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The Planning Fallacy and Its Effect on Realistic Project Schedules

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Abstract: "How long do you think that task will take?" It's a question that is asked frequently during the course of a project, but is often answered with little or no factual basis. Project team members typically underestimate the time needed to complete a task they are responsible for. This tendency has been referred to as the "planning fallacy," and it can have a dramatic effect on developing a realistic overall project schedule. This article examines various causes of the planning fallacy, including optimism bias, lack of task unpacking, and short memory.

As a project manager or planner, it is important to recognize when these psychological effects are impacting your project schedule. This article uses examples from various projects to show where this challenging planning issue is likely to occur. Identifying where adjustments need to be made, at both the task and overall project level, is essential in developing a project schedule that is both achievable and reasonable.

"**H**ow long do you think that task will take?" Anyone who has participated in a planning discussion to lay out a project's schedule will recognize this fundamental question asked to project team members. It often initiates an unsettling pause while the person responsible for the task contemplates the "correct" answer. Frequently, the answer is a gross underestimation of the actual duration needed to complete the task. When these individual, shortened task durations are linked to form the full project schedule, the result is often a misrepresentation of the time needed to complete the overall project.

This tendency to underestimate task durations is commonly referred to as the planning fallacy [2]. Theories on why this effect occurs tend to focus more on psychological research than on traditional project management issues. As an experienced project manager or planner, it is important to recognize when this effect is occurring and make adjustments during the development of the schedule. This article explores common reasons for the planning fallacy, provides insight on typical situations where it occurs, and offers techniques to help develop more realistic project schedules.

The Planning Fallacy Defined

The *planning fallacy* concept was first used by Daniel Kahneman and Amos Tversky to describe the tendency to underestimate the time needed to complete a given task. More importantly, they found that this underestimation happens even when people have previous experience in performing similar tasks. Kahneman states that the planning fallacy describes plans and forecasts that:

- Are unrealistically close to best-case scenarios
- Could be improved by consulting the statistics of similar cases [7].

Kahneman also describes the exercise that first led him to describe the concept. He was working with a team of colleagues to write an academic textbook. After progressing for about a year, he asked each team member to independently write down how long they thought it would take to finish a draft of the book. The estimates generally centered around two more years, with a range of one and a half to two and a half years.

He then asked one colleague who had extensive experience with other academic textbooks how much longer it had taken similar teams to finish a draft, once they had reached the same point in development. The experienced colleague gave this question additional thought and delivered some bad news: it typically took about seven more years to finish. Even worse — about 40 percent of the other teams never finished their books at all.

Kahneman's textbook team was shocked to hear the actual timeframes of similar projects. The team could not

imagine what might take them that long, so they promptly noted the comparables but stuck with their original duration estimate. Kahneman states that his team had committed a planning fallacy by relying on internal estimates that, "were closer to a best-case scenario than to a realistic assessment." The textbook ended up taking eight more years to complete!

Research on the planning fallacy has been conducted primarily in the area of psychology, rather than in project management. The various research areas include the effects of deadlines, perceived durations of similar previous tasks, level of planning detail, anchored dates, individual versus group planning, egos, team power structure, and bias. From that research, some methods have been developed that try and offset potential effects of the planning fallacy.

Recognizing the Planning Fallacy

A savvy project manager or planner will recognize when their project team is becoming aggressive in their activity duration estimates. Often, recognition happens when activity sequences or project phases appear to be forced into time frames established by top-down planning techniques. In other cases, an unrealistic project schedule is the output of a collaborative planning session driven by a few influential team members. These situations need to be recognized during the planning process and then offset with challenges to the basis of optimistic durations. Frequently, the person questioning the validity of the planned schedule is not very popular with the rest of the group [1].

The following sections describe project schedule planning situations that often promote planning fallacy effects. Identifying when these occur is a key to offsetting them and to developing a more realistic overall project schedule.

The Project Planning Environment

When project schedules are developed in a group environment, gathering project team members in a conference room to walk through their assigned tasks in the context of the entire project is a common approach. Various tools are used to plan the project, from sticky notes to specialized software that facilitates a group collaboration effort. A project plan and schedule that the full project team "buys into" are the measure of success.

Unfortunately, research suggests that this group planning environment often exacerbates planning fallacy issues. Group predictions tend to be more optimistic than those set by an individual. Researchers have described this group accentuation effect as a result of dynamics between team members during the planning process. Even though individual members can act as observers to other members' tasks, any impartiality tends to be overshadowed by being an active participant and stakeholder to the entire group's optimism [3].

