set of past experiences; the various instances seem so different from each other that individuals cannot compare them meaningfully (Kahneman & Lovallo, 1993; Kahneman & Tversky, 1979). As a British rugby-player-turned-commentator noted ''Each game is unique, and this one is no different from any other.''

People may also interpret the past in a manner that reduces its pertinence to the current prediction. The meaning and relevance of any past behavior depends largely on an individual's explanation of why it occurred. Whereas certain types of attributions link a past event to the present and future, other attributions isolate the past. To the extent that people perceive a previous episode to be caused by external, unstable, and specific factors, they need not connect its outcome to future occasions. For example, a woman may attribute her inability to complete a past weekend task to an unexpected visit by her former college roommate. Thus, she may generalize the previous failure only to weekends when that external and specific factor is present. Knowing that her college friend is out of town, she may assume she will be able to readily attain her objectives.

We suggest that people often make attributions that diminish the relevance of past experiences to their current task. People are probably most inclined to deny the significance of their personal history when they dislike its implications (e.g., that a project will take longer than they hope). If they are reminded of a past episode that could challenge their optimistic plans, they may invoke attributions that render the experience uninformative for the present forecast. This analysis is consistent with evidence that individuals are inclined to explain away negative personal outcomes (for reviews, see Miller & Ross, 1975; Taylor & Brown, 1988). People's use of others' experiences are presumably restricted by the same two factors: a focus on the future reduces the salience of others' experiences, and the tendency to attribute others' outcomes to their dispositions (Gilbert & Malone, 1995) limits the inferential value of others' experiences. Furthermore, our understanding of other people's experiences is typically associated with uncertainty about what actually happened; consequently, we can readily cast doubt on the generalizability of those experiences. To quote Douglas Adams, "Human beings, who are almost unique in having the ability to learn from the experience of others, are also remarkable for their apparent disinclination to do so." (Adams & Carwardine, 1991, p. 116)

In sum, we note three particular impediments to using the outside perspective in estimating task completion times: the forward nature of prediction which elicits a focus on future scenarios, the elusive definition of "similar" experiences, and attributional processes that diminish the relevance of the past to the present.

3.3. Optimistic plans

People's completion estimates are likely to be overly optimistic if their forecasts are based exclusively on plan-based, future scenarios. A problem with the scenario approach is that people generally fail to appreciate the vast number of ways in which the future may unfold (Arkes et al., 1988; Fischhoff et al., 1978; Hoch, 1985; Shaklee & Fischhoff, 1982). For instance, expert auto mechanics typically consider only a small subset of the possible things that can go wrong with a car, and hence underestimate the probability of a breakdown (Fischhoff et al., 1978). Similarly, when individuals imagine the future, they often fail to entertain alternatives to their favored scenario and do not consider the implications of the uncertainty inherent in every detail of a constructed scenario (Griffin et al., 1990; Hoch, 1985). When individuals are asked to predict based on "best guess" scenarios, their forecasts are generally indistinguishable from those generated by "best-case" scenarios (Griffin et al., 1990; Newby-Clark et al., 2000).

The act of scenario construction itself may lead people to exaggerate the likelihood of the scenario unfolding as envisioned. Individuals instructed to imagine hypothetical outcomes for events ranging from football games to presidential elections subsequently regard these imagined events as more likely (for reviews, see Gregory & Duran, 2001; Koehler, 1991). Focusing on the target event (the successful completion of a set of plans) may lead a predictor to ignore or underweight the chances that some other event will occur. Even when a particular scenario is relatively probable, a priori, chance will still usually favor the whole set of possible alternative events because there are so many (Dawes, 1988; Kahneman & Lovallo, 1993).

4. Empirical Support for the Inside–Outside Model

An important goal of our initial studies of the planning fallacy was to test the inside–outside account. We first looked for evidence that a focus on the future—and a consequent neglect of the past—was indeed characteristic of the planning process. In several studies, we included "think-aloud" procedures to record the "online" narratives of participants as they estimated their completion times for various tasks, most of which had specific deadlines. We instructed respondents to say aloud every thought or idea that came to mind while predicting when they would finish an upcoming project. We later analyzed the verbal protocols for evidence that people focus on plan-based scenarios for the task at hand, rather than distributional information such as their previous experiences. In a typical study of academic and home projects (Buehler et al., 1994, Study 3), the majority of respondents' thoughts were directed toward the future ($M = 74\%$). The participants focused overwhelmingly on their plans for the current project, for the most part describing scenarios in which they finished the task without problems arising (only 3% of respondents' thoughts included potential impediments); their verbal protocols revealed an almost total neglect of other kinds of information, including their own past experiences (7% of thoughts) or others' experiences with similar projects (1%). We have replicated this pattern of results a number of times using written thought-listing measures instead of think-aloud procedures, and collecting retrospective rather than online measures of thoughts. Thought-listings also revealed a consistent neglect of another piece of information in favor of the focus on future plans. In all studies, few students report thinking about the role of deadlines when constructing their forecasts of completion times. For example, in one study with varying deadlines (Buehler et al., 1994, Study 2), students' predictions were only weakly associated with their self-reported deadlines ($r = 0.23$, $p < 0.09$), whereas their reported completion times were strongly associated with the deadlines ($r = 0.82$, $p < 0.001$).

In one particularly interesting analysis of thought focus, we compared the reported thought content of Canadian and Japanese students (Buehler et al., 2003). Participants named a school assignment that was due in the next 4 weeks, reported best guess predictions for that project, described their thoughts while they made their predictions, reported when they typically finished similar assignments in the past, and later reported when they actually finished the target assignment. As described earlier, both Japanese and Canadian participants showed the classic planning fallacy dissociation between their current predictions and their reports of typical completion times. Furthermore, as seen in Fig. 1.6, the thought-listings also revealed a very similar pattern across cultures. Consistent with previous findings, most participants (70%) focused on their plans for completing the task, whereas only about one quarter of the participants (26%) referred to their past experiences (which typically implied that a more conservative prediction was in order), and very few participants contemplated the potential problems and delays they might encounter. The Canadian and Japanese samples did not differ significantly in their use of any of the thought categories.

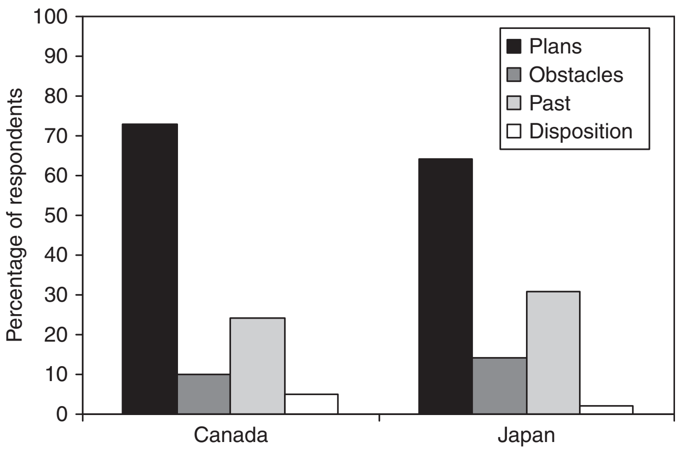

Figure 1.6 Focus of thoughts in Canadian and Japanese students predicting their completion for a self-nominated school assignment (Buehler et al., 2003).

In another experiment (Buehler et al., 1994, Study 4), we examined whether the relative neglect of past experiences was due to a lack of attention or due to the perceived irrelevance of the past. Participants predicted when they would finish a standard, 1-h computer assignment. Those in the Recall condition reported on their previous experiences with similar assignments just before making their predictions. They indicated how far before the deadlines they had typically finished school assignments similar to the present one. Control participants were not asked any questions concerning their past experiences until after they had reported their predictions. In both conditions, participants remembered finishing the majority of their previous projects very close to the relevant deadlines. Participants in the Recall condition—who had just focused on their usual deadline-snatching pattern of completion times—nonetheless underestimated their actual completion times just as much as those in the standard Control condition. Even in the Recall condition, only 12% of participants reported thinking about past experiences when making their current plans (vs. 2% in the Control condition). Again, this pattern has been replicated in other studies (e.g., Buehler & Griffin, 2003), indicating that attention to and awareness of the past is not enough to make the past relevant to the future.

The relevance account is further strengthened by a demonstration that forcing the past to become relevant eliminates the optimistic prediction bias for completion times. Our manipulation required participants to actively link their past experiences with their specific plans for an upcoming task. In this "recall-relevance" manipulation, participants first indicated the date and time they would finish a computer assignment if they finished it as far before its deadline as they typically completed assignments (Buehler et al., 1994, Study 4). They were then required to describe a plausible scenario—based on their past experiences—that would result in their completing the computer assignment at their typical time. This procedure was designed to prevent participants from either ignoring past experiences with similar tasks or discounting the relevance of those experiences. After writing the hypothetical scenario, participants made predictions for the computer assignment. For this task, at least, the recall-relevance manipulation successfully eliminated the usual optimistic bias.

Recall that a third reason that people may fail to incorporate the lessons of past experiences into their future predictions is that people may diminish the relevance of the past through attributional means. To test the role of attributional processes in the planning fallacy, we have asked participants to recall an occasion when they had failed to complete a task by the time they had originally anticipated, and then to recall a similar prediction failure experienced by a close acquaintance (Buehler et al., 1994, Study 3). Next, we asked them to explain why each of the two tasks was not finished by the expected time and coded them using the dimensions of the Attributional Style Questionnaire (Peterson et al., 1982). The reasons participants reported for their own lateness were more external, transitory, and specific than the reasons they provided for similar tardiness by close acquaintances. Participants attributed their own lateness to such rare events as their computer monitor "frying" while they were typing their final English essay, whereas others' failures seemed to reflect enduring personal problems with time management. In a related study (Buehler et al., 1994, Study 4), participants who either succeeded or failed in meeting their predictions rated their own reasons for the success or failure. Those who finished late rated their reasons as significantly more transitory and specific than those who finished on time. Both studies reveal that people interpret their own tardiness in a manner that makes it seem unique and unlikely to recur.

In the cross-cultural study mentioned previously (Buehler et al., 2003), we asked participants to describe a past prediction failure of their own and that of a school friend and to explain why each of these had occurred. Once again, we found a moderate self-serving bias in Canadians' attributions for failures to complete tasks by the expected time, one that could serve to diminish the relevance of past failures to future forecasts. Canadian students reported causes that were more external, transitory, and specific than the causes they reported for a friend's late completion. However, we did not expect that the same attributional bias would appear in Japanese students, given that theorists propose Japanese culture is marked by social pressure toward self-derogation rather than self-enhancement, at least publicly (e.g., Heine et al., 2000, 2001). Consistent with these cultural theories, the Japanese students demonstrated a self-derogation bias in their attributions for failing to complete tasks on time: they attributed their own prediction failures to causes that were more internal, stable, and global than those of a friend. This finding implies that the planning fallacy may be supported by attributional processes to a lesser degree in Japanese than in Western cultures, and raises the intriguing possibility that Japanese participants might be more influenced by reminders of past failures than are Western participants.

We have also validated the role of the perceived irrelevance of the past (at least in Western cultures) through interviews with software engineers engaged on major projects at a firm specializing in taxation software for government use. Although this small sample does not provide a confirmatory test of the attributional hypothesis, it does provide vivid demonstrations of the seemingly unassailable logic that drives the dissociation of past from future projects. Of the dozen software engineers interviewed, there was virtual unanimous agreement that past projects tended to be late and that the results of past projects could not be used to inform future predictions. Participants were first asked "When you made the prediction...did you think of past projects and their outcomes?" Typical answers included "No...because it's a unique working environment and I've never worked on anything like it"; "No, not relevant. It's not the same kind of project at all."

Participants were also asked "When you made this prediction did you think about other people's projects here or within the field in general?" Answers included: "There didn't seem to be anything that was comparable. This is a bit unique. A lot of it relies on new technology, new software on which to build reports, etc. It's difficult to compare to other projects"; "No, not on this one. The nature of this project is a little strange; it's not like anything I've ever worked on"; "No comparison, because this type of thing hasn't been done before."

Overall, the evidence for the cognitive processes underlying the inside model of prediction is highly consistent, whether in terms of thought-listing analysis, manipulations of attention to and perceived relevance of past experiences, or measures of attributional processes that diminish the relevance of the past to future outcomes. In the next sections, we go beyond documenting the processes underlying the classic model of the planning fallacy, and use these processes to explain the effects of a broader range of variables, resulting in an extended model (Fig. 1.7 presents a comparison of the classic and extended inside–outside model).

5. Extending the Planning Fallacy: An Extended Inside–Outside Model

5.1. Identifying key elements of the inside focus

A basic axiom of the planning fallacy is that the future is perceived to be rosier than the past; realistically pessimistic lessons from the past fade from a forecaster's attention in light of optimistic plans about the future. However, according to Kahneman and Tversky's (1979) initial definition, the inside view includes all case-specific content including possible problems or obstacles to completion as well as plans for how to overcome them. Thus, an inside view can, at least in theory, vary in the balance of its content between plans for success and possible obstacles or interruptions. This led us to two guiding hypotheses about the *content* of the inside view on a given prediction: (1) the content will, in general, be biased toward a best-case scenario dominated by plans for success; (2) the balance of the content between plans for success and obstacles to completion is a continuous variable that varies according to the psychological state of the forecaster and influences the optimism of the resulting forecast. Thus, in the research that follows, we extend the inside–outside view of the planning fallacy by drawing a distinction not only between inside and outside perspectives, but also between varying amounts of positive focus within the inside perspective.

