Sources of Schedule Risk

Schedule risk cases make up well over a quarter of the records in the PERIL database. These risks have an average impact of about seven weeks, a bit less than scope risks and somewhat higher than the average for resource risks. They represent more than a quarter of the overall impact in the PERIL database. Schedule risks fall into three categories: delays, estimates, and dependencies. Delay risks were most numerous; these are defined as schedule slips due to factors that are at least nominally under the control of the project team. Estimate risks were next most numerous and were caused by inaccurate duration assessment of project activities. Schedule dependency risks, also significant, relate to project slippage due to factors outside the project, and on average caused the most harm—over eight weeks of slippage. (These schedule dependencies all relate to timing—dependency problems primarily caused by deliverable requirements are grouped with the scope change risks.) Each of the three root-cause categories is further divided into subcategories, shown in the following table.

Schedule Root-Cause Subcategories	Definition	Count	Cumulative Impact (Weeks)	Average Impact (Weeks)
Dependency Legal	A shift in legal, regulatory, or standards	11	121	11.0
Estimates Learning	New work assumed to be easier than it turned out to be	47	431	9.2
Dependency Project	Project interdependency delay in programs	31	250	8.1
Estimates Deadline	Top-down, imposed deadlines that are unrealistic	15	118	7.9
Dependency Infrastructure	Infrastructure not ready or support not available (printing, IT, shipping, etc.)	28	193	6.9
Delay Information	Slip due to unavailability of specification or other needed data	41	270	6.6
Delay Parts	Delay waiting for needed deliverable component	84	552	6.6
Estimates Judgment	Poor estimating process or inadequate analysis	33	208	6.3
Delay Hardware	Needed equipment arrives late or fails	41	232	5.7
Delay Decision	Slip due to untimely decision for escalation, approval, phase exit	33	182	5.5

The overall impact of these schedule risk subcategories is summarized in Figure 4-1. The subcategory with the largest total impact is waiting for a needed component (particularly common during recent supply-chain problems), with estimating novel work not far behind.