To examine various group planning scenarios that lead to the planning fallacy and overly optimistic project schedules, we will visit a planning meeting for the fictitious YYZ Plant Expansion Project.

Project Team Optimism Bias

- **YYZ Project Director:**
  "Two years is more than enough time to design and construct the expansion project."
- **Construction Manager:**
  "Absolutely. If you get me the design and major deliveries by the beginning of the year, we will have it up and running by the holidays."
- **YYZ Operations Manager:**
  "Remember we ran into some problems when the previous unit was started up.

- **YYZ Project Manager:**
  "Yeah, but those were caused by our equipment vendors, not us. We will just source our equipment from another vendor"

This is an example of group optimism bias. Both individuals and groups often attribute past successes to themselves but failures to outside factors [14]. Typical thinking is that problems that happened last time were one-offs and will not happen again. There is always a chance that the new project will have valid lessons learned from previous efforts, but complications that happened before must be recognized [8].

Projects planned backward from a desired end date can exhibit this group bias. Activities frequently get shoe-horned into desired time frames and have unrealistically short durations. Even though schedules are most often easier to develop "when you know the answer first," project teams should be cautious when planning activities to meet interim date benchmarks. Projects frequently have hard completion dates (e.g., the Olympics), but their activities are always executed in the forward direction from the start, regardless of how they were planned. Unrealistic, backward-planned durations can lead later on to sacrifices in scope, cost, or quality to meet deadlines that may have been established without a solid basis.

The project environment also tends to produce an inherent bias by team members. There is a strong desire to keep the project moving forward at all times, with required approvals and funding. This bias can lead to overly aggressive schedules for the next phase of the project in order to comply with economic and operational targets established outside of the project [2]. No one who works in the projects business enjoys the uncertain period between assignments, especially after a project gets cancelled. Terminating a project before it is completed is often a correct decision, but schedule bias

from those directly involved in the project can cloud an impartial project evaluation.

Team Member Egos

- **YYZ Project Director:**
  "Some of the higher-ups are saying there is no way the plant expansion construction can be done in a year."
- **YYZ Construction Manager:**
  "We will make it happen. I have never missed a deadline on one of my projects and I am not going to start now."
- **YYZ Project Manager:**
  "I just want to make sure we do not promise to meet the end of the year deadline and then not deliver."
- **YYZ Construction Manager:**
  "Look, I am not going to have somebody from the corporate office telling me how long it will take to get my construction done."

Nobody likes to have their ability to perform on a project questioned, especially by someone outside of the project. Protecting egos and self-esteem is a common occurrence in business and in a high-pressure project environment [14]. "If everyone else would just get us what we need and then stay out of our way, we could get our tasks done when we say they are going to be done." Any delays that occur are often blamed on someone else, or on factors outside of a team member's control.

Unfortunately, this individual optimism brought on by team member egos can lead to a very aggressive schedule when all tasks are combined. All of the optimistic team members must deliver on ego-driven promises for the project schedule to stay on track. When the inevitable delay occurs, the unrealistic project schedule is exposed, and frequently, finger-pointing begins.

Schedule Anchors

- **YYZ Engineering Manager:**
  "So our current engineering schedule shows that all detailed drawings will be issued by the end of April."
- **YYZ Project Sponsor:**
  "Wait. In the approved funding document we said that we would have engineering done four months earlier in December."
- **YYZ Project Manager:**
  "Yeah, but we added more equipment scope and are still waiting on vendor drawings, so that is adding time to engineering."
- **YYZ Project Director:**
  "Well, we originally told the Board the end of December for engineering completion. Unless you two want to stand in front of them and explain why we cannot make it, we need to make it happen."

Specific dates tend to establish themselves in project stakeholders' minds. Research in this area suggests that when quantities and overall scope of a project are still not established, people are still relatively comfortable in estimating a project's completion date [10]. These initial estimates, even though often without a firm basis, are often "anchored" to the project and to its stakeholders going forward.

Even when new information, or additional scope, suggests that the completion date should be extended, stakeholders often are anchored to the original date and are reluctant to change [8]. If the original anchored date is based on a biased prediction, any adjustments made to reflect specific project information will usually still result in an unreasonable revised date [12].