To evaluate the first of these hypotheses, Newby-Clark et al. (2000) assessed the overall positivity of people's scenarios about future projects by

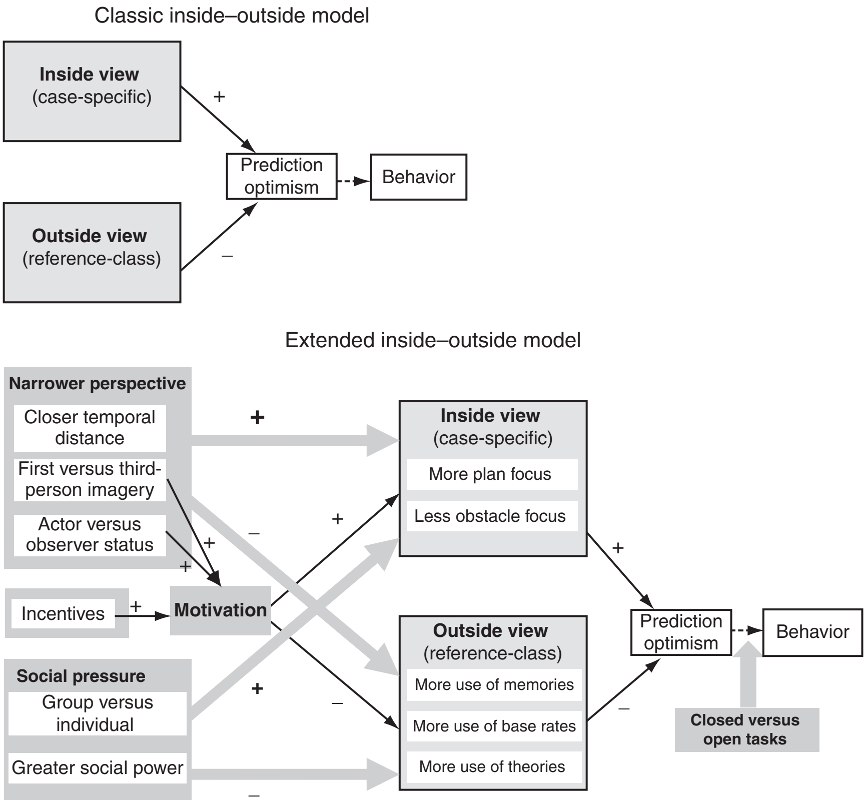

Figure 1.7 **Summary of the classic and extended inside–outside model of the planning fallacy.**

contrasting thought-listings and predictions created by forecasters assuming either realistic, worst-case, or best-case future scenarios. Notably, the content of the best-case scenarios was rated as only slightly (although significantly) more optimistic than the content for the realistic scenarios, and the number of future problems mentioned and the rated plausibility of the scenarios did not differ between realistic and best-case conditions (which both differed markedly from the worst-case scenario condition). A follow-up study revealed that when predictors constructed multiple scenarios to describe the time-course of a project, the first scenario was the most optimistic in content, contained the fewest problems, and was rated as most plausible. Furthermore, only the predicted completion time associated with the first scenario was uniquely associated with the final "best guess" prediction. Taken together, these findings imply that planning a task and estimating its completion is similar to—although not identical to—assuming the best and working from there.

According to our second hypothesis, scenarios can vary in the extent to which they are tightly focused on an optimistic future plan versus open to acknowledging the possibility of obstacles, both foreseen and unforeseeable. Following this logic, a greater than normal focus on detailed planning could exacerbate the degree of optimistic bias. In two studies examining school assignments and holiday shopping plans, we experimentally manipulated the degree of focus on plans by having some participants make detailed, step-by-step plans about a current project whereas other participants merely reported their predictions about project completions (Buehler & Griffin, 2003). In both studies, we instructed a subset of the participants, those in the "planning-focus" condition, to formulate highly specific plans for completing their target task. These participants considered and described in detail when, where, and how they would carry out the task. This enhanced focus on concrete plans produced highly optimistic predictions. In the "Christmas shopping" study, for example, participants in the planning-focus condition predicted they would complete their designated shopping list more than a week before Christmas day ($M = 7.5$ days) whereas control participants expected to finish approximately 4 days before Christmas ($M = 4.5$ days). Follow-up interviews revealed that participants in both conditions finished their designated shopping list only 3 days before Christmas. A similar pattern was obtained for the study involving school assignments. Increasing the focus on specific plans produced more optimistic forecasts because this focus, induced at the time of prediction, substantially affected predictions but did not affect actual completion times.

This pattern of effects may seem surprising in light of the apparent similarity of the planning focus manipulation to manipulations of unpacking (e.g., Kruger & Evans, 2004) and implementation intentions (e.g., Gollwitzer, 1999). First, unpacking a complete project into subcomponent tasks makes people *less* optimistic in their time predictions because the subtasks serve as specific reminders of the many steps that need to be completed, but may be neglected in an overall scenario-based project plan (Kruger & Evans, 2004). However, the effects of breaking down a task into concrete details may depend on the type of information that is highlighted. If people are induced to focus on otherwise ignored nonfocal aspects of a task, as in the unpacking manipulation, this should lead to less optimism. If, however, people are induced to focus in greater concrete detail on how they will carry out the central or higher level task components (without contemplating the otherwise ignored subcomponents of the task), then we should find greater optimism. Given that the planning focus instructions emphasized the creation of a flowing scenario for a unitary task (e.g., "...Try to provide a complete picture, from beginning to end, of how this assignment will be completed"), it probably led participants to focus on their plans for carrying out central task components, rather than to recognize previously ignored aspects of the task.

Second, there is considerable research indicating that making specific plans can have facilitating effects on behavior (e.g., Gollwitzer, 1999; Gollwitzer & Brandstätter, 1997; see also Armor & Taylor, 2003; Koole & Van't Spijker, 2000), which we do not find in these studies. Participants who share a common goal intention (e.g., a desire to maintain an exercise program or diet) are more likely to succeed if they are prompted to generate implementation intentions that specify precisely when, where, and how they will act to achieve the goal. The implementation intention is effective because it links anticipated opportunities with effective goal-directed behaviors. A key variable controlling the impact of a concrete plan on actual completion times, we suggest, is the nature of the barriers to project completion. When the barriers to completion consist primarily of internal (and therefore more controllable) factors such as forgetfulness, lack of motivation, and weakness of will, we expect the effect of plans on behavior to be substantial. However, when the barriers to completion consist primarily of external (and therefore less controllable) factors such as competing projects, unexpected problems in the task itself, or missing resources, we expect that the effect on behavior will be minimal. We believe that the kind of projects we have been studying—the completion of income tax forms, major school assignments, and long-term personal projects—may fit the latter pattern. These are long-term projects that require sustained effort over several days or weeks, and the problems that are encountered are generally not because of self-control or forgetfulness about goal completion. We will return to the question of when optimistic planning processes influence behavior in a later section.

5.2. Effects of motivation: The mediating role of focus on plans

Our emphasis on the balance of positive versus negative content in the extended inside–outside model also highlights the role of motivation in enhancing or exaggerating a narrow focus on planning for success. Directional motivation in service of the desire to finish tasks quickly may lead to a greater focus on future plans and a reduced focus on possible obstacles (e.g., problems, distractions, or other threats to completion), a form of motivated reasoning (Kunda, 1990) or desirability bias (Krizan & Windschitl, 2007). We hypothesize that as the motivated individual relies on more focused and biased plans for success, the resulting predictions should exhibit an even greater optimistic prediction bias—assuming that completion behavior is not equally influenced by the optimistic plans and associated goals. Our contention is that although it is relatively easy and straightforward to generate plans and predictions that correspond with one's current goal, it will usually be much more difficult to translate that goal into behavior. People's task completion behaviors occur long after the prediction is generated and are subject to a wide range of external factors that can intervene between prediction and completion behavior. To the extent that a task is prone to influence from these external factors, people's incentive-induced goals at the time of prediction may have little, if any, impact on actual completion time.

In an initial nonexperimental field test of the role of motivated reasoning, we surveyed Canadian taxpayers and asked them to predict when they would file their income tax forms (Buehler et al., 1997). The study took advantage of a naturally occurring variation in people's desire to finish the task promptly. Individuals expecting a tax refund have an incentive to submit the forms early (and thus receive an early refund). These motivated respondents predicted that they would send in their tax returns about 10 days earlier than nonmotivated respondents, but managed to send them in only about 3 days earlier. As a result, the optimistic prediction bias was markedly greater for the motivated respondents. Furthermore, the individuals expecting a refund appeared to give less weight to their past experiences in making their predictions: reports of past completion times were less related to predicted completion times for participants who expected a refund than for participants who did not.

This field study is consistent with the hypothesis that motivation enhances the planning fallacy through a heightened focus on future plans. However, it was a nonexperimental demonstration and subject to a host of alternative explanations; in addition, the field setting prevented a detailed measure of the hypothesized process. As a consequence, we conducted a follow-up laboratory study that was tightly controlled and provided detailed process data but was rather far removed from the defining real-world phenomena. This experiment used a word-puzzle task to replicate the incentive effect on prediction in an experimental setting and to measure the mediating cognitive mechanisms. After taking part in a practice trial, participants completed three trials with feedback (completion times ranged from 5 to 7 min) so that they had prior experiences on which to base their subsequent prediction. Some participants, those in the speed incentive condition, were then promised monetary incentives if their completion time in the next round was substantially (1 or 2 min) faster than their previous trial time. As expected, monetary incentives for speedy completion of the task led to more optimistically biased predictions, increased attention to detailed future plans, reduced attention to—and perceived relevance of—past experiences, and reduced thoughts about possible obstacles. In other words, the speed incentives appeared to elicit the double pattern of cognitive processes that constitute the planning fallacy—an exaggerated focus on singular information (plan-based scenarios) at the expense of relevant distributional information (past experiences), and an exaggerated focus on plans for success and a reduction in the consideration of competing tasks and other obstacles to successful completion. These cognitive processes also played a mediating role in the enhanced optimistic bias found in the incentive/motivated condition. This laboratory study serves as an "*in vitro*" examination of the processes underlying prediction; because the word puzzle was a short, novel task, the optimistic bias was virtually absent in the control condition, where students by and large directly reported the highly salient past experiences from moments before. However, even in this short and highly constrained laboratory setting, the presence of small financial incentives was sufficient to engage planning processes that overrode the salient past experiences.

Similar effects of incentives for speed have been observed by other researchers. Byram (1997) asked participants to estimate how long they would take to perform an origami task in the lab. Participants offered a monetary incentive for speedy completion of the task ($4 for finishing in the top quartile, $2 for finishing in the next quartile, $1 for finishing in the third quartile, and nothing for finishing in the bottom quartile) underestimated their completion times, whereas participants without a monetary incentive for speed did not exhibit the bias. Again, the incentive for speed increased bias because it had a large impact on predicted completion times but did not influence actual performance (for an economic analysis of the role of incentives in the planning fallacy, see Brunnermeier et al., 2008).

Another strategy for exploring the role of motivational processes is to solicit predictions from observers, who do not typically share the same motivations as the individuals carrying out a task. Indeed, an early study (Buehler et al., 1994, Study 5) indicated that observers are generally less attentive than actors to actors' reported plans and more attentive to potential obstacles, the actors' past experiences, and task deadlines—in other words, observers are more likely to adopt the outside view *and* to construct a more problem-focused inside view. Similarly, a more recent study found that observers gave little weight to an actor's motivation for early completion. Actors who imagined themselves completing a school project predicted they would finish it much earlier in a scenario where they were offered incentive grades for early completion; however, knowing that the student had been offered this incentive did not affect the predictions generated by observer participants (Mulhern, 2006). Thus it appears that observers are more skeptical than actors about whether incentives that operate on the actor are enough to overcome past behavioral tendencies.

However, what would happen if observers were motivated to see an actor achieve an early completion time? Conceivably, for such observers, the same motivated reasoning processes that encourage optimism in actors would operate so that they adopt an inside perspective dominated by plans for success. We have tested this possibility by offering financial incentives to observers that were contingent on a target (actor) individual's timely task completion (Buehler & Griffin, 2009). In the initial study, actor participants were given a take-home writing assignment to be completed within a

2-week deadline, predicted their completion time, and then carried out the assignment. Observers were each yoked to a participant (actor) and received the following information provided by the actor: demographic information (sex, age, academic major), the instructions the actor received for completing the assignment, the actor's report of typical assignment completion times along with the self-predicted completion time for the target assignment, and finally, the actor's scenario-based description of how he or she arrived at the prediction. We varied whether observers were offered a reward that was contingent on the actor's completion of the project. The contingent observers were informed that they would receive a bonus payment for participating in the study and that the size of the payment would depend on how soon the target actor completed the assignment (50 cents for each day before deadline the assignment was completed). (Note that these motivated observers were in no way compensated for the optimism of their predictions nor were their predictions communicated to the actors.) Neutral (control) observers were offered a standard bonus payment that was not contingent on the actor's performance. After reviewing the information, observers were instructed to estimate as accurately as possible when the target actor would finish the assignment and also rated the extent to which they had based their predictions on the actor's plans, past experiences, and potential obstacles to early completion. They were also asked to rate, specifically, the extent to which the actor's past experiences were relevant in predicting the completion time of the upcoming task.

The actor participants reported that they typically finished their assignments about a day and a half before deadlines and, consistent with this report of past behavior, finished the present assignment just prior to the 2-week deadline (mean completion time was 12.1 days). However, in another display of the planning fallacy, the actors predicted they would finish the assignment in only 8.1 days, thereby exhibiting a substantial optimistic bias. Observers in the contingent incentive condition, who were presumably motivated to believe that the actor would finish as early as possible, also tended to underestimate the completion time (mean prediction was 9.9 days) whereas neutral observers did not exhibit this bias (mean prediction was 12.0 days). Furthermore, the thought ratings indicated that the incentives affected observers' predictions, in part, because they prompted the observers to rely more heavily on the target individual's future plans and to place less weight on reports of past experiences and potential obstacles. Participants' direct ratings of the relevance of past experience also indicated that incentives for early task completion led them to diminish the relevance of past experience.

