UNIT II

PROJECT LIFE CYCLE AND EFFORT ESTIMATION

8. Basics of Software Estimation

Software project estimation approaches assist project managers in effectively estimating critical project parameters such as cost and scope. PMs can then use these estimation strategies to give clients more accurate projections as well as budget the funds and resources they'll require for a project's success.

In this article, we, Vietnam's leading software development company, will go over which project elements should be estimated, the many available projects estimating approaches, and how to get started with estimation techniques that greatly help with software project estimation in software engineering.

1. What Is Software Project Estimation?

In short, project estimation is a complex process that revolved around predicting the time, cost, and scope that a project requires to be deemed finished. But in terms of software development or software engineering, it also takes the experience of the software outsourcing company, the technique they have to utilize, the process they need to follow in order to finish the project (Software Development Life Cycle). Project Estimation requires the use of complex tools & good mathematical as well as knowledge about planning.

In most cases, the whole estimation process would cost the company rather considerable cost & time at the very first stage of developing a brand new website, app, or software. However, this will act as the stepping stone to make the final result more credible, realistic, and customer-satisfying.

Whether big or small, every project is advised to employ project estimation as a crucial step to avoid unpredictable failure in the future.

2. Which Estimations Take Place During A Project?

Ultimately, there are six critical elements of a project that benefit from the use of project estimating techniques.

Cost:

In project management, cost is one of the three primary constraints. The project will fail if you do not have sufficient funds to complete it. You can help set client expectations and ensure you have enough money to complete the work if you can accurately estimate project costs early on. Estimating costs entails determining how much money you'll need and when you'll need it.

Time:

Another of the project's three main constraints is the lack of time. It is critical for project planning to be able to estimate both the overall project duration and the timing of individual tasks.

You can plan for people and resources to be available when you need them if you estimate your project schedule ahead of time. It also enables you to manage client expectations for key deliverables.

Size or Scope:

The third major project constraint is scope. The project scope refers to all of the tasks that must be completed in order to complete the project or deliver a product. You can ensure that you have the right materials and expertise on the project by estimating how much work is involved and exactly what tasks must be completed.

Three sides of a triangle are often used to describe the three main constraints. This is because any changes to one constraint will inevitably have an effect on the other two. You need to know the scope and schedule to accurately estimate the budget. If one of the three estimates turns out to be higher or lower than you anticipated, the other two are likely to be off as well.

Risk:

Any unforeseen event that could positively or negatively impact your project is referred to as project risk. Estimating risk entails predicting what events will occur during the project's life cycle and how serious they will be.

You can better plan for potential issues and create risk management plans if you estimate what risks could affect your project and how they will affect it.

Resources:

The assets you'll need to complete the project are known as project resources. Tools, people, materials, subcontractors, software, and other resources are all examples of resources. Resource management ensures that you have all of the resources you require and make the best use of them.

Quality:

Quality is concerned with the completion of project deliverables. Products that must adhere to stringent quality standards, such as environmental regulations, may require more money, time, and other resources than those with lower standards.

Estimating the level of quality required by the customer aids in the planning and estimating the remaining five aspects of your project. Because all six project factors are interconnected, forecasts for one can have an impact on forecasts for the other five.

As a result, applying the same software project estimation techniques to all six areas can help you improve your accuracy.

3. When To Do Project Estimation In Software Engineering?

By definition, estimating is a forecast. And according to a **McKinsey report**, overruns occur in 66% of all software development projects. This means that most of them fail to meet deadlines, go over budget, and deliver fewer features than expected. There could be various reasons for this, but at Savvycom, we often think that determining a transparent software development process prevents late deliveries and budget overruns.

Waterfall:

The planning phase follows the project initiation in a traditional Waterfall project. Estimates for the six project aspects discussed above will be created and documented during this stage.

Estimates may be revised as new information becomes available throughout the project. Your project risk estimates, for example, will need to be updated as unknown risks are discovered.

Agile:

Agile projects use a more iterative planning process. Projects are typically divided into iterations or sprints in most Agile frameworks. Estimates would be made at the start of the

project, when the overall project backlog (list of features and requirements) was being created, and then again during each sprint.

Estimation can take place during the sprint retrospective as you update the backlog based on the sprint results. It can also happen during each new sprint's planning session.

4. Project Estimation Techniques In Software Engineering?

"Making a workable project estimation that is precise and accurate takes the discipline of a surgeon." – Savvycom

There is no one-size-fits-all solution, as evidenced by the variety of methods available. Making a perfect forecast that addresses all potential issues is extremely difficult. Software development is a dynamic process in which programmers are constantly learning new technologies and making new discoveries. This has a significant impact on the estimate.

However, throughout a decade of coding, our team at Savvycom has pointed out a few outstanding projects estimation techniques. We also recommend find out about this **work breakdown structure guide**.

Top-down Estimate:

Top-down estimating assigns an overall time for the project and then breaks it down into individual phases, work, and tasks based on the work breakdown structure of your project (**WBS**).