Power Bias

- **YYZ Team Member:**
  "After we receive all the vendor information, it will take our modeling department eight weeks to complete the model before we can have a review"
- **YYZ Project Director:**
  "Eight weeks???"
- **YYZ Team Member:**
  "Yes. This is a pretty complex model, especially for the new expansion pipe routing. It will take a solid eight weeks to resolve clashes and finalize the model."
- **YYZ Project Director:**
  "Well, we do not have eight weeks. Let us put four in the schedule. Are you OK with that?"
- **YYZ Team Member:**
  "Um, I guess so."
- **YYZ Project Director:**
  "Good, four weeks it is."

Power and intimidation can become a major factor in group schedule planning sessions. If a participant has legitimate power over subordinates on the project team, that high-ranking individual can dominate activity duration discussions. Studies show that groups containing a powerful member consistently led to more optimistic and less accurate time predictions [15]. This power influence leads to a selective focus on a dominant, goal-focused opinion with less focus on often-relevant, secondary information.

An effective planning facilitator will recognize when this situation is occurring and try to coax additional opinions from other intimidated team members; this can be quite a challenge in a group environment. Sometimes a "divide-and-conquer" approach is effective where smaller, similar-level groups are assembled to obtain schedule information from multiple sources, which is then integrated later.

Short Memory

- **YYZ Construction Manager:**
  "We have three months in our schedule to construct the foundations for the new expansion equipment."

- **YYZ Project Planner:**
  "Three months seems pretty short. When we did the foundations for the previous expansion project during the winter months, it took a pretty long time."
- **YYZ Construction Manager:**
  "I remember, but there is no way it was much longer than what we are showing."
- **YYZ Project Manager:**
  "Can you pull up the schedule from the last expansion project and look up how long it took?"
- **YYZ Project Planner:**
  "Here it is. Wow! It took us about five and a half months until we were done with the foundations."
- **YYZ Construction Manager:**
  "That cannot be right, and we will have better weather this winter. I am going to stick with my three months."

How long did the previous project take to perform the same sequence of tasks? Project managers and even team members that performed the work prior have a tough time accurately remembering how long it took to complete past activities. This "memory bias" has been studied extensively in conjunction with planning fallacy. These incorrect memories of past task durations are a major cause of biased future predictions [11, 12].

Vierordt's Law (1868) says that short intervals of time tend to be overestimated, while long periods of time are typically underestimated. This effect can lead to incorrect approximations of the actual durations on past projects or phases. Additional studies show that providing people with the accurate actual duration of past tasks improved their prediction accuracy of future similar tasks [13]. However, planning fallacy effects can still play a role when historical information is discounted or ignored [8].

A key factor in overcoming this memory bias is the availability of accurate, past project schedule information. A collection of completed, "as-built" project schedule information should be a priority for project organizations. As-built activity records could evolve into a statistical distribution of actual durations from which various activity durations that best correlate to the current project parameters may be selected. Three-point duration estimates (optimistic/most likely/pessimistic) could also be referenced for schedule risk analysis. This approach to mitigating the planning fallacy is a forecasting method advocated by Bent Flyvjberg [4].

Task Unpacking

- **YYZ Project Manager:**
  "Let us put two months in the planned schedule for reviews and approvals before full-funding approval."
- **YYZ Project Planner:**
  "I am not sure the standard two-month rule-of-thumb is enough anymore."
- **YYZ Controls Manager:**
  "Do we know all the required stage gate reviews and approvals that we need to go through under the new project process?"
- **YYZ Project Director:**
  "I know we are supposed to have external reviews for both cost and schedule. I think there is going to be an internal project audit too, but I am not sure if it has been finalized yet."
- **YYZ Project Manager:**
  "Well, if they really want this project to meet the end of the year deadline, we cannot take more than two months to get funding."
- **YYZ Controls Manager:**
  "Let us try and lay out all the required steps once we find out everything we need to do."

Three Weeks Later…

- **YYZ Project Planner:**

"I came up with a timeline for the eight separate reviews and approvals we need to get. With the holidays falling right in the middle, it looks like it is going to take at least four months from start to finish — and that is if all the external reviewers are available when we need them."
- **YYZ Project Manager:**
  "That is unbelievable! Looks like I need to put in for some advanced funding to keep this project moving forward."

The level of detail in a project's planned schedule can have an effect on its overall duration. Research in this area has focused on the "task unpacking" scenario where longer activities are broken down into more detailed, shorter-duration tasks. Results show that when this task unpacking is incorporated to more accurately reflect the sequence of steps needed to complete the summary activity, the total estimated duration is typically increased [6]. Interestingly, near-term activities that are unpacked normally have their durations increased more than activities that are further in the future. This suggests that people can focus more easily on developing detailed task sequences when requirements have been set for performing upcoming work.

