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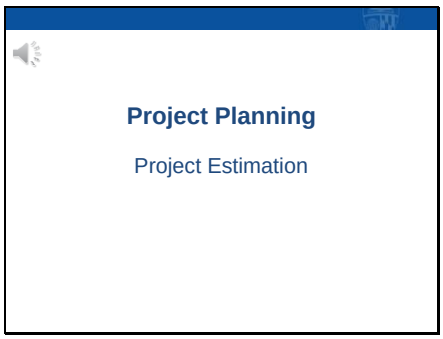

In this lecture we'll discuss the project estimation process.

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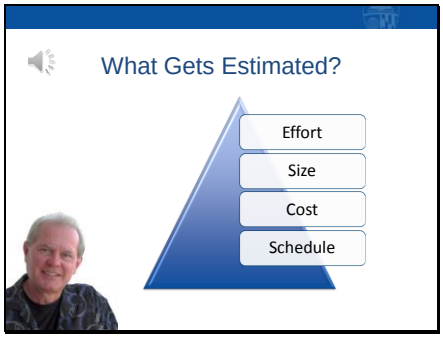

There are several types of project estimates that are typically made during the project planning process…as illustrated here.

Effort is measured in terms of how much time is required to perform project tasks. Typical units of effort are person-hours, person-days, person-weeks, person-months, or person-years. Effort is the amount of work it takes. It helps to determine project labor cost, but it's not directly related to calendar time. Calendar time is schedule.

Sometimes size estimates are determined. Estimates of size might be the total number of lines of code that the software product is expected to have, or the total number of function points associated with the software product. Not everyone estimates size measures…but the idea is that the size of a product should be correlated to the effort required to build it…just like estimating the number of square feet of walls in a house can be used to estimate how much effort will be required to paint the rooms in the house.

Project cost is, of course, a very common thing that is estimated during the project planning process, as is the project schedule, which consists of the calendar time duration and specific calendar dates associated with major project components and overall completion date.

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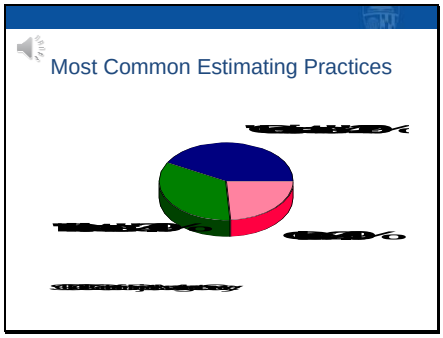

The Center for Project Management, considered to be a thought leader on project management in the information technology field, conducted a survey of IT project managers to determine which kinds of estimating practices were commonly used.

Somewhat surprisingly, most managers reported that they used “guesstimates”. Technically, the dictionary meaning of guesstimate is to make an estimate without using adequate or complete information. In practice, it more strongly means making estimates based on guesses and conjecture versus using some underlying methodology.

Another large contingent reported using “dictimates”. I’m pretty sure the word dictimate isn’t even in the dictionary…but it’s meaning in the context of the survey was that dictated values for cost or dictated deadlines for schedules were used.

In my experience, the problem with using guesstimates is that the guesstimates are hard to defend unless there is some documented logic or procedure that was employed. The problem with dictimates is that they are really not estimates at all, and often have no relationship to realistic effort, cost, and schedule elements that are needed to build a software product.

Only about a quarter of the respondents reported using “other” techniques.

Estimating is challenging, especially for software engineering projects, but there are quite a few techniques that are, in fact, used in practice by project management professionals.

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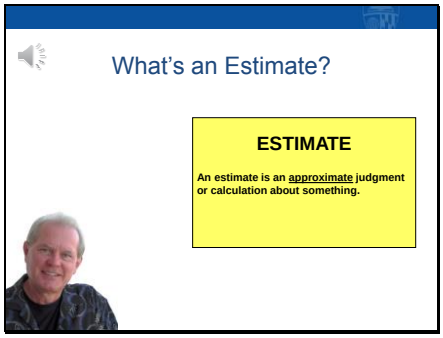

Let's start by defining what an estimate is. The dictionary definition of an estimate is that an estimate is an approximate judgment or calculation about something. The keyword in this definition is "approximate".

An estimate is an approximation of something…not an exact statement or measure about something. One of the problems we see in practice is that estimates are presented as if they are certain, precise, measures…what I like to call "point estimates"…and presenting them that way is a mistake.