In a second study of contingent observers, we manipulated the extent to which the contingent observers saw participants' past experiences as relevant using a variant of the recall-relevance manipulation used in our original paper (Buehler et al., 1994). New observer participants were yoked to the same actor participants as in the first study and were randomly assigned to three conditions: neutral (control), contingent, and contingent plus past-relevant scenario. In the new combined condition, observers were offered the contingent incentive, but were also asked to indicate the completion time suggested by the actor's typical past experience and to generate a scenario that could lead the person to finish at that time. Again, the ultimate task was to estimate the target actor's completion time as accurately as possible. The study replicated the effect of incentive found previously, and added the novel finding that forcing observers to confront the implications of an actor's past behavior was enough to eliminate the incentive effect on the planning process—and the corresponding degree of optimistic bias.

In a third observer motivation study, we constructed a set of "prediction dossiers," each about a hypothetical actor participant (Buehler & Griffin, 2009). Four different actor profiles were constructed which differed in terms of the individual's typical task completion time relative to predictions (early vs. late) as well as the current completion estimate (early vs. late). As in the first two observer incentive studies, we manipulated whether or not observer participants were offered a monetary incentive for each day before deadline the apparently real task (an academic essay) was completed. Notably, the previously documented effects of contingent incentives on prediction were not moderated by the profile information variables. In each case, the observers who stood to gain from an early completion time predicted the actor would finish earlier than did neutral observers. In addition, thought-listings indicated that the effect of incentives was mediated by the observers' cognitive focus. Observers with an incentive predicted earlier completion times because they focused more exclusively on the actors' optimistic plans, and relatively less on the actors' previous lateness or the potential obstacles they could encounter.

Taken together, these studies provide strong and consistent evidence that directional motivation both increases the relative focus on the inside versus the outside view, and accentuates the tendency to create a positively biased inside view, as indexed by a narrow focus on plans for success and a concomitant neglect of possible obstacles and interruptions. Notable is the demonstration that even observers, who are usually less caught up in the inside perspective than actors, can be made to "see" the world like actors when they are motivated to hope for a short completion time.

5.3. Perspective(s) and the planning fallacy

Our work on motivation, described in the previous section, extends the classic model of the planning fallacy by illustrating the important role of motivation in altering the cognitive processes of prediction. The work also touches upon two other important themes that are emphasized in our extended model: first, that people who view the same future project from different vantage points (e.g., an actor vs. observer perspective) can arrive at very different conclusions, and second that even people who take an inside view can vary markedly in the kinds of scenarios they construct (e.g., the relative focus on plans vs. obstacles) and these variations within the inside view can translate into different predictions. We take up each of these themes further in this section by exploring variations in perspective or vantage point that may influence the kinds of mental scenarios that people construct.

5.3.1. First-person versus third-person imagery perspective

As people imagine themselves carrying out a future project they often generate visual imagery (Atance & O'Neill, 2001; Marks, 1999) and generally adopt one of two visual perspectives (Libby & Eibach, 2002, 2009; Pronin & Ross, 2006). People who adopt a *first-person* perspective see the project unfolding as if they were actually carrying it out. People who adopt a *third-person* perspective see the events from an observer's visual perspective; in their mental image, they see themselves as part of the field of view, embedded in their surroundings. A defining attribute of a third-person perspective is that individuals can "see themselves" acting, much like an onlooker would. At a metaphorical level at least, the two visual perspectives appear to map onto the inside and outside approaches to project prediction.

Furthermore, research on imagery perspective in a variety of domains suggests two reasons why third-person imagery may interfere with the cognitive and motivational processes that typically result in optimistic bias. First, imagery perspective may affect people's cognitive approach to prediction. Adopting a third-person perspective elicits cognitive processes that are more similar to those found in neutral observers than in actors (Frank & Gilovich, 1989; Pronin & Ross, 2006; Robinson & Swanson, 1993). Robinson and Swanson (1993) proposed that the first- and third-person perspectives activate cognitive processes typically associated with the corresponding roles of actor and observer. For example, whereas observers typically try to understand why a person is acting in a particular way, actors are actively engaged in goal pursuit and thus focus on plans for accomplishing their goals. Along similar lines, research on attribution has found that individuals prompted to recall or imagine an event from a third-person perspective make attributions that more closely resemble those typically made by observers than those made by actors (Frank & Gilovich, 1989; Pronin & Ross, 2006). Thus, people who imagine an upcoming task from the third-person perspective may be less inclined to focus on plans and more inclined to consider potential obstacles, and as a result would generate more realistic predictions.

Second, imagery perspective may alter the salience and intensity of people's emotional engagement with a target outcome. People tend to experience stronger affective involvement with an event when they generate first-person, rather than third-person, imagery (Kross et al., 2005; Lorenz & Neisser, 1985; McIsaac & Eich, 2002; Pronin & Ross, 2006; Robinson & Swanson, 1993). For example, in first-person memories, people report rich accounts of the affective reactions, physical sensations, and psychological states they experienced during the event (McIsaac & Eich, 2002; Robinson & Swanson, 1993). People who adopt a third-person perspective remain relatively dispassionate, objective, and removed. In the realm of planning and prediction, then, task-relevant feelings and motives (such as the motivation to finish a task at the desired time) may be less vivid and cognitively available to people who imagine the task from the third-person perspective, and hence this perspective may be relatively immune from the additional bias associated with motivated inference.

We recently conducted several experiments to explore the effects of people's imagery perspective as they envision an upcoming task (Buehler et al., 2010b). The first two studies tested whether differences in imagery perspective are indeed linked to the degree of bias in task completion predictions. Participants first nominated a project they intended to complete in the coming weeks, and were then instructed to visualize the project unfolding: "Try to picture in your mind how the project is likely to unfold, including details such as when, where, and how it will be done. For example, you could picture the steps you will take to complete the project. You could think of potential problems, interruptions, or distractions that may arise and how these would affect you. Make an effort to really "see" how the project is likely to unfold." In the initial study, participants then reported whether they had adopted primarily a first-person perspective (i.e., seeing the events through their own eyes, just as they would when they were actually occurring) or a third-person perspective (i.e., seeing themselves and their surroundings, just as an onlooker would). Approximately, two-thirds of participants reported adopting first-person imagery and one-third reported third-person imagery. In the next study, imagery perspective was randomly assigned: participants were instructed to adopt either the first-person or third-person perspective as they visualized the target project. Immediately after the visualization procedure, participants predicted when the project would most likely be finished and later reported their actual completion times in an e-mail survey.

Both studies yielded a very similar pattern of results. Overall, predicted completion times were significantly shorter than actual completion times, indicating that, as usual, participants tended to underestimate how long their projects would take to complete. However, the degree of optimistic bias in prediction was related to whether participants had generated third-person or first-person imagery. Participants predicted they would take significantly longer to finish their tasks when they generated third-person rather than first-person imagery. Actual completion times did not differ across conditions, however, and thus the bias was reduced by third-person imagery.

Indeed, there was no optimistic prediction bias in the participants instructed to adopt a third-person perspective.

The next study again manipulated imagery perspective and also introduced measures to assess the focus of participants' thoughts (plans vs. obstacles) as well as their motivation to complete the task promptly. The study also introduced a control condition (in which participants were not assigned to a specified perspective) to locate the effects of visual perspective more precisely. As expected, participants predicted they would take significantly longer to finish the project in the third-person than in the first-person condition. Predictions in the control condition fell in between, and did not differ significantly from those in either manipulated condition. To examine the role of cognitive focus, coders rated the extent to which participants focused on their plans for successful task completion and, separately, the extent to which they focused on potential obstacles they might encounter. Comparisons across the conditions indicated that, as expected, participants focused less on future plans, and more on potential obstacles, in the third-person than in either the first-person or control condition. Furthermore, mediational analyses indicated that the effect of perspective (third-person vs. first-person) on prediction was mediated by the focus of participants' thoughts as they generated predictions. Third-person imagery reduced the tendency to focus narrowly on plans and increased the likelihood of considering obstacles, which, in turn, yielded longer completion predictions (see Fig. 1.8).

In addition to assessing cognitive processes, we also explored the guiding role of motivation. Two items that were included to assess participants' motivation to complete the task promptly indicated that, as hypothesized, participants experienced lower levels of motivation in the third-person condition than in either the first-person or the control condition. Apparently,

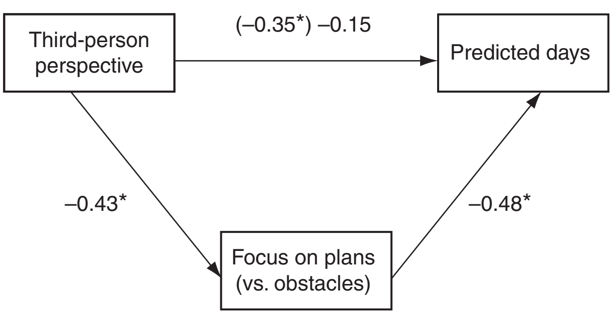

Figure 1.8 Focus on plans (vs. obstacles) as a mediator of the effects of visual perspective (third-person vs. first-person) on completion time predictions. The plan focus index was based on ratings of focus on plans minus ratings of focus on obstacles. Sobel $z = 2.98$, $^{\star}p < 0.01$ (Buehler et al., 2010b, Study 3).

third-person imagery served to dampen participants' levels of motivation at the time of prediction. Additionally, third-person imagery appeared to reduce people's tendency to base predictions on their feelings of motivation. Individuals who were feeling more motivated to complete the task quickly predicted shorter completion times within the first-person condition ($r = -.46$, $p < 0.01$) and control condition ($r = -.38$, $p < 0.05$), but not within the third-person condition ($r = -0.10$, *ns*). Similarly, regression analyses revealed a significant interaction between motivation and perspective indicating that motivation was a stronger determinant of predicted completion times in the first-person than in the third-person condition (see Fig. 1.9).

Our final study in this series provided a fully experimental test of the motivation by perspective interaction—that is, we experimentally varied both the level of motivation to finish early as well as imagery perspective. Participants imagined a project completion scenario, in which their professor had just given them a 15-page research essay due in 30 days. The scenario included a motivation manipulation: half of the participants were informed that, to encourage students to hand in the assignment promptly, the professor was offering one bonus mark for each day before the deadline the essay was submitted (high motivation condition), whereas the other

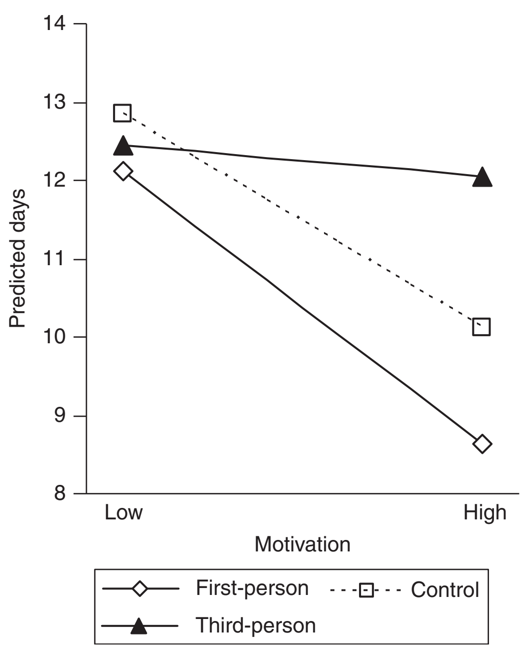

Figure 1.9 Predicted completion time for self-selected project as a function of motivation to finish task and imagery perspective (Buehler et al., 2010b, Study 3).

participants were not informed of this incentive (low motivation condition). Participants were asked to visualize, from the assigned perspective (first-person vs. third-person), the steps they would take to complete the assignment, and then to predict when the project would most likely be finished. The predicted completion times again revealed a perspective by motivation interaction. Within the first-person condition, participants predicted they would finish much earlier in the high motivation condition than in the low motivation condition. Within the third-person condition, this effect of motivation was significantly attenuated. The results thus provide further evidence that imagery perspective alters the role of motivation in prediction.

Taken together, then, the studies of visual perspective supported three guiding hypotheses about the effects of imagery perspective. First, people predicted longer completion times—and thus were less prone to bias—when they imagined an upcoming task from a third-person rather than a first-person perspective. Second, the effect of imagery perspective was mediated by people's cognitive focus on plans versus obstacles at the time of prediction. Third-person imagery reduced people's inclination to focus narrowly on optimistic plans, and increased their focus on potential obstacles. Finally, imagery perspective altered the role of task-relevant motivation in prediction. People's desire to finish an upcoming task promptly was reduced, and weighted less heavily, when they adopted a third-person rather than a first-person perspective. In essence, then, third-person imagery elicited predictions and underlying psychological processes that mimic those found previously in neutral observers (Buehler et al., 1994; Newby-Clark et al., 2000).

5.3.2. Temporal perspective

In everyday life, people must generate task completion predictions at various points in time; for example, a homeowner might try to predict the time required for a renovation project months in advance (e.g., when booking the contractors) or when the work is about to begin (e.g., when arranging temporary lodging). Academic conference organizers often deliberately invite participants far in advance when the prospect of giving a talk seems a desirable and inviting chance to share knowledge and renew old friendships. More generally, perceived temporal distance influences the level of optimism for judgments and predictions in many other domains (Liberman et al., 2007). Thus, we have begun to examine whether, and how, the temporal distance to a future project influences people's predictions of when it will be finished.