The average project manager or planner might react to this research by requiring extremely detailed schedules for projects to obtain a more accurate (and often longer) overall duration. But development of large, detailed schedules for projects also takes extended time and resources. Finding the level-of-detail "sweet spot" where sufficient breakdown exists for the critical path or key sequences, while maintaining reasonable development time, can be difficult. Task unpacking research suggests that a better approach could be a rolling wave of schedule development with more detail for near-term work and summary-level activities for work in the future.
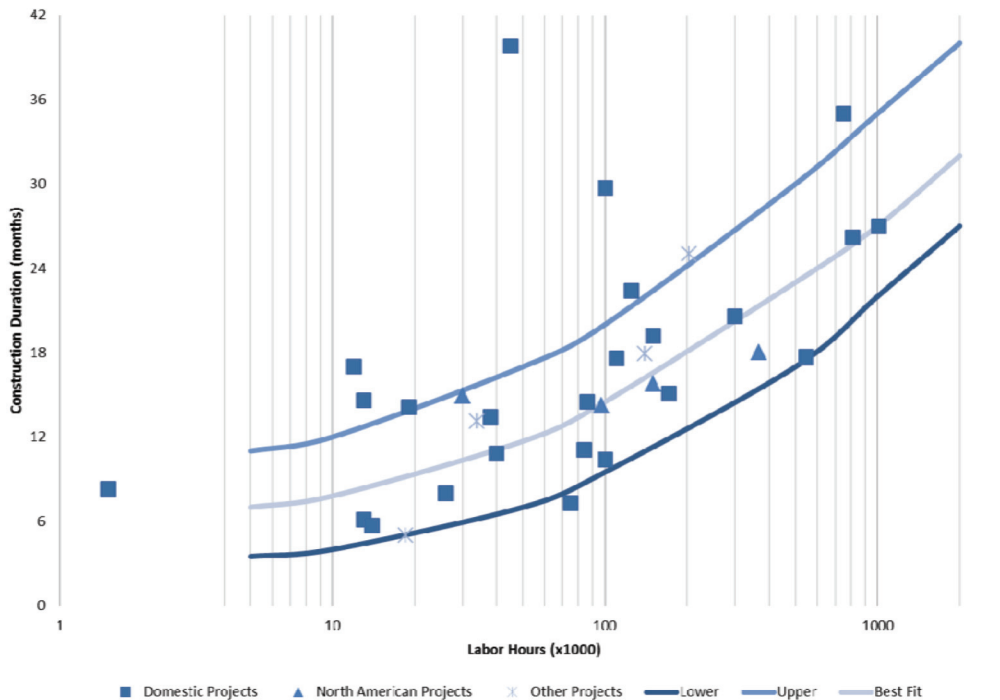
Figure 1 – Example Schedule Metric (Construction Duration vs. Labor Hours)

Combating the Planning Fallacy

The planning fallacy is a real psychological phenomenon that requires a focused effort to offset its effect. Discussed here are a few of the many suggested options for making that happen.

Inside vs. Outside View and High-Level Sanity Check

The inside view relates to the perspective of project participants who draw from their own personal knowledge and experience. In contrast, the outside view draws from external sources of information [5]. It has been found that using feedback from other similar projects (outside view) will lead you to a more realistic schedule [13] than the inside view, which tends to be clouded by an inability to see one's own shortcomings. Whenever possible, you should strive to obtain external data for similar projects to provide unbiased information.