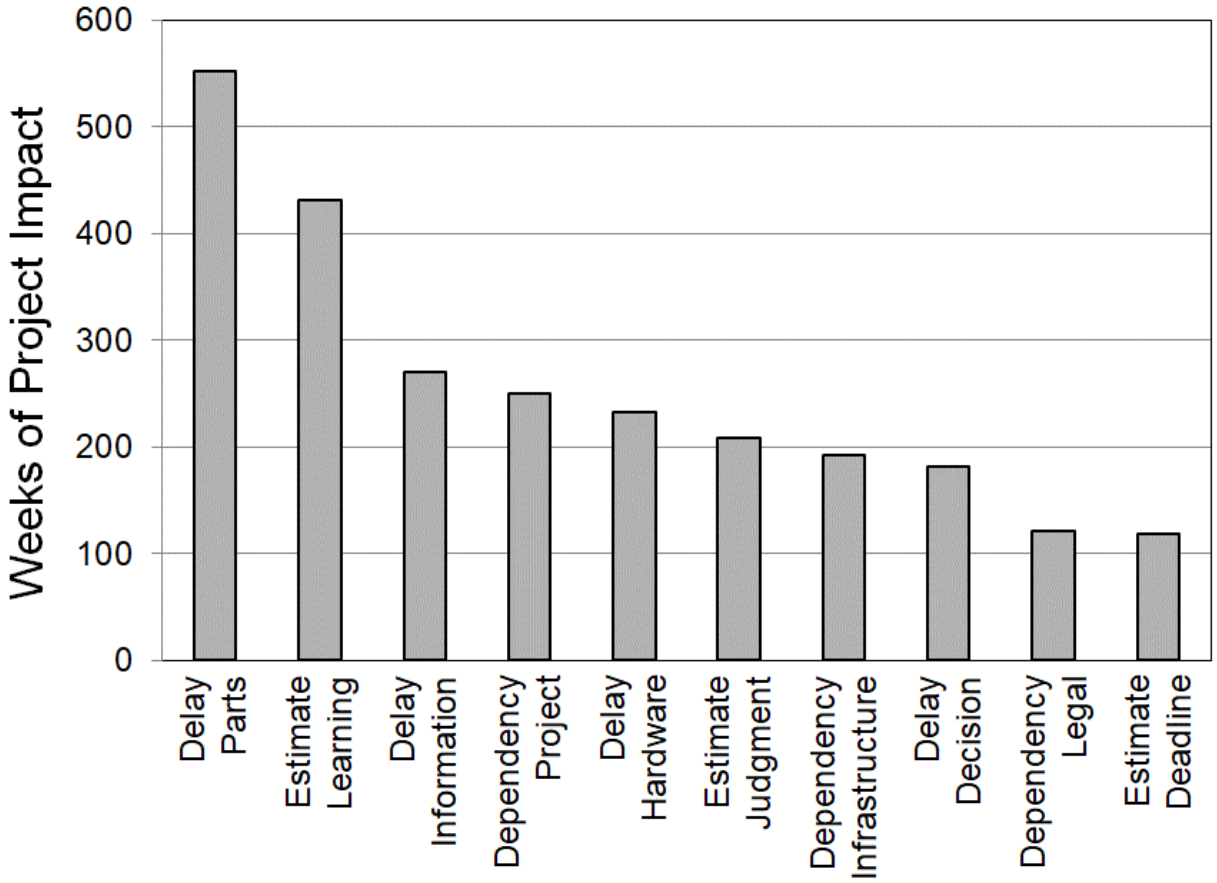

Figure 4-1: Total Project Impact by Schedule Root-Cause Subcategories

Delay Risks

Delay risks represent almost half of the schedule risks and about one-sixth of all the risks in the PERIL database. Impact from delays averaged about a month and a half. Types of delay risk in the PERIL database include parts, hardware, information, and decisions.

Parts that were required to complete the project deliverable were the most frequently reported source of delay, with an average schedule impact of over five weeks. Delivery problems and supply chain disruptions were common sources for this delay, but there were also quite a few issues involving customs and paperwork for international shipping. Delays also resulted from parts that arrived on time but were found to be defective.

More than 20 percent of the delay risks were caused when **hardware** needed to perform project work was late, including systems and other equipment. Risks in this subcategory averaged almost a month and a half of delay. Over the recent past supply chain issues have spiked, resulting in an increase compared with earlier PERIL database statistics in delays due to both late parts and hardware.

Information needed by the project represented another fifth of the cases in the delay category. These and parts delays were also the most damaging on average, representing an average of over six weeks of project slip. Some of the information delay was due to time differences between parts of distributed global teams. Losing one or more days on a regular basis due to communication time lags and

misunderstandings was common. In other cases, access to information was inadequate, or delivery of needed reports was interrupted.

Slow **decisions** also caused project slippage. Roughly one-sixth of the delay examples were due to managers or other stakeholders who did not act as quickly as necessary to keep the project on schedule. Sometimes the cause was poor access to the decision makers, or their lack of interest in the project. For other projects, delays were the result of extended debates, discussions, or indecision. Projects facing these issues lost over five weeks on average while waiting for a response to a project request.

Potential delay risks may be difficult to anticipate, and many of them legitimately appear to be "unknown" risks. Thorough analysis of the input requirements at each stage of the project plan, however, will highlight many of them.

Estimating Risks

Of all the types of schedule risk found in technical projects, estimating is the most visible. When you ask project managers what their biggest difficulties are, estimating is high on, if not on top of, the list. Despite this, the number of incidents in the PERIL database is not too large, under 8 percent of the records, and only about a quarter of the total schedule risks. The average impact of the estimating risks is only slightly above that of the PERIL database as a whole, at roughly two months of slippage. One frequently cited issue with estimating in technical projects is the relatively rapid change in the work. Good estimates rely on history. When the environment is in constant flux, history may not seem all that useful (more on this later in the chapter). The estimating risk subcategories relate to learning curves, judgment, and imposed deadlines.