According to temporal construal theory (TCT) (Liberman & Trope, 1998; Trope & Liberman, 2003), decreasing temporal distance enhances the tendency for forecasters to focus on concrete, specific representations of an event, whereas increasing temporal distance enhances the tendency for forecasters to focus on high-level, abstract representations. For example, the same future project (e.g., completing a school assignment) in the far future will be construed at a high level of abstraction (e.g., pursuing educational goals) but in the immediate future will be construed at a low-level or concrete-level of abstraction (e.g., typing words on paper). High-level construals contain information about the central and abstract features of the event, but are schematic and decontextualized and hence do not contain incidental or peripheral details. In contrast, low-level construals contain more concrete, contextualized representations of the specific case at hand; they are rich in detail, including information about incidental or peripheral features of the event (Liberman et al., 2002).

In the realm of planning and prediction, people's thoughts about *both* the specific plans they hope to undertake and the specific obstacles they may encounter (e.g., problems with the task, competing demands for their time, changes in motivation, lack of skills or ability) may be heightened by temporal proximity. Studies on predictions in other domains have found that people become less optimistic and less confident in their predictions about an event as it draws near (e.g., Eyal et al., 2004; Gilovich et al., 1993; Savitsky et al., 1998); a plausible account for several of the findings is that potential obstacles become more salient as an event draws near. For example, Gilovich et al. (1993) found that students estimating their performance on several short experimental tasks (e.g., recalling nonsense syllables) were less confident and listed more possible reasons for failure when told they would complete the tasks immediately rather than later in the semester. Along similar lines, people appear to be more sensitive to competing demands on their time in the near future than in the distant future (Liberman & Trope, 1998; Zauberman & Lynch, 2005). These findings imply that forecasters may focus more on obstacles to task completion (e.g., problems, interruptions, competing demands) when thinking about a task that is closer in time.

Although temporal proximity heightens people's focus on potential obstacles, we postulate that it also increases the tendency to focus on specific, concrete plans for carrying out a task at a desired time. Plans are concrete in that they spell out the specific steps that will be taken to carry out the upcoming task; they require that people move beyond abstract, decontextualized representation of an event to consider features unique to the case at hand. According to this logic, temporal closeness should prime or make available concrete content of two different types, each with directly opposite implications for prediction. In the context of a specific prediction, situational factors may determine which of the two types of content is most prevalent, and thus determine the size and direction of temporal proximity effects on prediction. In circumstances where people are aware of or concerned about obstacles they might encounter, temporal proximity may accentuate these concerns, thereby resulting in less optimistic predictions.

In circumstances where people are already inclined to focus on developing plans for success, with little concern about feasibility, temporal proximity will strengthen the plan-based approach to prediction.

Our initial studies in this area (Peetz et al., 2010) find support for the general pattern expected following TCT: people generate more optimistic predictions when tasks are further in the future. For example, in an experimental study, individuals predicted when they would finish the gift shopping they planned to do for the upcoming Christmas holiday. All participants came into the lab in October and provided their shopping list. However, participants were then randomly assigned to make their predictions immediately (for predictions made 3 months in advance of Christmas day) or in a subsequent questionnaire session 6 weeks later (for predictions made only 3 weeks in advance of Christmas day). Consistent with the classic planning fallacy pattern, participants predicted they would finish their nominated shopping earlier than they had typically completed their shopping in previous years, but did not finish any earlier than in the past. Most relevant to our present questions, participants in the temporally distant condition predicted that they would finish their holiday shopping significantly earlier than those asked closer to the holiday; because the two groups did not differ in when they actually completed their shopping, the distant predictions were more optimistically biased than the close predictions. Of course this pattern could stem in part from differences in the time available to carry out the shopping; however, in studies described below we have replicated the effect of temporal proximity to a future task while controlling for the time available to carry it out.

Thought focus measures shed further light on cognitive processes underlying the effect of temporal proximity on participants' shopping predictions. Participants' open-ended thought-lists were coded for references to concrete obstacles (e.g., *I figure with being in school I won't have much time to plan or go out and buy any gifts. So I gave myself some time once I have completed all my exams to go out and buy them.*) and to concrete plans (e.g., *I will go to a couple different malls in the area to look around*). Perhaps in recognition of the challenges of the holiday season, thought-listings revealed a moderate focus on potential obstacles—indeed, there were slightly more references to obstacles than to concrete plans. Although this pattern may seem somewhat surprising, given that many previous studies have found little focus on potential obstacles, the effects of this focus on obstacles were clearly consistent with our theorizing. People mentioned potential obstacles more frequently in the close condition than in the distant condition, and a greater focus on obstacles, in turn, led people to predict later completion (see Fig. 1.10). Thus, the impact of temporal proximity on prediction was mediated, at least partially, by the degree of focus on potential obstacles.

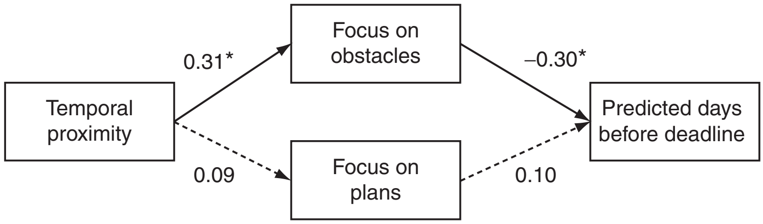

Figure 1.10 **Focus on plans and obstacles as mediators of the effects of temporal distance on completion time predictions for holiday shopping, *$p < 0.05$ (Peetz et al., 2010, Study 2).**

As developed above, the logic of temporal construal applied to our plan focus construct implies that temporal proximity should sometimes yield opposite effects. In particular, in those circumstances where people are already inclined to focus more on optimistic plans, with little concern for potential obstacles, temporal proximity should *strengthen* people's tendency to generate optimistic predictions. In order to test this reasoning, we tried to create a context where there would be minimal concern about obstacles at the time of prediction. We reasoned that for hypothetical tasks the obstacles that tend to delay task completion (interruptions, problems, competing demands) would not be salient (Armor & Sackett, 2006) and instead people would be unconstrained in constructing an optimistic scenario that depicts the task unfolding as planned. To test this reasoning, in one study we varied whether participants generated predictions for a task described as hypothetical or real. Participants were asked to imagine completing (hypothetical task) or to actually complete (real task) a take-home writing task that they would receive either the next day (close condition) or not until the next term (distant condition). In each case, the deadline was 2 weeks after receiving the task, thereby controlling for the time interval available to complete the task. Consistent with our theorizing, temporal distance had directly opposite effects on prediction depending on whether the task was hypothetical or real. For the hypothetical task, participants generated more optimistic predictions when the task was closer in time, and this effect was mediated by an increased focus on a concrete, plan-based scenario. For the real task, in contrast, participants generated less optimistic predictions when the task was closer in time, and this effect was mediated by an increased focus on potential obstacles (see Fig. 1.11). It appears that temporal proximity can increase the planner's focus on potential obstacles to task completion *or* future plans for success, but has a more pronounced impact on whichever type of cognition is focal as participants generate their predictions.

A final experiment manipulated more directly individuals' inclination to focus on plans versus obstacles. Participants were again presented with the

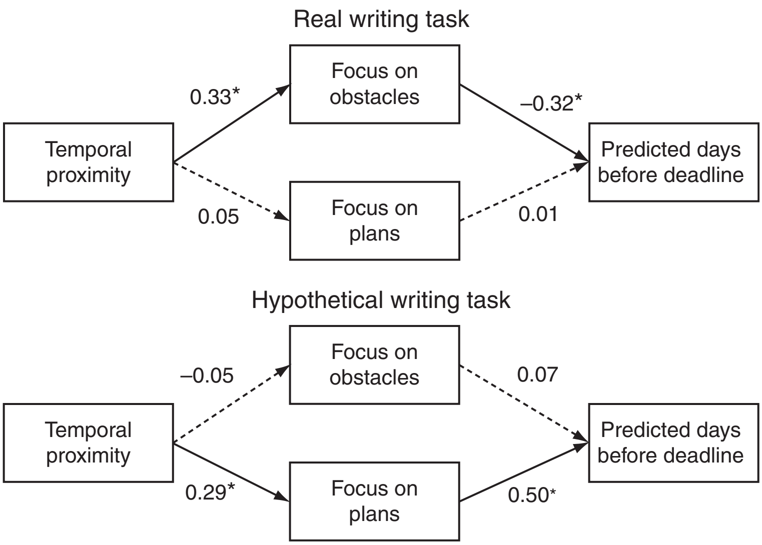

Figure 1.11 Focus on plans and obstacles as mediators of the effects of temporal distance on completion time predictions, $^{*}p < 0.05$ (Peetz et al., 2010, Study 4).

hypothetical version of the writing task and imagined they would receive it either the next day or 2 months hence. They were instructed either to focus either on a step-by-step plan for completing the task (plan focus condition) or possible problems and interruptions (obstacle focus condition) as they read the detailed task instructions. According to our theorizing, predictors should be more responsive to the manipulation of these concrete task cognitions when they are contemplating a close task (and thus engaged in concrete thinking) rather than a distant task (and thus engaged in more abstract thinking). A significant interaction effect supported this reasoning. For a task starting tomorrow, individuals predicted earlier completion times when they were induced to focus on plans rather than obstacles, whereas for a task starting in 2 months the concrete thought focus manipulation did not affect predicted completion times.

Taken together, these findings supplement previous research and theory concerning the role of temporal distance (Gilovich et al., 1993; Shepperd et al., 1996) and hypotheticality (Armor & Sackett, 2006) in other kinds of performance predictions. Previous research demonstrates that people are less likely to make optimistic predictions about their performance on an imminent test than on a distant one. Our findings indicate that, depending on the context, temporal proximity can elicit concrete thoughts about either plans or obstacles. It may be that the effects of temporal distance observed in previous studies are accounted for, in part, by contexts (e.g., considering an imminent exam) that elicit a focus on obstacles over plans—one can no longer plan to study long hours if time has run out. Our account also suggests the novel prediction that in contexts where step-by-step planning is salient and feasible, temporal proximity can increase optimism.

The present research also contributes to the expansive literature exploring implications of TCT for judgment (for reviews, see Ledgerwood et al., 2010; Liberman et al., 2007; Trope & Liberman, 2003). Our findings offer further evidence that increases in the temporal proximity of an event heighten the role of concrete information in judgments about the event. Moreover, our findings highlight the importance of distinguishing between the types of concrete thought that may be enhanced by temporal proximity, as they can have different, even *opposing*, effects on subsequent judgments. Increased attention to different types of concrete cognitions and their distinctive consequences may yield valuable insights into the effects of distance in other judgment domains as well.

A quite different approach to studying temporal perspective was taken by Sanna et al. (2005), who varied perceived distance by focusing forecasters on how a standard period of time was either short or long. Using class projects with a 3-month deadline as the target task, a negative temporal frame was created by reminding some groups of forecasters that "given the deadline....you only have 12 weeks remaining" and a positive temporal frame was created by reminding other groups of forecasters that "beginning today...you still have 12 weeks remaining." Consistent with the classic inside–outside analysis of the planning fallacy, predictions made under a positive temporal frame were essentially identical to those made in a control condition, whereas the negative temporal frame led forecasters—relative to the other two conditions—to rate the deadline as perceptually closer, to rate thoughts about success as more difficult to bring to mind, and to make later and less biased forecasts for completion time. The same pattern was replicated in a laboratory experiment using furniture assembly as the target task. Sanna et al. (2005) also manipulated the number and valence of thoughts that forecasters were required to list and found that optimistic predictions were more marked when success thoughts were experienced as easy to bring to mind (because participants were only asked to list a few) and thoughts about problems were perceived as difficult to bring to mind (because participants were asked to list many). Conversely, optimistic predictions were attenuated when success thoughts were difficult to bring to mind and thoughts about problems were easy to bring to mind. This latter demonstration indicates that under certain experimental conditions the accessibility versus frequency of positive versus negative thoughts—essentially what we have called positive future focus—can be dissociated (see Sanna & Schwarz, 2004, for a similar effect). Furthermore, under these conditions, where ease of generation and amount of content are negatively correlated, perceived ease was the driving force. How this translates into a naturalistic setting, when ease and overall valence of thoughts are positively correlated, is an interesting area for future research.

5.4. Social forces: Group processes accentuate plan focus

Consulting with and working with others is a necessary part of many activities within organizations, including forecasting (Armstrong, 1985). Even when project managers render a final prediction alone, they usually interact with others to collect information, opinions, and advice (Heath & Gonzalez, 1995). Similarly, people often consult family members or friends when predicting their personal futures (MacDonald & Ross, 1999; Shrauger et al., 1996). How does this affect the optimistic bias associated with the planning fallacy? On one hand, the group discussion process brings with it an opportunity to consult an outside-oriented perspective; on the other hand, the group discussion may bring an even greater focus on success and reduce or eliminate the influence of the outside perspective.

In one research stream, we have examined tasks performed collaboratively by groups, and predictions generated through group discussion (Buehler et al., 2005). Participants predicted—individually and collaboratively—when they would complete upcoming group projects ranging from brief laboratory tasks to extensive real-world projects, and their actual completion times were measured. The research was guided by three specific questions: Are completion forecasts for group tasks optimistically biased? Do groups generate predictions for group tasks that are more or less biased than those generated by individual group members? How does interaction and discussion influence the degree of future-focused thought and hence the degree of bias in predictions generated by—or least influenced by—group process?