Figure 1 shows an example of a high-level metric comparison between construction duration and labor hours. Similar metrics can be used to validate the current plan
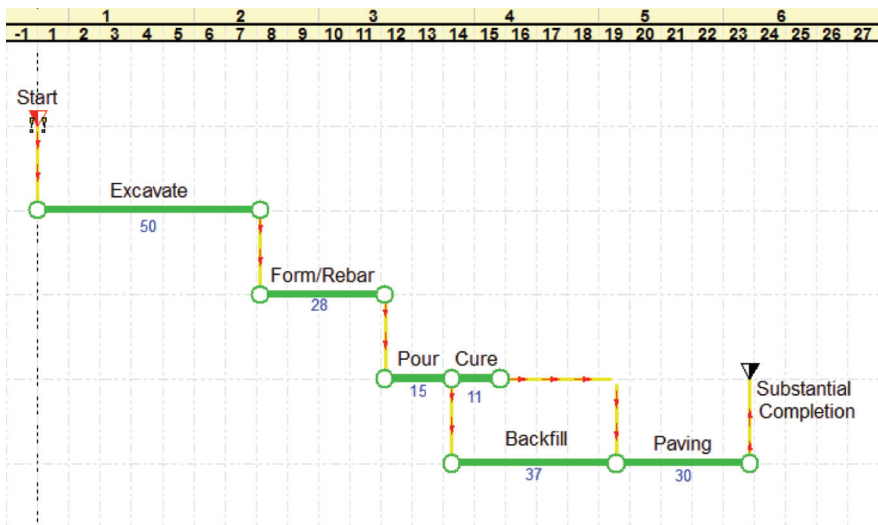

Figure 2 – Example Schedule with Ordinal Dates

against the durations of comparable past projects.

Ordinal Dates

Project team members have a tendency to fixate on a calendar date, often anchoring to it, as discussed previously. They have predisposed ideas of when they expect to perform various phases of the project and will adjust durations to make that happen, even if those durations conflict with

reality. This is particularly common when activities are weather-sensitive and the desire is to perform that work during the summer months. To combat this tendency, it is often useful to set the calendar strip of the schedule to ordinal number dates as depicted in Figure 2.

Seeing that concrete work is planned for month three does not enlist the same reaction as concrete work planned for January. Once the

ordinal calendar is converted to named calendar periods, some seasonality duration adjustments may be required for potential weather-impacted work.

The Pre-Mortem

Another helpful tool for getting project participants to accept that unplanned things do happen is to have a pre-mortem discussion [9]. A pre-mortem assumes that you are at the end of a project and you have completed late. Looking back, what were the things that were likely to have caused the delay? Did you not properly assess risks that impacted the schedule, like late equipment delivery, or possibly were you overly optimistic in your labor productivity? Maybe you assumed you would get funding at a particular time and it was delayed. A focused effort to identify project risks at the beginning will facilitate mitigating those risks or avoiding them completely.

Resource Overpromising/Awareness

Schedules are often developed with no consideration to the resources needed to complete the plan. Reviewing the resource requirements against the schedule will enable a review of what the labor requirements will be. Are they reasonable? Or are the durations so optimistic versus the estimated labor hours that more workers are required than can physically work in the area? Are there peaks in the resource profile that can be smoothed if a more realistic (longer) duration is set, particularly for activities not on the critical path?

"Risked" Schedules

Linking a pre-mortem with a Coach's Challenge (see explanation later in this article) is the process of performing a risk analysis on the project schedule. A probabilistic schedule risk analysis reviews the durations set by the project team and questions them. For each activity reviewed, the group determines the optimistic, pessimistic, and most likely durations. The schedule is then analyzed in a Monte-Carlo type simulation using those low/high/most likely durations. The result is a set of probabilistic durations for the overall schedule. A thorough analysis will attempt to remove inherent biases in the base schedule and replace them with more realistic, optimistic, and pessimistic cases.

The result is often a completion date far beyond that of the project plan and one that is difficult to accept [1]. In fact, an achievable deterministic target schedule is rare even in a fraction of analyses simulations. There are several significant benefits to performing a risk analysis on the project schedule, in addition to the output of an actual probabilistic analysis.

First, the analysis itself forces the team to take a close look at the durations and confirm their validity. In many cases, the team realizes that they have been too optimistic in their planning and will adjust durations to a more reasonable length. A third-party facilitator, however, can get the team to focus on the outside view of the project, bringing with it wider ranges of potential durations for given activities.

Second, the dialogue that takes place as part of the analysis process greatly enhances the team's knowledge of the project, schedule, and potential risks. Bringing as many project stakeholders as possible together to discuss all aspects of the project tends to force each participant to look beyond their specific realm of responsibility. The result is that team members often change the durations of their assigned work.

Another benefit of risk analysis centers on risk identification. Base plans rarely include delays or impacts resulting from risks inherent to the project. Project schedules are often developed with the assumption that everything will go as planned, though this assumption is rarely supported. Equipment fabrications take longer than quoted, underground obstructions are discovered, weather is worse than anticipated, productivity is not as good as estimated; the list of common risks is endless. In addition, there are project-specific risks that may be even more impactful. If the team can make an effort to identify those risks and how they may affect the schedule, its members will highlight those risks that need to be carefully monitored and mitigated.