Learning curve issues were the most common type of estimating risk. Their impact was well above the average for the database, in excess of nine weeks. The quality of the estimates when new technology or new people (or even worse, both) are involved is not good. The portions of project work that require staff to do things they have never done before are always risky, and although thorough analysis of the work can show which parts of the project plan are most exposed, precise estimating is difficult.

Judgment in estimating was the next most common estimating problem in the PERIL database. For most of these cases, the estimates were simply overoptimistic—one of the most common sources of project bias. Some of these estimates were too short by factors of three or four. Dealing with this source of estimating risk requires thorough planning, with appropriate understanding and decomposition of the work, so that the effort and steps required are known. It also requires good record keeping. Metrics and project data archives are invaluable in creating future estimates that are more consistent with reality than past estimates have been (even for projects where things change rapidly). Having some data always beats having to guess. Another powerful tool in revealing and combating optimistic estimates is worst-case analysis. The answer to the question "What might go wrong?" will not only reveal something about the likely duration, it will also uncover new potential sources of risk.

Imposed **deadlines** were the third subcategory of estimating risks. These inaccurate estimates caused a typical two months of slippage, and there the root cause lies outside the project team. Technical projects frequently have aggressive deadlines set by stakeholders in advance, with little or no input from the project team. Even when the project plan shows the deadline to be unrealistic, these unattainable timing objectives are often retained. Such projects are doomed from the start.

Dependency Risks

Dependency risks make up about a sixth of the schedule risks. The impact from schedule dependency risks averaged just over eight weeks of slip per incident. There are three dependency risk subcategories: other projects, infrastructure factors, and legal issues.

Other **projects** with shared dependencies not only are the most numerous of the dependency risks, they also are quite damaging, with an average of about two months. In larger projects (often classified as programs), a number of smaller projects interact and link to each other. In addition to providing each other with information and deliverables that meet well- defined specifications (also a scope risk exposure), each project within a larger program must also synchronize the timing of schedule dependencies to avoid being slowed down by (or slowing down) other projects. Managing all these interface connections is difficult in complex programs, and the amount of damage increases with time; many of these risks in the PERIL database were noticed only near the end of the projects. Even for the interfaces that were defined in advance, delay was fairly common due to the uncertainty in each project and the high likelihood that at least one of the interconnected projects would encounter some sort of difficulty. With so many possible failure modes, it is all but certain that something will go wrong. Analysis of the dependencies and interfaces between projects is a key aspect of program management, and many of the risks faced by the projects become visible through interface management techniques (detailed in Chapter 13).

Infrastructure dependencies also interfered with project schedules in the PERIL database. The frequency of these problems was somewhat lower than those due to project interdependencies, but their impact was less on average, but still almost seven weeks. These situations included interruption of technical services, such as computer systems or networks required by the project, and inadequate access to resources such as help desks, system support, and people who understood older but necessary applications. Several projects were delayed by maintenance outages that were unknown to the project team, even though they had been scheduled in advance.

Legal and regulatory dependencies are also problematic. Though the number of cases is well under 20 percent of the dependency risks, the average impact was highest for any subcategory in the PERIL database at about 11 weeks. Legal and paperwork requirements for can cause problems when they change abruptly. Monitoring for planned or possible changes to laws and mandatory standards can provide early warning for many types of potential regulatory problems.

Schedule Risk and VUCA

As with the PERIL database as a whole, schedule risks are dominated by uncertainty, with two-thirds of the impact. These predictability issues arose from inaccuracies in estimates and scheduling dependencies. Complexity was the next most significant VUCA factor, causing most of the remaining third of the harm due to inadequate understanding of interactions with other projects and legal and organizational dependencies. Volatility also contributed some damage, primarily through imposed (and unrealistic) deadlines. You can minimize the schedule risk effects of VUCA through more thorough analysis, honest assessment of worse cases, better analysis of project complications, and documenting and carefully reviewing project information. Additional examples of schedule risks from the PERIL database are found in the Appendix.