Estimates are almost always made without having complete or perfect information, so by their very nature they possess some degree of uncertainty, and that uncertainty should be communicated.

Another common estimating fallacy is that there exists some "absolutely correct" value for an estimate. That's just not true, especially in software engineering projects where staff productivity can vary significantly. What I mean by that is two software engineers, working on exactly the same product, can have very different productivity rates. One engineer might spend twice the effort as another engineer to build exactly the same software product…so the cost and schedule can be quite different.

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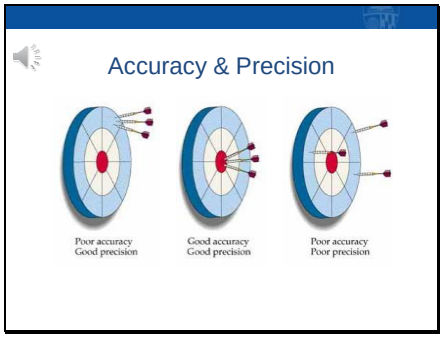

Two terms that are often used in conjunction with estimating are accuracy and precision…and it's important to understand the difference. I'm using this graphic to illustrate the differences between the two.

Let's assume that the red bulls-eye represents the actual value that turns out for something we're estimating. Pick any project-related thing you want…the effort required to build something, the cost to build something, how long it takes to build something, it doesn't matter. Let's take estimating effort for the sake of discussion. Now…the actual effort required to complete some task, for example, isn't known until the task is actually completed…that is, until it's done.

The accuracy of an estimate is "how close" the estimate comes to the actual result. And you don't know what the accuracy is until you know the actual result. As an example…you estimate that it will take 10 person-days of effort to complete a task, and it actually takes 12 days. Your estimate was within 20 percent of the actual.

The stated precision of an estimate is a "range of values" that you expect the actual result to fall within. The smaller the range, the higher the stated precision. The larger the range, the lower the stated precision. I was careful to use the term stated precision, because precision is a statement about what you expect to happen. Like accuracy, you don't know what the actual precision is until after the actual result is known.

Precision is also a way to express the confidence or uncertainty of your estimate. For example, suppose you estimate that a task will take between 9 and 12 person-hours of effort. That is the most precise statement that you can make at the beginning of the project because there are a number of unknowns. As the unknowns become known, you may be able to increase the precision of your estimate.

The example on the left illustrates poor accuracy, but good stated precision. The actual is not even close to the estimate, but the range of values around the darts is quite small.

The example on the right illustrates both poor accuracy and poor or low stated precision. The wide variation in precision indicates a high degree of uncertainty in the estimate…and the actual result didn't fall within the state precision values.

And…the example in the middle illustrates both good accuracy and good stated precision. The actual result fell within the stated precision values.

One thing that should be avoided in estimating is the use of what is called "false precision". For example, at the beginning of a project the most precise schedule estimate we may be able to make might be 6-9 calendar months. If we give an estimate of 7 months it sounds more precise but really isn't. And, stakeholders will have a tendency to think it's in concrete…that it's a certainty.

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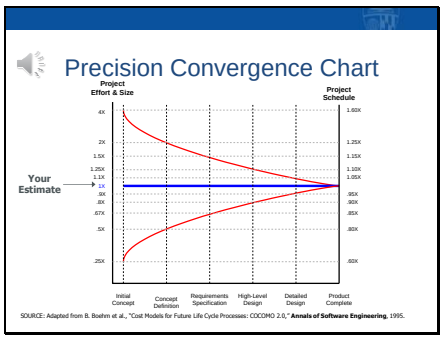

It's a best practice to revise estimates periodically during the course of a project…though this is often not done. I see too many projects in which the original, and early, estimates are set in concrete.

The precision of estimates can, and should, improve, as a project progresses and more of the original unknowns emerge. This chart, which is based on a large sample of projects, shows how the precision of estimates converges over time. Note how little precision exists at the very start of a project…an estimate can be off by 400 percent.

It's a good practice to always state estimates in a way that indicates they are approximations…to show that there is uncertainty about them. This practice comes highly recommended by the Project Management Institute. One way to do this is to quote a range, backed up by the assumptions that went into the calculation of that range. Another way to do this is to incorporate probabilities associated with estimates, and we'll discuss how to do this in later lectures.

When single values are quoted for an estimate…sometimes called point estimates…they send the message of false precision and certainty.