The probabilistic analysis results provide valuable information to the project team regarding alternate scenarios that can ultimately drive the project's schedule. Once the range of driving probabilistic critical paths is evaluated, the project can reserve schedule contingency in key locations in the activity network to reflect possible anticipated slippage in the plan [11]. The resulting "risked schedule" becomes a more realistic plan when duration uncertainty is applied to the project. Active management of the risked project schedule includes updating the analysis periodically as execution changes during the project's life cycle. This approach can be an effective solution to overcoming the inherent bias present in early-date, critical path method project schedules.

The Coach's Challenge

Sometimes the most useful thing you can do for your project is to bring in an unbiased third party to facilitate a high-level planning session [1]. This is often practiced when performing a schedule risk analysis. Frequently, project teams are too close to the details and don't want to accept an alternate view of the project's schedule risks. The concept of the "Coach's Challenge" can be used during schedule review sessions. The facilitator or a designee has the authority to throw a "challenge flag" when they see the team making a decision that does not make sense when looked at from an outside view. Like the Coach's Challenge in the National Football League, the flag throw identifies a decision that needs to be more carefully looked at and

then tested for validity.

Coach's Challenges are most frequently issued during the ranging session of a schedule risk review. While working with team members to determine optimistic and pessimistic durations, it is not uncommon for the discussion of an activity to highlight a potential risk or significant variance in the planned duration from that previously experienced. The consensus may be to extend the duration, but the person ultimately responsible will disagree for any of the various reasons discussed previously. It is at this point that the challenge flag is thrown to focus the discussion on how the planned duration was developed. The discussion may either verify that the planned duration has a solid basis as currently shown, or may lead to a revision.

Less Collaborative Planning?

The collaborative approach to developing a project's schedule is often in contrast to how the project's cost is estimated. Even though the scope and associated quantities are often reviewed with the full project team, the project's estimate is typically developed independently. Estimated hours and cost are computed using detailed comparable and historical information as a verifiable basis. Why are these approaches so different? Why do participants in a group schedule planning session feel so confident in proposing activity durations (often with little or no basis), when they would be very hesitant to throw out an estimate of its cost?

Research implies that planning fallacy effects are greater in a group setting than when task durations are estimated independently [3]. When combined with the often fragile dynamics that tend to surface during group planning sessions, maybe the collaborative planning technique should not be the preferred approach. Perhaps project schedules should be developed more like estimates: with extensive analyses of scope and other

factors that determine a project's cost, and in turn, its completion date.

In reality, the collaborative planning environment has too many advantages that offset its potential limitations. The common understanding of the project scope, work breakdown structure, activities, and relationships is inherently valuable to planning session participants. Key hand-off points during execution of the work must be accurately represented in the project's schedule. The person building the schedule network is a primary beneficiary of these collaborative planning sessions.

However, planning fallacy limitations of this group planning approach suggest that more activity duration validation is needed before establishing a schedule as the project baseline. External reviews, benchmarking, resource analysis, and high-level sanity checks are all valuable techniques to combat potentially optimistic and inherently biased project schedules. When combined with the synergistic benefits of collaborative planning, this two-step approach can produce a schedule that is both accurate and backed up with a solid basis for its durations.

Summary

The planning fallacy is a tangible influence that can lead to planned schedules that are doomed to fail, even before a project starts. Optimistic and often biased estimates of individual activity durations can combine to produce a schedule that severely underestimates the total time needed to complete a project. The planning approach, especially in a group environment, can often exacerbate the inside view taken by a project team when proposing an overly aggressive schedule.

Planning fallacy research shows that other factors, such as memory bias, power influence, egos, group optimism, and level of detail, can play a major role during schedule development. An effective project

manager or planner will recognize these effects and take steps to mitigate their impact on the schedule. Techniques like ordinal dates, a pre-mortem, the Coach's Challenge, and risk-adjusted schedules can often be used to offset unrealistically short schedule durations. Effective project teams welcome an outside view of their plan and use comparative data to validate and provide a solid basis for their schedule.

An examination of the planning fallacy might suggest that the ultimate solution is to simply extend planned schedules out so that they reflect an overly conservative estimate of the project's duration. In the project world, however, this approach is simply not viable. Projects should be planned to complete in a sensible amount of time, including contingency. Recognizing and overcoming potential planning fallacy issues during development will produce better project schedules that are both achievable and reasonable.

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