There is some reason to expect that optimistic biases found for individual tasks may be reduced or eliminated for group-based tasks. An important feature of truly interactive group tasks is that people are interdependent—they must often wait for contributions of others before they can do their own part. In some ways, then, participants' viewpoints are similar to that of an observer of other people's activities, which might give rise to an outside perspective and mitigate the planning-based optimistic bias. However, membership in a collaborative group—even an ad-hoc group such as those we study—also creates important differences in perspective relative to neutral observers. Although a group member may be partially an observer (for the other members' contributions), he or she is also an active participant (for his or her own contribution) and has a stake in the task as a whole. We reasoned that the role as an active contributor and stakeholder to a project would override any tendency to think as an outside observer—and thus we hypothesized that people's predictions would be optimistically biased for group tasks.

If group predictions are optimistically biased, should we expect a smaller or larger error than for individual predictions? Such comparisons are important because a common justification for consulting with others is to increase prediction accuracy. However, relevant research in other judgmental domains has yielded inconsistent evidence about whether interaction with others improves the quality of judgment (for a review, see Kerr & Tindale, 2004). Although some studies have indicated that group discussion attenuates judgmental biases (Wright & Wells, 1985; Wright et al., 1990), several other findings suggest that groups tend to accentuate rather than attenuate judgmental biases found in individuals (Hinsz et al., 1997b; Tindale, 1993; Tindale et al., 1996). Indeed, the "group accentuation effect" noted by Tindale and colleagues affects two judgmental biases—overconfidence and base-rate neglect—that are close cousins to the planning fallacy (Argote et al., 1986, 1990; Heath & Gonzalez, 1995; Tindale, 1993). On the basis of this research, we hypothesized that group discussion will tend to heighten or accentuate the optimistic bias in people's task completion forecasts.

Our third question concerned the mechanism or process by which collaboration may result in overly optimistic forecasts. Prior theoretical work on group-mediated shifts in attitudinal judgment (Hinsz et al., 1997b; Tindale, 1993; Vinokur & Burnstein, 1974) suggests that group discussion prompts individuals to focus selectively on information that supports or accentuates the initial inclination of the individual group members. In the present judgment domain, we have argued that people's initial inclination is to focus narrowly on thoughts of successful task completion. We expected that group discussion would reinforce this tendency, prompting group members to focus even more exclusively on task-relevant information (plans for task completion, qualities of the task, qualities of the group members, qualities of the situation) which imply that the task will be completed promptly, and consequently to neglect or underweight information suggesting a task may take longer than desired.

Our first study (Buehler et al., 2005) provided an initial test of the hypothesis that forecasted completion times for group-based projects tend to be optimistically biased, using a real academic task. Undergraduate business students predicted when they would complete each of the four components of an extensive (9-week) required course project carried out in small groups, and later reported when the work was finished. The study also provided a preliminary comparison of individual and group-based predictions using a simple pretest/posttest design. Individual predictions were generated by each group member and later each group arrived at a single group-based prediction through discussion. As predicted, participants underestimated their completion times for each phase of the project, and this optimistic bias appeared both for predictions generated by individual group members, as well as predictions generated collaboratively. In addition, for each task component, the group-based prediction was more optimistic than the individual predictions. Notably, all four components were completed in the last 10 days before the project was due, on average, whereas predictions based on group discussion indicated that the first component would be complete about 6 weeks before the due date, more than a week earlier than indicated by the initial individual predictions. Similar tasks were studied by Sanna et al. (2005), who confirmed that the classic optimistic prediction bias was robust for group projects but did not compare group and individual predictions.

In two additional studies, we examined the consequences of group discussion using more tightly controlled laboratory experiments. The target tasks were a jigsaw puzzle task completed in the lab and a take-home assignment that involved finding answers to factual questions. In each case, to ensure that participants desired an early task completion, they were provided with incentives for finishing quickly. In the puzzle task study, participants were also provided with the average time taken in a separate pilot study. Group members were randomly assigned to generate task completion predictions under one of three discussion conditions: consensus, consultation, and an individual (no discussion) condition. In the *consensus condition*, groups of participants arrived at a single prediction that represented the consensus of the group. In the *consultation condition*, participants discussed their predictions with fellow group members before rendering a final prediction privately. Although we did not anticipate differences between these two conditions, we sought to determine whether effects of group discussion occurred primarily due to consultation or due to the requirement of negotiating a common group forecast. We also varied whether group members made initial private predictions prior to the discussion manipulation. Participants in all conditions were asked to list the thoughts and ideas they had considered or discussed to arrive at their predictions.

In both studies, participants in all conditions underestimated how long they would take to complete the tasks, but predictions based on group discussion were significantly more optimistic (and hence more biased) than predictions generated by individual group members, whether that comparison was made over time within participants (comparing sequential individual and group-based predictions) or across conditions (comparing individual and group discussion conditions). There were no differences between the Consultation and Consensus conditions, indicating that it was the group discussion, rather than the process of agreeing on a specific forecast, that was the key factor. Notably, for all conditions, the actual completion times on the puzzle task were very close to the normative time reported to participants before they made their forecasts (14 min and 10 s); individuals on average incorrectly expected they could shave a full minute off that time, and group discussion led to the removal of an additional minute.

The thought-listing measures allowed us to test whether the group discussion effects were mediated by the focus of participants' thoughts as they arrived at their predictions. To this purpose, the verbal protocols were coded into four main categories (future scenarios, past experiences, group qualities, and task characteristics) and in each case the thoughts in these categories could be either positive or negative (i.e., imply a relatively short or long completion time, respectively). This coding scheme differs somewhat from those we have used in previous studies. It was developed to suit group-based tasks and to allow a closer examination of the role of positive versus negative thought content.

The findings suggested that group discussion effects were mediated by the positivity of participants' thoughts as they generated their final predictions. Group discussion prompted an increased focus on several factors promoting successful task completion, and this positive future focus mediated the effects of group discussion on prediction. This mediation effect was found for an overall index of the extent to which participants focused on the positive versus negative forecasting content. However, analyses of the individual coding categories also suggested that the pattern of mediation was most pronounced and reliable (appearing across both studies) for the category involving future scenarios. Group discussion increased participants' focus on positive future scenarios (i.e., scenarios in which things go according to plan) and decreased their focus on negative future scenarios (i.e., scenarios that included possible obstacles or problems), and this pattern of thought focus resulted in more optimistic forecasts.

In sum, the studies supported our three guiding hypotheses about predictions in group contexts. We found a consistent optimistic bias in time predictions for collaborative group projects (for further evidence of this bias, see Sanna et al., 2005), we found that predictions based on group discussion were more optimistic than individual predictions, and we found that the effects of group discussion were mediated by individual group members' thought focus at the time of prediction. These findings extend the previous evidence of optimistic bias in important ways—to include target tasks carried out by groups and to include group-based predictions—and also have considerable applied value. Planners in organizational contexts often develop their forecasts in team meetings and are called upon to justify their predictions on the basis of detailed step-by-step plans. Presumably people engage in consultation and discussion because they believe it will improve the accuracy of their forecasts. According to the results of our studies, however, group discussion can actually exacerbate the tendency toward unrealistic predictions through an even greater tendency to "plan for success." These findings may be applicable to many collaborative work ventures that are similar in form to the projects examined here—that is, projects to be completed collaboratively by groups who are motivated to finish early. Under such circumstances, forecasters may be well advised to collect and aggregate individual forecasts, instead of engaging in group discussion. It may also be beneficial to consult neutral observers, who appear to be less prone to optimistic biases (e.g., Buehler et al., 1994), rather than relying solely on predictions from active contributors.

Other social factors also appear to affect the optimistic time prediction bias. One study tested the possibility that self-presentation concerns may influence people's task completion predictions (Pezzo et al., 2006b). Participants generated more optimistic predictions when they reported them verbally to an experimenter than when the experimenter was absent and predictions were anonymous. Another recent program of research suggests that people's social roles may influence how they generate task completion predictions. Weick and Guinote (2010) proposed that people who occupy positions of power in the social hierarchy—and experience the sense of power associated with that role—may be particularly prone to optimistic bias. This hypothesis is based on previous evidence that power induces goal-directed attention and a tendency to disregard information that lies outside the focal goal (Guinote, 2007a,b). Applied to the planning fallacy, then, powerful individuals should be particularly inclined to focus narrowly on planning for success and to disregard potential obstacles. Consistent with this reasoning, a series of experiments by Weick and Guinote indicated that individuals were more likely to underestimate task completion times when they were induced to experience feelings of power. Additional findings supported the hypothesis that the effect of power on prediction was mediated by attentional focus: Drawing participants' attention to relevant information outside the focal goal (i.e., relevant past completion times) eliminated the effect of power on prediction.

5.5. The behavioral impact of plans and predictions

We have described a number of extensions of the planning fallacy model, and we have demonstrated that each of these variables works through the relative balance of positive and negative content of the inside planning process; this balance, in turn, influences the optimism of predicted completions and, hence, affects the degree of bias. So far, in developing this model, we have explicitly assumed that the influences of plans on behavior are small relative to their effects on prediction. Furthermore, we have implicitly assumed that any effects of predictions on behavior are similarly small.

However, in some circumstances, the prediction—and the planning process that gave rise to it—may have wide ranging consequences on how the predictor feels, thinks, and acts; in particular, an optimistic prediction may have self-fulfilling consequences that may be quite adaptive for the predictor. This is particularly true for the personal projects that we study, which may languish uncompleted because of the forecaster's self-control problems and lack of concrete goals. This possibility is less relevant for applied projects such as software engineering or large-scale public works, where no amount of wishing, goal-setting, and motivation can make a project less complex or expensive. (It has been argued that simply adding personnel to a behind-schedule software development project may actually lead to a slower completion cycle because of training and coordination costs (Brooks, 1975, p. 25); Brook's Law states that ''Adding manpower to a late software project makes it later.'')

Within the domain of personal projects, people's predictions may sometimes influence when and how they carry out the target tasks. Imagine, for example, a student attempting to predict when she will finish an extensive project due at the end of the month. Although painfully aware that she typically finishes such projects just before the relevant deadline, she hopes and intends to complete this one well ahead of schedule and, reflecting this honest hope, estimates that she will finish a week before it is due. Could it be that the very act of generating an optimistic forecast will help her to finish the task, if not by the predicted time, at least earlier than she would have otherwise?

Such questions are not easy to answer empirically. It may be tempting to examine the association between people's predicted and actual completion times and, as noted previously, many past studies have found strong positive correlations. These correlations are at least consistent with the idea that predictions influence actual completion times: They indicate that individuals who predict to finish a task earlier (relative to other individuals in the sample) do end up finishing relatively early. However, they do not provide conclusive evidence that the earlier predictions actually *cause* earlier completion times. Such a conclusion requires an experimental manipulation of predicted completion times to examine their impact on behavior.

In our research, we have begun to explore the questions of whether, and when, task completion predictions have a behavioral impact (Buehler et al., 2010a). These questions bear some resemblance to issues addressed in research on goal-setting and task motivation, which concludes that specific, challenging goals can enhance performance in many tasks (Locke & Latham, 1990, 2002). However, generating predictions and setting goals are distinguishable acts: Whereas goals represent desired future outcomes that people strive to attain, predictions represent beliefs about what will actually transpire. Certainly people often set goals for project completion, but there are also many circumstances in which they strive to predict as accurately as possible when a project will actually be done. They may be called upon by others—such as supervisors, coworkers, or spouses—to provide a realistic estimate. They may privately seek an accurate estimate to guide their own plans and decisions. In such circumstances, it would be valuable to understand whether the forecasts people generate are likely to guide their actual completion times.

Several theoretical approaches suggest that optimistic predictions could facilitate early task completion times. An early task completion prediction might help to initiate action because: it serves as a guiding goal or standard (Locke & Latham, 1990, 2002); it operates like other performance expectancies to increase people's confidence, effort, and persistence (Bandura, 1977; Carver & Scheier, 1998; Cervone & Peake, 1986); it induces consistency motives (Festinger, 1957); it elicits concrete plans or scenarios that specify when, where, and how the task can be completed promptly (Armor & Taylor, 2003; Gollwitzer, 1999; Taylor et al., 1998); and it heightens the accessibility of the person's attitudes and intentions toward the behavior (Morwitz & Fitzsimons, 2004; Sherman, 1980). However, despite these potential mechanisms, research summarized here suggests that predictions themselves often have little or no influence on completion times.

A challenge, then, is to reconcile two apparently contradictory findings: first, that expressed predictions can affect subsequent behavior (e.g., Morwitz & Fitzsimons, 2004; Sherman, 1980), and second, that manipulations that indirectly affect the optimism of predicted task completion times have typically failed to show measurable behavioral effects. We propose that task completion predictions are more "translatable" (Koehler & Poon, 2006) into the one-time action of starting a project than into the continuing actions necessary to complete a project. This assumption has clear implications for identifying the type of tasks for which optimistic predictions will have beneficial effects. In particular, tasks that can be completed in a single, continuous session (e.g., reading a magazine article, writing a thank-you note, changing a lightbulb), and thus are not usually prone to interruptions and delays once they have been started, are the type of tasks where we expect an effect of predictions on completion times. We term these "closed tasks" because once initiated, these tasks are relatively insulated from outside disruption. In contrast, "open tasks" require multiple steps to be completed at different times or locations. These are the kinds of tasks that typically require several work sessions to finish (e.g., reading a textbook, writing a manuscript, completing a home renovation) and thus are relatively prone to interruptions and delays even after they have been started; hence, for these tasks, differential plans, intentions, and starting times may not influence the ultimate completion times.

Consider, for example, a homeowner who wants to hang a newly acquired painting in the hallway, a task that requires purchasing hooks, fastening them to the wall, and hanging the artwork. There are only a few easy steps (i.e., the task is quite simple) and the actual working time should be less than an hour (i.e., the task is brief in duration), yet this is an open task because the steps are spread out across multiple times and places, making it prone to external interruptions. Even after starting the task, the individual could be easily sidetracked, and days or weeks might pass before the painting is on display.