If a client specifies that the project must be completed in six months, a top-down approach allows you to take that overall timeline and estimate how much time you can commit to each project activity while still meeting the deadline that has been given by the client.

Bottom-up Estimate:

A bottom-up estimate is the polar opposite of a top-down estimate. You begin by estimating each individual task or aspect of the project using this method. Then you add all of the individual estimates together to create the overall project estimate.

This type of estimate is more accurate than the top-down approach because each activity is assessed individually. However, it takes longer to have a completed software estimation and requires more effort from the project manager as well as business analyst.

Expert Judgment:

Expert judgment is one of the most widely used estimation techniques because it is quick and simple. To estimate projects, this method relies on the expertise and intuition of experts.

It's most useful when you're planning a standard project that your team has previously completed or has knowledge about. Top-down and bottom-up estimates can both be made using expert judgment.

Comparative or Analogous Estimation:

To estimate project duration, comparative estimation employs past project data and a top-down approach. If similar projects took an average of eight months to complete, you'd expect the current one to take the same amount of time. Then, to get your lower-level work estimates, divide those eight months into tasks and activities.

Parametric Model Estimating:

Parametric modeling makes use of previous project data as well, but it tries to adjust the data each time to reflect the differences between each project. This method estimates the current project by pro-rating the details of previous projects that you have completed.

Assume your firm is in the business of building homes. To calculate the average project cost per square foot of the house, use metric modeling to divide the total cost of all previous construction projects by the square footage of each project. Then you'd multiply that number by the current home's planned square footage to get your overall project budget.

Three-point Estimating:

Three-point estimating is a technique for generating bottom-up estimates that are sometimes used. You could assign three durations to a task instead of one; it may look like these: optimistic, pessimistic, and most likely. Your actual estimate is calculated by averaging these three numbers.

The PERT (**Program Evaluation and Review Technique**) method employs three-point estimating, but it uses a weighted average of the three, with the "most likely" guess receiving the most weight.

5. Step by Step to a Successful Software Project Estimation:

Like what we've mentioned above: estimation's goal is to predict the amount of money, resources, and time required to complete a project. But there is a lot to consider depending on

the estimation case, be it a new project, changing teams for an ongoing project, or just contemplating a new idea for investment.

We have listed below a few tips to help you better visualize your future development plan:

Define Project Type and Environment:

It's critical to think about the framework in which the project will be executed before you start working on project estimation. In the world of project management, the two most common types of projects are waterfall (also known as cascade) and agile. Frameworks and methodologies for each type exist, including Prince2 (waterfall), Scrum (agile), Extreme Programming (agile), and others.

Understanding The Scope Of Work:

When it comes to determining the size of your project, it's crucial to decide what you want to accomplish and how far you want to go. According to reference material, there could be breakdowns in some functions. A detailed description of the probable scope and elements of the system will be provided.

Without considering these factors, the estimating work can become more unpredictable and challenging in some circumstances:

- Encourage conversation to improve understanding.
- You can learn a lot from the existing products similar to the ones you will develop.
- Spend more time researching the industry.

Prioritizing Tasks In The Project:

Money, time, and manpower estimates and constraints on the project make achieving the stated goals considerably more difficult. The value of each functional priority must be clarified in these scenarios in order to concentrate on the most critical ones.

A precise estimate of the project's priorities from the start would also help keep it on schedule. A lot of time and effort could be saved if fewer revisions and additional needs are required during the development process.

Choosing Estimation Techniques:

Software development project estimation is often laborious and time-consuming. If done poorly, it may result in a client's disappointment. You can choose from several methods and techniques that we have listed above.

Write Down Every Possibilities:

During the estimation process, it is impossible to specify all conceivable assumptions. However, it is preferable to address as many of them as possible in order to prevent any potential for uncertainty. This will help the parties involved in the estimation process to have a better knowledge of each other.

Revising Your Estimation:

As the saying goes, "Two heads are better than one." While working on a software estimation project, revising with other estimators can help you anticipate projects much faster and more precisely. The only possible drawback is the time constraint involved. More people equals more ideas, as the saying goes. In this case, you – the project manager must be able to make an informed decision as to what suggestions and what changes to implement.

Use Software Estimation Tools:

There are several software solutions used for estimation. While they won't do the entire work for you, they will make it easier:

- For this, **GitLab**, **Jira**, and other Agile task management services can be used. The man-hours spent on each task can be tracked using time tracking software. This will serve as a reminder in the future.
- **Redmine**'s cost estimation add-on makes calculations simple. It lets you set an hourly rate for each task and calculates the total.
- **EcoSys** can keep track of changes and link man-hours to costs. In a comprehensive table, it provides a complete estimate.
- **Google Sheets** and **Microsoft Excel** are also popular. They have calculation capabilities and are more user-friendly.

Special Request From Client:

"The customer is always right" has to be one of the oldest sayings in the book when it comes to basically every buying or selling activity. Some clients may have special requests for their products. However, when the demand is too far-fetch, and over the horizon, you need to explain it to them. If it is done right, it becomes a framework for the evaluation of all future products that may lead to success.