

Unit 4: Estimating Tools and Risk Assessment

1. Select an appropriate tool for project estimation based on a number of common factors.

Estimation, often referred to as the 'black art' due to its subjective nature, is a challenging task in project management. However, this 'black art' can be mastered with a good formal estimation process. Such a process can enhance the accuracy of estimates, increasing the likelihood of projects being completed on time. Equipped with sound techniques and a deep understanding of what makes estimates more accurate, a project manager is crucial in creating successful estimates for any software project. This contrasts off-the-cuff estimates, which can be inaccurate and lead to late projects (Stellman & Greene).

Laoyan (2024) underscores the pivotal role of project managers in the estimation process, emphasising their empowerment in shaping the project's trajectory. Project estimation involves predicting the time, cost, and resources needed from start to finish. This process relies on leveraging past information such as timelines, budgets, experience, and stakeholder requirements. Effective stakeholder management and thorough requirements gathering are essential for creating accurate project estimations, showcasing the significant contribution of project managers.

The project management triangle, which encompasses cost, scope, and time, is a fundamental tool for estimating a project. According to Laoyan (2024), six standard estimation methods are available, each offering a unique approach to project estimation. With their diverse approaches, these methods cater to different requirements and complexities, providing project managers with a flexible toolkit. This

flexibility instils confidence in project managers, assuring them they can adapt to any project's unique needs for accurate estimation.

- Top-down estimation breaks down a project into smaller phases and tasks based on the estimated final time. This technique is often paired with the work breakdown structure (WBS) project management strategy.
- Bottom-up estimation estimates each smaller task's time and adds them to the final project deadline.
- The three-point estimation method is a valuable tool in project estimation. It takes the average of three variations of a bottom-up estimation, such as the most optimistic, pessimistic, and likely timeline. This approach provides a balanced estimate, considering both best-case and worst-case scenarios, thereby enhancing the accuracy of project estimations.
- Analogous estimation uses past projects to identify similarities and differences between current projects. This helps estimate the cost, scope, and time of the project.
- Parametric estimation uses historical project data to estimate resources, budget, equipment, and timeline. This method is often combined with analogous estimation to create a more accurate estimate.
- Expertise-based estimation is based on the project manager's experience. Due to their previous experience, they may know how long a specific type of project will take. If using expertise-based estimation, it's best to discuss it with an expert in their field or combine it with other estimation methods.

2. Utilise the tool to create a project estimate.

The estimating process involves obtaining project details, developing a project work breakdown structure (WBS), creating a rough project plan, determining staffing and project duration, assessing risk, validating the estimate, and reviewing it with stakeholders. However, this process is ineffective due to the lack of an estimating methodology, poor project results, and insufficient risk assessment. Automated estimating tools are essential for improving the process, leading to accurate estimates, schedules, cost and budget, staffing optimisation, and customer satisfaction (Lawrence, 1994).

A Work Breakdown Structure (WBS) is a systematic and practical approach to project management that divides a project into a hierarchy of deliverables and tasks. It helps

organise and understand the scope in smaller, manageable components and defines detailed cost or time estimates, guiding schedule development and control. Without creating a WBS, it becomes challenging to granularise the work needed on any project, leading to missed expectations and budget overages (Harned, 2019).

Harned (2019) states that the work breakdown structure (WBS) is an indispensable tool for estimating projects. To create a WBS, we must list the project's high-level deliverables, such as sitemap, wireframes, page designs, front-end and back-end codes. We need to break down each deliverable into tasks and scrutinise what needs to be done to create each. This meticulous approach helps us account for all the time required to complete the project and make a practical estimate.

After that, we need to get into the nitty-gritty with subtasks and specify precisely what goes into each task. This helps us account for any expenses beforehand and ensures no surprises when deep into the project.

We can format the WBS and estimate the work in flowcharts or spreadsheets. Once we have listed all possible tasks and subtasks, we must review the list and discuss each task in terms of the level of effort required. Assigning an increment of time to each task helps us add up a total estimate of time and possible cost, which is critical for efficient project management.

3. Evaluate the usefulness of the tool in estimating.

Project estimation techniques are vital to aligning six key constraints: scope, time, cost, quality, resources, and risk. These techniques involve experienced team members and industry experts and use proven methods such as analogous, parametric, Delphi, 3-point estimates, etc. By leveraging these methods, project managers can confidently

plan, budget, and execute projects to meet business objectives while mitigating potential risks (Simplilearn, 2024).