Our reasoning, then, is that a task completion prediction will exert its greatest impact on the early stages of task completion, but this impact will diminish as delaying factors are encountered. Consequently, the effects of predictions on task completion times will differ for closed and open tasks. For a closed task, an early start time should be sufficient to influence final completion times because there is little opportunity for delay once the task has been started. For an open task, however, an early start is much less likely to translate into an early completion time because there is great potential for delaying factors to intervene between starting and finishing the task.

As one test of our theoretical framework, we performed a quantitative review of studies that have examined the impact of various factors on predicted and actual completion times (Buehler et al., 2010a). Recall that this research has often found that factors affecting prediction do not have a corresponding effect on behavior. But according to our reasoning, the extent to which this pattern is obtained should depend on whether the tasks are open or closed. Thus, we identified studies in which researchers manipulated a factor to influence predicted completion times and reported means for both predicted and actual completion times. Two research assistants independently coded the target tasks as being either relatively closed (e.g., a 1-h computer tutorial, a short writing assignment) or relatively open (e.g., major school projects, income tax returns). We then examined the effect of each manipulation (i.e., the mean difference across conditions) on predicted and actual completion times and created a behavioral effect index by dividing the effect on behavior (i.e., the mean difference between conditions in actual completion time) by the effect on prediction (i.e., the mean difference between conditions in predicted completion time). This index represents the extent to which an effect on prediction was accompanied by a corresponding effect on behavior, where a score of 0 indicates a complete lack of a behavioral effect, and a score of 1 indicates that the effect of the manipulation on behavior was equal to its effect on prediction, and a score greater than 1 indicates that the effect of the manipulation on behavior was greater than its effect on prediction. The behavioral effect index scores were significantly higher for closed tasks than for open tasks (Ms $= 0.76$ vs. 0.31), $t(12) = 2.60$, $p = 0.02$, indicating that differences in prediction were more likely to carry through to behavior for closed tasks than for open tasks.

To supplement the findings of this systematic review, we also supervised a study designed to assess the impact of prediction on completion behavior (Deslauriers, 2002). In this study, some participants were instructed to think about (and describe) the specific details of when, where, and how they would complete the target assignment (plan focus condition), and others were not given this instruction (control condition). The extent to which the target task was open or closed was also manipulated, providing a test of whether differences in prediction induced by a plan focus would carry through to affect the actual completion times of open and closed tasks. All student participants were given a take-home assignment that consisted of writing three short essays (500 words each) and submitting the essays by e-mail as soon as they were completed. To manipulate the extent to which this writing assignment constituted a closed or open task, participants were told either that they could complete all three of their essays in one sitting, as long as they submitted each one individually (closed task condition) or that they were required to let 1 day elapse between writing and submitting one essay and starting to compose the next one (open task condition). Thus, although the actual work required for the assignment was identical in each condition, the latter version of the assignment constituted an open task because the steps of the assignment needed to be completed across multiple work sessions and, consequently, would be relatively prone to interruptions and delays caused by factors external to the task itself.

An examination of predicted and actual completion times for the assignment revealed a pattern of effects that was consistent with our theorizing. Although all participants tended to underestimate their task completion times, the degree of bias differed markedly across conditions. For the open version of the task, focusing on plans increased the optimistic bias: Participants predicted to finish the task in fewer days when they were induced to focus on plans than when they were not (*M*s = 7.4 vs. 8.9 days) but their actual completion times did not differ (*M*s = 10.4 vs. 10.3 days), and thus underestimation was greater in the plan focus than in the control condition (*M*s = 3.0 vs. 1.4 days). In other words, the effect of plan focus instructions did not carry through from prediction to affect actual completion times. However, a very different pattern was seen for participants assigned to the closed version of the task. Participants again predicted to finish in less time in the plan focus condition than in the control condition (*M*s = 5.8 vs. 7.7 days); however, the actual completion times were also shorter in the plan focus than in the control condition (*M*s = 7.9 vs. 10.2 days), and thus the bias was similar across the two conditions (*M*s = 2.1 vs. 2.5 days).

Although the pattern of effects observed in this study is generally consistent with our reasoning about the moderating role of open versus closed tasks, note that the studies so far did not manipulate predictions directly, and thus it is plausible that the plan manipulation influenced both predicted and actual completion times, without a causal role of prediction on behavior. To assign a causal role to prediction, it is desirable to manipulate predictions as directly as possible. Thus in a series of experiments (Buehler et al., 2010a), we used anchoring procedures to manipulate participants' task completion predictions more directly and then examined their actual completion times on a variety of open and closed tasks. The specific anchoring manipulations varied across studies, from drawing a card to sliding a pointer along a numbered time line, but each one provided participants with an ostensibly "random" starting point that was either early or late. Participants were then asked to adjust from this starting point to arrive at their predictions for a particular project. In each study, the anchoring manipulation yielded a strong effect on predictions, allowing us to investigate whether the completion times would follow predictions. The type of task (open vs. closed) was varied across studies as well as experimentally manipulated within a study. We tested three central hypotheses derived from our theorizing: first, that a manipulation of task completion predictions can influence actual completion times; second, that manipulating predictions will result in stronger behavioral effects on completion times for closed tasks than for open tasks; third, that even for open tasks manipulating predictions will result in behavioral effects on *start* times.

The results were consistent with each of these hypotheses. First, at least for tasks that were closed (e.g., a computer tutorial assignment, a simple writing assignment), we found that manipulated differences in prediction carried on to affect actual completion times. For example, for the computer tutorial assignment (which could be completed easily in one session), participants exposed to the early anchor forecasted that they would finish 5 days earlier than those exposed to the late anchor, and actually did finish about 5 days earlier (although both groups showed a substantial optimistic bias). Second, we found that predictions had a greater impact on the actual completion times of closed tasks than of open tasks: indeed, for each of the open tasks that we examined (e.g., major school projects, income tax returns), completion times were not affected significantly by the prediction manipulation. Third, even though predictions did not influence completion times for open tasks, the predictions did influence when these tasks were started. On the tax return task, for example (see Fig. 1.12), participants exposed to the early anchor predicted that they would send in their returns almost 20 days earlier than those exposed to the late anchor, and actually started the task some 18 days earlier, but eventually completed the task only 5 days earlier (a nonsignificant difference between conditions). These findings are consistent with the theory that completion predictions have their greatest impact on the beginning phases of a project, particularly the initiation time, and that this effect diminishes over the course of an extensive, multistage project.

The results of these studies not only support our theoretical framework but also have practical implications. They begin to address the complex questions of whether, or when, it may be adaptive to predict an early task completion time. People hoping to finish a task early may be well advised to predict an early completion time if the task is relatively closed, because the predictions appear to facilitate early completion times without increasing proneness to underestimation (and any associated costs). When the task is relatively open, people may be advised to make more conservative forecasts, especially if there are serious costs associated with underestimation, because

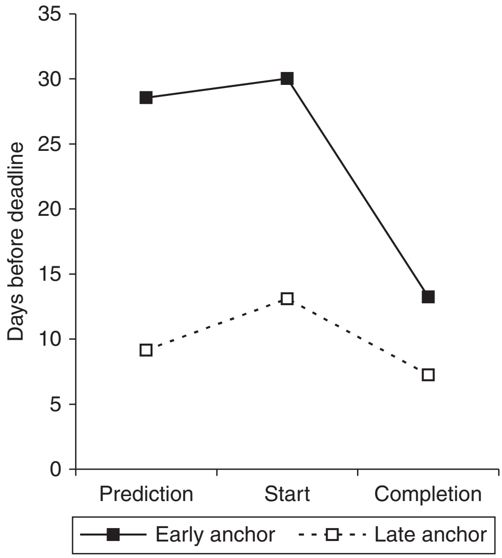

Figure 1.12 Predicted completion time, actual start time, and actual completion time for income tax forms as a function of anchor condition (Buehler et al., 2010a, Study 4).

the predictions appear to have little benefit for actual completion times but have clear potential to exacerbate bias. When an earlier starting time has value in itself, then optimistic forecasts may be valuable regardless of the nature of the task. The findings also provide guidance for inducing desired task completion times in others, at least when tasks are relatively closed. Techniques used in the early anchor condition of our studies could be adapted for use in a range of applied settings where practitioners (e.g., teachers, managers, coworkers) wish to encourage others to complete tasks well before a final deadline. A potential benefit of the early anchor, relative to simply imposing a goal on others, is that it may be less likely to jeopardize the individual's commitment to finish at the desired time (Hinsz et al., 1997a).

We believe that to fully understand the pattern of moderation, it is necessary to consider the role of deadlines in guiding task completion behavior. Note that each of our target tasks had a firm deadline for completion, and previous research has shown that such deadlines exert a powerful impact on when people actually finish their tasks—even when people hope to finish well in advance of a deadline, their actual time ends up being driven largely by deadlines (Ariely & Wertenbroch, 2002; Buehler et al., 1994). We suspect that for open tasks, the salience of an early prediction (and perhaps the task itself) may fade until a looming deadline pulls it back into focus. That is, people's final task completion times may be a function of two psychological forces—people's plans to finish early and their deadlines. Optimistic plans to finish early may get tasks started, but then the effects of external factors take over and it is the force of deadlines that controls actual completion times.

5.6. Implications for debiasing

Although we have focused on exploring the scope and origins of the planning fallacy, the extended model also has important practical implications, particularly for those seeking to ''debias'' task completion predictions (for previous reviews of debiasing, see Buehler et al., 2002; Roy et al., 2005). Below we briefly highlight implications of the model, and the empirical research supporting it, for reducing people's tendency to repeatedly underestimate task completion times.

A central implication of both the classic and extended inside–outside model is that people can reduce optimistic bias by adopting an outside view, wherein they use past distributions as the basis for prediction rather than relying on goal-based plans and scenarios for the future. A direct application is seen in Reference Class Forecasting, an approach to forecasting described by Kahneman and Tversky (1979), named by Lovallo and Kahneman (2003), and tested in the realm of major infrastructure projects (Flyvbjerg, 2008; Flyvbjerg et al., 2009). Reference class forecasting sidesteps the problems associated with an inside view, as well as people's disinclination to base predictions on past experience, by *requiring* forecasters to base their predictions on the outcomes of a distribution of comparable projects. The empirical tests of this approach support its effectiveness in reducing time and cost overruns in large-scale construction projects. Similarly, on a smaller scale, our research on individual projects showed that an intervention designed to induce individuals to base predictions on past experience (by highlighting the relevance of their typical completion times to the target project) yielded unbiased predictions (Buehler et al., 1994). Of course forecasts based on past experience may still be overly optimistic to the extent that people believe previous tasks took less time than they actually did (Roy et al., 2005, 2008). However, given that individuals often hold relatively pessimistic views of their own previous completion times, we believe interventions that induce people to base predictions on past experience (such as reference class forecasting) could often help to debias prediction.

What about those instances where forecasters do adopt an inside approach to prediction? According to our extended model, their predictions will still vary greatly depending on factors that determine the extent to which they focus on goal-based plans or on obstacles, and thus we believe each factor identified in the model could be applied strategically to reduce or eliminate prediction bias. The findings of actor–observer differences imply that prediction bias could be reduced by consulting neutral outside observers. Such observers should be less likely than the project stakeholders to focus narrowly on goal-based plans and more likely to account for potential obstacles to task completion (Buehler et al., 1994; Mulhern, 2006; Newby-Clark et al., 2000). Our research on imagery perspective implies that similar benefits might accrue from adopting a third-person perspective when imagining a future task (Buehler et al., 2010b). The guided imagery procedure used in these studies could be readily adapted for use as an intervention in applied contexts, with a number of advantages over other debiasing strategies. For example, unlike strategies that rely on previous experience, it does not require that individuals have accurate knowledge about relevant previous tasks, and unlike strategies that alter the kinds of information people consider, the imagery perspective intervention is not content-specific, and thus could be applied generically to a wide range of target tasks and contexts.

Our research on temporal perspective tells a somewhat complex story but, again, highlights the importance of attending to potential obstacles while generating predictions (Peetz et al., 2010). In one study, for instance, a manipulation that induced people to focus on obstacles, rather than goal-based plans, led them to predict later completion times, particularly for projects in the distant future. This suggests that interventions that focus people's attention, directly and explicitly, on potential obstacles may help them to generate realistic predictions for future tasks. Our extended model also highlights the role of motivational and social processes in the planning fallacy, suggesting that people may be able to generate more realistic forecasts in contexts that minimize their motivation to finish early, or at least the salience of such motives, at the time they are generating predictions, and also in contexts that reduce social pressures that might encourage optimistic predictions (Buehler et al., 2005; Pezzo et al., 2006b).

Another debiasing strategy that relies on the content of the inside-focused scenario involves the "unpacking" or "segmentation" of a target task into smaller units (e.g., Connolly & Dean, 1997; Forsyth & Burt, 2008; Kruger & Evans, 2004). As noted previously, unpacking a whole project into subcomponents is likely to result in less optimistic predictions when the subtasks serve as reminders of steps that need to be completed, but would have otherwise been neglected in a scenario-based project plan (Kruger & Evans, 2004). In some respects, then, the recognition of additional steps to task completion is very similar to the recognition of obstacles that may delay task completion, and consistent with evidence that focusing on such cognitions can attenuate the planning fallacy.

Finally, as our research on the behavioral impact of predictions illustrated, the degree of bias in prediction is not determined solely by processes occurring at prediction, but also depends greatly on what transpires after a prediction has been generated. Thus one way to increase the accuracy of prediction is to bring people's behavior in line with the predictions they have generated. For example, given that people's focus on their goals and plans (salient at the time of prediction) may diminish across time, one remedy would be to enhance the salience of goal-directed plans throughout the entire project period. In a relevant test of this idea (Taylor et al., 1998), students were trained to imagine themselves performing each of the steps needed to complete a school-related project by their predicted completion time. Participants rehearsed these simulations each day of the week during which they carried out the project. The exercise increased the proportion of students who finished by the predicted time from 14% (in a control condition) to 41%. Along similar lines, Koole and Van't Spijker (2000) found that students were more likely to finish a brief writing task by the expected time if they were instructed to form "implementation intentions" (Gollwitzer, 1999; Gollwitzer & Brandstätter, 1997) that specified the exact time and place they would do the task. These findings suggest that one way to reduce prediction bias is to target the behaviors that occur after prediction. Our recent research suggests that such behavior-based approaches may vary in effectiveness depending on the nature of the task, and particularly the extent to which it is prone to unexpected interruptions, problems, and delays (Buehler et al., 2010a).

6. Concluding Perspectives

The planning fallacy is a phenomenon rooted in daily life and daily experience, rich enough to keep our research group busy for the best part of two decades. Although this chapter explored the planning fallacy in the domain of task completion predictions, we have also documented similar patterns and psychological processes in people's tendency to overpredict the longevity of their romantic relationships (Buehler et al., 1995; see also MacDonald & Ross, 1999) and to overestimate the intensity of their emotional reactions to upcoming events (Buehler & McFarland, 2001). In each case, we find that people's natural inclination to take the inside approach to prediction, and to overlook or dismiss the outside approach, leaves them prone to bias. A recent program of research extends our work on the planning fallacy into the realm of personal financial behavior (Peetz & Buehler, 2009). In this domain we again find that a similar phenomenon—a "budget fallacy"—exists for personal spending predictions. Individuals tend to underestimate their future spending, predicting that they will spend less money in the upcoming week than they actually spend, and also predicting that they will spend less than they remember spending in previous weeks. This budget fallacy appears to stem, at least in part, from financial goals at the time of prediction. Individuals who experienced a stronger desire to minimize future spending predicted they would be able to reduce their future spending. However, these goals were not related to subsequent spending levels, and thus contributed to the prediction bias.

A phenomenon-based approach to research invites the use of multiple theoretical approaches, and innovation comes not only through traditional theory-building but also through theoretical integration and application, as we demonstrated in our extensions to Kahneman and Tversky's classic model of the planning fallacy. To understand how people maintain hope for the future while making sense of the past has required us to integrate a number of social psychological theories with the inside–outside model of prediction first proposed by Kahneman and Tversky 40 years ago. Our extended inside–outside model adds explanatory principles from theories of motivated reasoning, attribution, visual perspective, temporal construal, group deliberation, goal-setting, and affective forecasting to the classic model. The resulting extended model preserves the essential focus on singular versus distributional reasoning while elaborating on the social contexts and settings that control not only the relative weight of singular versus distributional information, but also the content of the singular scenario and its translation into prediction and action. The resulting "inside story" of the planning fallacy is not simple, but it is coherent and comprehensive. As a result, this integrated extended account provides many entry points for intervention and control, both for use in applied settings and for individuals hoping to improve their daily planning and prediction.

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REFERENCES

Adams, D., & Carwardine, M. (1991). *Last chance to see*. New York, NY: Harmony Books.

Argote, L., Seabright, M. A., & Dyer, L. (1986). Individual versus group use of base-rate and individuating information. *Organizational Behavior and Human Decision Processes*, *38*, 65–75.

Argote, L., Devadas, R., & Melone, N. (1990). The base-rate fallacy: Contrasting processes and outcomes of group and individual judgment. *Organizational Behavior and Human Decision Processes*, *46*, 296–310.

Ariely, D., & Wertenbroch, K. (2002). Procrastination, deadlines, and performance: Self-control by precommitment. *Psychological Science*, *13*, 219–224.

Arkes, H. R., Faust, D., Guilmette, T. J., & Hart, K. (1988). Eliminating the hindsight bias. *Journal of Applied Psychology*, *73*, 305–307.

Armor, D. A., & Sackett, A. M. (2006). Accuracy, error, and bias in predictions for real versus hypothetical events. *Journal of Personality and Social Psychology*, *91*, 583–600.

Armor, D. A., & Taylor, S. E. (2003). The effects of mindset on behavior: Self-regulation in deliberative and implemental frames of mind. *Personality and Social Psychology Bulletin*, *29*, 86–95.

Armstrong, J. S. (1985). *Long-range forecasting: From crystal ball to computer*. New York: Wiley.

Atance, C. M., & O'Neill, D. K. (2001). Episodic future thinking. *Trends in Cognitive Sciences*, *12*, 533–539.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, *84*, 191–215.

Brooks, F. P. Jr. (1975). *The mythical man-month: Essays on software engineering*. Reading, MA: Addison-Wesley.

Brunnermeier, M. K., Papakonstantinou, F., & Parker, J. A. (2008). *An economic model of the planning fallacy*. Unpublished manuscript, Princeton University.

Buehler, R., & Griffin, D. (2003). Planning, personality, and prediction: The role of future focus in optimistic time predictions. *Organizational Behavior and Human Decision Processes*, *92*, 80–90.

Buehler, R., & Griffin, D. (2009). *Motivated prediction in observers*. Unpublished data.

Buehler, R., & McFarland, C. (2001). Intensity bias in affective forecasting: The role of temporal focus. *Personality and Social Psychology Bulletin*, *27*, 1480–1493.

Buehler, R., Griffin, D., & MacDonald, H. (1997). The role of motivated reasoning in optimistic time predictions. *Personality and Social Psychology Bulletin*, *23*, 238–247.

Buehler, R., Griffin, D., & Ross, M. (1994). Exploring the ''planning fallacy'': Why people underestimate their task completion times. *Journal of Personality and Social Psychology*, *67*, 366–381.

Buehler, R., Griffin, D., & Ross, M. (1995). It's about time: Optimistic predictions in work and love. In W. Stroebe & M. Hewstone (Eds.), European review of social psychology (Vol. 6, pp. 1–32). Chichester: Wiley.

Buehler, R., Griffin, D., & Ross, M. (2002). Inside the planning fallacy: The causes and consequences of optimistic time predictions. In T. Gilovich, D. Griffin, & D. Kahneman (Eds.), *Heuristics and biases: The psychology of intuitive judgment* (pp. 250–270). Cambridge: Cambridge University Press.

Buehler, R., Messervey, D., & Griffin, D. (2005). Collaborative planning and prediction: Does group discussion affect optimistic biases in time estimation? *Organizational Behavior and Human Decision Processes*, *97*, 47–63.

Buehler, R., Otsubo, Y., Heine, S., Lehman, D., & Griffin, D. (2003). *Culture and optimism: The planning fallacy in Japan and North America*. Unpublished manuscript.

Buehler, R., Peetz, J., & Griffin, D. (2010a). Finishing on time: When do predictions influence actual completion times? *Organizational Behaviour and Human Decision Processes*, *111*, 23–32.

Buehler, R., Griffin, D., Lam, K. C. H., & Deslaurier, J. (2010b). *Perspectives on prediction: Does third-person imagery improve task completion estimates?* Manuscript submitted for publication.

Burt, C. D. B., & Kemp, S. (1994). Construction of activity duration and time management potential. *Applied Cognitive Psychology*, *8*, 155–168.

Byram, S. J. (1997). Cognitive and motivational factors influencing time predictions. *Journal of Experimental Psychology: Applied*, *3*, 216–239.

Carver, C. S., & Scheier, M. F. (1998). *On the self-regulation of behavior*. New York: Cambridge University Press.

Cervone, D., & Peake, P. K. (1986). Anchoring, efficacy, and action: The influence of judgmental heuristics on self-efficacy judgments and behavior. *Journal of Personality and Social Psychology*, *50*, 492–501.

Connolly, T., & Dean, D. (1997). Decomposed versus holistic estimates of effort required for software writing tasks. *Management Science*, *43*, 1029–1045.

Dawes, R. M. (1988). *Rational choice in an uncertain world*. New York: Harcourt Brace Jovanovich.

Deslauriers, J. (2002). *Should we plan for upcoming tasks? Effects of planning on prediction accuracy for simple and difficult assignments*. Honors Thesis, Wilfrid Laurier University.

Dougherty, M. R. P., Gettys, C. F., & Thomas, R. P. (1997). The role of mental simulation in judgments of likelihood. *Organizational Behavior and Human Decision Processes*, *70*, 135–148.

Dunning, D. (2007). Prediction: The inside view. In A. W. Kruglanski & E. T. Higgins (Eds.), *Social psychology: Handbook of basic principles* (2nd ed. pp. 69–90). New York: Guilford Press.

Engerman, S. L., & Sokoloff, K. L. (2004). *Digging the dirt at public expense: Governance in the building of the Erie Canal and other public works*. NBER Working Paper No. w10965.

Eyal, T., Liberman, N., Trope, Y., & Walther, E. (2004). The pros and cons of temporally near and distant action. *Journal of Personality and Social Psychology*, *86*, 781–795.

Festinger, L. (1957). *A theory of cognitive dissonance*. Stanford: Stanford University Press.

Fischhoff, B., Slovic, P., & Lichtenstein, S. (1978). Fault trees: Sensitivity of estimated failure probabilities to problem representation. *Journal of Experimental Psychology: Human Perception and Performance*, *4*, 33–344.

Flyvbjerg, B. (2008). Curbing optimism bias and strategic misrepresentation in planning: Reference class forecasting in practice. *European Planning Studies*, *16*, 3–21.

Flyvbjerg, B., Bruzelius, N., & Rothengatter, W. (2003). *Megaprojects and risk: An anatomy of ambition*. United Kingdom: Cambridge University Press.

Flyvbjerg, B., Garbuio, M., & Lovallo, D. (2009). Delusion and deception in large infrastructure projects: Two models for explaining and preventing executive disaster. *California Management Review*, *51*, 170–193.

Flyvbjerg, B., Holm, M. K. S., & Buhl, S. L. (2004). What causes cost overrun in transport infrastructure projects? *Transport Reviews*, *24*, 3–18.

Flyvbjerg, B., Holm, M. K. S., & Buhl, S. L. (2005). How (in)accurate are demand forecasts in public works projects? *Journal of the American Planning Association*, *71*, 131–146.

Forsyth, D. K., & Burt, C. D. B. (2008). Allocating time to future tasks: The effect of task segmentation on planning fallacy bias. *Memory and Cognition*, *36*, 791–798.

Francis-Smythe, J. A., & Robertson, I. T. (1999). On the relationship between time management and time estimation. *British Journal of Psychology*, *90*, 333–347.

Frank, M. G., & Gilovich, T. (1989). The effect of memory perspective on retrospective causal attributions. *Journal of Personality and Social Personality*, *57*, 399–403.

Gilbert, D. T., & Malone, P. S. (1995). The correspondence bias. *Psychological Bulletin*, *117*, 21–38.

Gilovich, T., Kerr, M., & Medvec, M. H. (1993). Effect of temporal perspective on subjective confidence. *Journal of Personality and Social Psychology*, *64*, 552–560.

Gollwitzer, P. M. (1999). Implementation intentions: Strong effects of simple plans. *American Psychologist*, *54*, 493–503.

Gollwitzer, P. M., & Brandstätter, V. (1997). Implementation intentions and effective goal pursuit. *Journal of Personality and Social Psychology*, *73*, 186–199.

Gregory, W. L., & Duran, A. (2001). Scenarios and acceptance of forecasts. In J. S. Armstrong (Ed.), *Principles of forecasting: A handbook for researchers and practitioners* (pp. 519–540). Boston: Kluwer Academic Publishers.

Griffin, D., & Brenner, L. (2004). Perspectives on probability judgment calibration. In D. Koehler & N. Harvey (Eds.), *Blackwell Handbook of Judgment and Decision Making* (pp. 177–199). Malden: Blackwell Publishing.

Griffin, D., & Buehler, R. (1999). Frequency, probability, and prediction: Easy solutions to cognitive illusions? *Cognitive Psychology*, *38*, 48–78.