Three-point estimating is a project management technique that accurately estimates task duration, effort, or cost. It involves identifying the task and determining three estimates based on optimistic, pessimistic, and most likely scenarios (Hati, 2023). The chosen formula is then applied to calculate the estimated value. The results are analysed to gain insights into potential variability or risks. As Hati (2023) emphasises, the benefits include improved accuracy, risk assessment, enhanced decision-making, and more realistic planning.

For instance, the 3-Point Software Estimation Test methodically breaks down tasks into sub-tasks and estimates each using three scenarios: best case, most likely, and worst case, as explained by Bhadoria (2022). The estimate is calculated using the double-triangular distribution formula, which measures the effort. This test provides a more precise estimation and significantly reduces the risk of failures. The formula for effort is $E = (b+4m+w)/6$, and for standard deviation, $SD = (wb)/6$.

On the other hand, Arun (2023) explains that a PERT Chart is a highly effective method used to analyse the time required to complete tasks and their dependencies, determining the minimum time needed for a project. It considers three-time estimates: optimistic time (T_o), pessimistic time (T_p), and most likely time (T_m). To create a PERT chart, define the project scope, establish task dependencies, and determine task duration. Create a network diagram, add critical path information, and update the chart regularly to reflect changes in the project. The final chart should effectively display these relationships.

4. Discuss risk evaluation and mitigation approaches.

Enterprise Risk Management (ERM) is an absolute necessity for organisations, and it must be implemented to identify, evaluate, and manage risks at the enterprise level. ERM is crucial to mitigate financial distress, low earnings performance, and other challenges while pursuing growth opportunities and maintaining board independence (Anton & Nucu, 2020).

According to Verner et al. (2014), global software development (GSD) projects face significant risks, including increased complexity, communication issues, and a lack of business know-how. Offshore projects also incur additional costs like communication, coordination, and infrastructure issues. Therefore, clients must monitor development carefully and engage experienced project managers to understand the most widespread risks while dealing with the increased risks of GSD.

Risk management identifies, analyses, and mitigates risks to prevent adverse impacts. Risk mitigation is focused on reducing exposure and potential impact of risks. Companies can use various strategies to manage risks successfully and balance taking opportunities and avoiding threats. While risk management and risk mitigation are related, they are different. Risk management is about developing plans to prevent or lessen the impact of risks. In contrast, risk mitigation involves taking actions to reduce the probability of risks occurring and their potential adverse effects. This can be achieved by implementing different controls such as policies, procedures, and technology (Jones, 2023).

According to Mitre (N.D.), risk management in a program can be categorised into five main options: assume/accept, avoid, control, transfer, and watch/monitor. To take/accept risk, it is imperative to collaborate with operational users to comprehend

the risks and their consequences, such as their impact on cost, schedule, performance parameters, and mission performance. Users must be involved in characterising mission impact to select the appropriate option.

To avoid risks, provide estimates of the schedule adjustments required to reduce risks associated with technology maturity or additional development. This will aid users in comprehending the operational implications of an "avoid" option. To control risks, analyse various mitigation options, such as using a commercially available capability instead of a contractor-developed one. While considering solutions from other organisations, evaluating any architectural changes needed and their impact is crucial.

Acquiring and maintaining awareness of organisations that focus on specialised needs and their solutions is essential to transfer risks. This is particularly important when the risk involves a narrow, specialised area of expertise not typically found in program offices. Acquire this awareness early in the program acquisition cycle when transfer options are more easily implemented.

To avoid adopting a "heads-down" attitude, watch/monitor is vital. This involves revisiting the basic assumptions and premises of the risk periodically. The risk may have changed significantly, making the current mitigation ineffective and needing to be scrapped, or it may have diminished, allowing resources to be redirected.

However, Tiara J. (2023) emphasises that risk assessment and mitigation are essential in project management. The process involves identifying potential risks, assessing their probability and impact, developing mitigation strategies, and monitoring and controlling them. The first step is to identify risks, which can be categorised into technical, operational, or financial types. Probability and impact are then assessed using a risk matrix. High-priority risks are identified and mitigated through contingency

plans, process improvements, and resource allocation. The project team must be involved in the development process to ensure support. Regular monitoring and control of risks are essential for effective mitigation strategies. This ongoing process ensures project success and prevents costly delays or failures. The involvement of the project team and regular communication of updates are crucial for transparency.

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