Griffin, D., & Buehler, R. (2005). Biases and fallacies, memories and predictions: Comment on Roy, Christenfeld, and Mckenzie (2005). *Psychological Bulletin*, *131*, 757–760.
Griffin, D., Dunning, D., & Ross, L. (1990). The role of construal processes in overconfident predictions about the self and others. *Journal of Personality and Social Psychology*, *59*, 1128–1139.
Guinote, A. (2007a). Power and goal pursuit. *Personality and Social Psychology Bulletin*, *33*, 1076–1087.
Guinote, A. (2007b). Power affects basic cognition: Increased attentional inhibition and flexibility. *Journal of Experimental Social Psychology*, *43*, 685–697.
Heath, C., & Gonzalez, R. (1995). Interaction with others increases decision confidence but not decision quality: Evidence against information collection views of interactive decision making. *Organizational Behavior and Human Decision Processes*, *61*, 305–326.
Heine, S. J., Kitayama, S., & Lehman, D. R. (2001). Cultural differences in self-evaluation: Japanese readily accept negative self-relevant information. *Journal of Cross-Cultural Psychology*, *32*, 434–443.
Heine, S. J., Takata, T., & Lehman, D. R. (2000). Beyond self-presentation: Evidence for self-criticism among Japanese. *Personality and Social Psychology Bulletin*, *26*, 71–78.
Hinds, P. J. (1999). The curse of expertise: The effects of expertise and debiasing methods on predictions of novice performance. *Journal of Experimental Psychology: Applied*, *5*, 205–221.
Hinsz, V. B., Kalnbach, L. R., & Lorentz, N. R. (1997a). Using judgmental anchors to establish challenging self-set goals without jeopardizing commitment. *Organizational Behavior and Human Decision Processes*, *71*, 287–308.
Hinsz, V. B., Tindale, R. S., & Vollrath, D. A. (1997b). The emerging conceptualization of groups as information processors. *Psychological Bulletin*, *121*, 43–64.
Hoch, S. J. (1985). Counterfactual reasoning and accuracy in predicting personal events. *Journal of Experimental Psychology. Learning, Memory, and Cognition*, *11*, 719–731.
Josephs, R. A., & Hahn, E. D. (1995). Bias and accuracy in estimates of task duration. *Organizational Behaviour and Human Decision Processes*, *61*, 202–215.
Kahneman, D., & Lovallo, D. (1993). Timid choices and bold forecasts: A cognitive perspective on risk taking. *Management Science*, *39*, 17–31.
Kahneman, D., & Tversky, A. (1979). Intuitive prediction: Biases and corrective procedures. *TIMS Studies in Management Science*, *12*, 313–327.
Kahneman, D., & Tversky, A. (1982a). Intuitive prediction: Biases and corrective procedures. In D. Kahneman, P. Slovic, & A. Tversky (Eds.), *Judgment under uncertainty: Heuristics and biases* (pp. 414–421). Cambridge: Cambridge University Press.
Kahneman, D., & Tversky, A. (1982b). Variants of uncertainty. *Cognition*, *11*, 143–157.
Kahneman, D., & Tversky, A. (1982c). The simulation heuristic. In D. Kahneman, P. Slovic, & A. Tversky (Eds.), *Judgment under uncertainty: Heuristics and biases* (pp. 201–210). Cambridge: Cambridge University Press.
Kerr, N. L., & Tindale, R. S. (2004). Group performance and decision making. *Annual Review of Psychology*, *55*, 623–655.
Koehler, D. (1991). Explanation, imagination, and confidence in judgment. *Psychological Bulletin*, *110*, 499–519.
Koehler, D., & Poon, C. S. K. (2006). Self-predictions overweight strength of current intentions. *Journal of Experimental Social Psychology*, *42*, 517–524.
König, C. J. (2005). Anchors distort estimates of expected duration. *Psychological Reports*, *96*, 253–256.
Koole, S., & Van't Spijker, M. (2000). Overcoming the planning fallacy through willpower: Effects of implementation intentions on actual and predicted task-completion times. *European Journal of Social Psychology*, *30*, 873–888.

Krizan, Z., & Windschitl, P. D. (2007). The influence of outcome desirability on optimism. *Psychological Bulletin*, *133*, 95–121.

Kross, E., Ayduk, O., & Mischel, W. (2005). When asking "why" doesn't hurt: Distinguishing rumination from reflective processing of negative emotions. *Psychological Science*, *16*, 709–715.

Kruger, J., & Evans, M. (2004). If you don't want to be late, enumerate: Unpacking reduces the planning fallacy. *Journal of Experimental Social Psychology*, *40*, 586–598.

Kunda, Z. (1990). The case for motivated reasoning. *Psychological Bulletin*, *108*, 480–498.

Ledgerwood, A., Trope, Y., & Liberman, N. (2010). Flexibility and consistency in evaluative responding: The function of construal level. In M. P. Zanna & J. M. Olson (Eds.), *Advances in Experimental Social Psychology*. Maryland Heights, MO: Elsevier.

Libby, L. K., & Eibach, R. P. (2002). Looking back in time: Self-concept change and visual perspective in autobiographical memory. *Journal of Personality and Social Psychology*, *82*, 167–179.

Libby, L. K., & Eibach, R. P. (2009). Seeing the links among the personal past, present, and future: How imagery perspective in mental simulation functions in defining the temporally extended self. In K. D. Markman, W. M. P. Klein, & J. A. Suhr (Eds.), *Handbook of imagination and mental simulation* (pp. 359–372). New York: Psychology Press.

Liberman, N., & Trope, Y. (1998). The role of feasibility and desirability considerations in near and distant future decisions: A test of temporal construal theory. *Journal of Personality and Social Psychology*, *75*, 5–18.

Liberman, N., Sagristano, M. D., & Trope, Y. (2002). The effect of temporal distance on level of mental construal. *Journal of Experimental Social Psychology*, *38*, 523–534.

Liberman, N., Trope, Y., & Stephan, E. (2007). Psychological distance. In A. W. Kruglanski & E. T. Higgins (Eds.), Social psychology: Handbook of basic principles (Vol. 2, pp. 353–383). New York: Guilford Press.

Lichtenstein, S., Fischhoff, B., & Phillips, L. D. (1982). Calibration of probabilities: The state of the art to 1980. In D. Kahneman & A. Tversky (Eds.), *Judgment under uncertainty: Heuristics and biases*. Cambridge, MA, US: MIT Press.

Locke, E. A., & Latham, G. P. (1990). *A theory of goal setting and task performance*. Englewood Cliffs, NJ: Prentice Hall.

Locke, E. A., & Latham, G. P. (2002). Building a practically useful theory of goal setting and task motivation: A 35-year odyssey. *American Psychologist*, *57*, 705–717.

Lorenz, C., & Neisser, U. (1985). Factors of imagery and event recall. *Memory and Cognition*, *13*, 494–500.

Lovallo, D., & Kahneman, D. (2003). Delusions of success: How optimism undermines executives' decisions. *Harvard Business Review*, *81*, 56–63.

MacDonald, T. K., & Ross, M. (1999). Assessing the accuracy of predictions about dating relationships: How and why do lovers' predictions differ from those made by observers? *Personality and Social Psychology Bulletin*, *25*, 1417–1429.

Marks, D. F. (1999). Consciousness, mental imagery, and action. *British Journal of Psychology*, *90*, 567–585.

McIsaac, H. K., & Eich, E. (2002). Vantage point in episodic memory. *Psychonomic Bulletin and Review*, *9*, 409–420.

Miller, D. T., & Ross, M. (1975). Self-serving biases in the attribution of causality: Fact or fiction? *Psychological Bulletin*, *82*, 213–225.

Molokken, K., & Jørgensen, M. (2003). A review of surveys on software effort estimation. *International symposium of empirical software engineering*. pp. 223–230.

Morwitz, V. G., & Fitzsimons, G. J. (2004). The mere-measurement effect: Why does measuring intentions change actual behavior. *Journal of Consumer Psychology*, *14*, 64–74.

Mulhern, K. (2006). *Self-other differences in task completion predictions: The impact of motivation*. Honors Thesis, Wilfrid Laurier University.

Nelson, R. R. (2007). IT project management: Infamous failures, classic mistakes, and best practices. *MIS Quarterly Executives*, *6*, 67–78.
Newby-Clark, I. R., Ross, M., Buehler, R., Koehler, D., & Griffin, D. (2000). People focus on optimistic and disregard pessimistic scenarios while predicting task completion times. *Journal of Experimental Psychology: Applied*, *6*, 171–182.
Norris, K. P. (1971). The accuracy of cost and duration estimates in industrial R&D. *R&D Management*, *2*, 25–36.
Peetz, J., & Buehler, R. (2009). Is there a budget fallacy? The role of savings goals in the prediction of personal spending. *Personality and Social Psychology Bulletin*, *35*, 230–242.
Peetz, J., Buehler, R., & Wilson, A. E. (2010). Planning for the near and distant future: How does temporal distance affect task completion predictions? *Journal of Experimental Social Psychology*. (in press).
Peterson, C., Semmel, A., von Baeyer, C., Abramson, L. Y., Metalski, G. I., & Seligman, M. E. P. (1982). The attributional style questionnaire. *Cognitive Therapy and Research*, *6*, 287–299.
Pezzo, M. V., Litman, J. A., & Pezzo, S. P. (2006a). On the distinction between yuppies and hippies: Individual differences in prediction biases for planning future tasks. *Personality and Individual Differences*, *41*, 1359–1371.
Pezzo, S. P., Pezzo, M. V., & Stone, E. R. (2006b). The social implications of planning: How public predictions bias future plans. *Journal of Experimental Social Psychology*, *42*, 221–227.
Pronin, E., & Ross, L. (2006). Temporal differences in trait self-ascription: When the self is seen as an other. *Journal of Personality and Social Psychology*, *90*, 197–209.
Robinson, J. A., & Swanson, J. A. (1993). Field and observer modes of remembering. *Memory*, *1*, 169–184.
Roy, M. M., & Christenfeld, N. J. S. (2007). Bias in memory predicts bias in estimation of future task duration. *Memory & Cognition*, *35*, 557–564.
Roy, M. M., & Christenfeld, N. J. S. (2008). Effect of task length on remembered and predicted duration. *Psychonomic Bulletin and Review*, *15*, 202–207.
Roy, M. M., Christenfeld, N. J. S., & McKenzie, C. R. M. (2005). Underestimating the duration of future events: Memory incorrectly used or memory bias? *Psychological Bulletin*, *131*, 738–756.
Roy, M. M., Mitten, S. T., & Christenfeld, N. J. S. (2008). Correcting memory improves accuracy of predicted task duration. *Journal of Experimental Social Psychology: Applied*, *14*, 266–275.
Sanna, L. J., Parks, C. J., Chang, E. C., & Carter, S. E. (2005). The hourglass is half full or half empty: Temporal framing and the group planning fallacy. *Group Dynamics: Theory, Research, and Practice*, *9*, 173–188.
Sanna, L. J., & Schwarz, N. (2004). Integrating temporal biases: The interplay of focal thoughts and accessibility experiences. *Psychological Science*, *15*, 474–481.
Savitsky, K., Medvec, V. H., Charlton, A. E., & Gilovich, T. (1998). What, me worry?: Arousal, misattribution, and the effect of temporal distance on confidence. *Personality and Social Psychology Bulletin*, *24*, 529–536.
Shaklee, H., & Fischhoff, B. (1982). Strategies of information search in causal analysis. *Memory and Cognition*, *10*, 520–530.
Shaw, G. B. (1903/1948). *Man and superman; A comedy and a philosophy*. Cambridge: The University Press.
Shepperd, J. A., Ouellette, J. A., & Fernandez, J. K. (1996). Abandoning unrealistic optimism: Performance estimates and the temporal proximity of self-relevant feedback. *Journal of Personality and Social Psychology*, *70*, 844–855.
Sherman, S. J. (1980). On the self-erasing nature of errors of prediction. *Journal of Personality and Social Psychology*, *39*, 211–221.

Shrauger, J. S., Ram, D., Greninger, S. A., & Mariano, E. (1996). Accuracy of self-predictions versus judgments by knowledgeable others. *Personality and Social Psychology Bulletin*, *22*, 1229–1243.

Silk, T. (2010). Getting started is half the battle: The influence of deadlines and consumer effort on rebate redemption. Manuscript submitted for publication: cited with permission.

Taylor, S. E., & Brown, J. D. (1988). Illusion and well-being: A social psychological perspective on mental-health. *Psychological Bulletin*, *103*, 193–210.

Taylor, S. E., Pham, L. B., Rivkin, I. D., & Armor, D. A. (1998). Harnessing the imagination: Mental simulation, self-regulation, and coping. *American Psychologist*, *53*, 429–439.

The Standish Group (1995). *The CHAOS report into project failure.* Boston, MA: Standish Group International Inc.

The Standish Group (2009). *CHAOS summary 2009.* Boston, MA: Standish Group International Inc.

Thomas, K. E., & Handley, S. J. (2008). Anchoring in time estimations. *Acta Psychologica*, *127*, 24–29.

Thomas, K. E., Newstead, S. E., & Handley, S. J. (2003). Exploring the time prediction process: The effects of task experience and complexity on prediction accuracy. *Applied Cognitive Psychology*, *17*, 655–673.

Tindale, R. S. (1993). Decision errors made by individuals and groups. In N. J. Castellan (Ed.), *Individual and group decision making: Current issues* (pp. 109–124). Hillsdale, NJ: Erlbaum.

Tindale, R. S., Smith, C. M., Thomas, L. S., Filkins, J., & Sheffey, S. (1996). Shared representations and asymmetric social influence processes in small groups. In E. Witte & J. Davis (Eds.), *Understanding group behaviour: Consensual action by small groups* (Vol. 1, pp. 81–103). Mahwah, NJ: Erlbaum.

Trope, Y., & Liberman, N. (2003). Temporal construal. *Psychological Review*, *110*, 403–421.

Tversky, A., & Shafir, E. (1992). Choice under conflict. The dynamics of deferred decision. *Psychological Science*, *3*, 358–361.

Van Oorschot, K. E., Bertrand, J. W. M., & Rutte, C. G. (2002). *An empirical study into the causes of lateness of new product development projects.* University of Eindhoven Working Paper (WP 100).

Vinokur, A., & Burnstein, E. (1974). Effects of partially shared persuasive arguments on group induced shifts: A group-problem-solving approach. *Journal of Personality and Social Psychology*, *29*, 305–315.

Weick, M., & Guinote, A. (2010). How long will it take? Power biases time predictions. *Journal of Experimental Social Psychology, 46,* 595–604.

Wilkes, A., & Norris, K. P. (1972). Estimate accuracy and causes of delay in an engineering research laboratory. *R&D Management*, *3*, 35–36.

Wright, E. F., Luus, C. A. E., & Christie, S. D. (1990). Does group discussion facilitate the use of consensus information in making causal attributions? *Journal of Personality and Social Psychology*, *59*, 261–269.

Wright, E. F., & Wells, G. L. (1985). Does group discussion attenuate the dispositional bias? *Journal of Applied Social Psychology*, *15*, 531–546.

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

Zauberman, G., & Lynch, J. G. Jr. (2005). Resource slack and propensity to discount delayed investments of time versus money. *Journal of Experimental Psychology: General*, *134*, 23–37.

Zhang, Y., & Fishbach, A. (2010). Counteracting obstacles with optimistic predictions. *Journal of Experimental Psychology: General*, *139*, 16–31.