Chapter 5: Estimating Resources and Duration

Key Learning Points

- Accurate estimates require understanding human, material, and financial resource needs.
- Overestimating wastes resources; underestimating risks, delays, and overruns.
- Estimation techniques (expert judgment, historical data, parametric models) improve accuracy.
- Resource reports track planned vs. actual use for better control.

As planning continues in the project lifecycle, one of the most critical and sometimes difficult tasks is estimating what resources are needed and how long each task will take. Effective **resource and time estimation** ensures that projects are not only staffed correctly but also have the right tools, materials, and schedule to support successful completion. When done well, these estimates help teams stay on time and on budget. When done poorly, they can lead to missed deadlines, overworked teams, and budget overruns.

According to the **PMBOK® Guide**, estimating resources and durations is a core part of the **Planning Process Group** and is closely tied to two Knowledge Areas: **Project Resource Management** and **Project Schedule Management**. Resource estimation includes identifying what types of people (by role or skill), tools, equipment, or materials are required to complete each task. Duration estimation, on the other hand, involves calculating how long each task will take, considering both the resources available and any dependencies or constraints.

Types of Project Resources in For-Profit Business Projects

In for-profit business projects, resource estimation must account for a variety of resource types, including:

- **Human Resources**: Employees and contractors such as project managers, software developers, marketing specialists, graphic designers, engineers, customer service reps, and financial analysts.
- **Technology Resources**: Hardware, software, licenses, servers, project management tools (e.g., Jira, Asana), and development platforms.
- **Material Resources**: Physical supplies, print materials, components, inventory, and consumables needed for project completion.

- **Financial Resources**: Budget allocation, labor costs, procurement costs, vendor contracts, and contingency funds.
- **Facilities and Equipment**: Office space, meeting rooms, workstations, printers, manufacturing machinery, or specialized tools needed to execute tasks.

For example, in a digital product launch project, you might require:

- A **UI/UX Designer** (human resource) to design interfaces,
- **Adobe Creative Cloud** (technology resource),
- Promotional **flyers and merchandise** (material resource),
- A budget of **$15,000 for ads and production** (financial resource),
- A **studio space** for recording the product demo (facility/equipment resource).

Estimating can be done using several techniques. One common method is **analogous estimation**, which uses data from previous similar projects to predict effort and duration. For example, if a previous product launch took two marketing professionals three weeks to design and run a campaign, you might estimate a similar timeline and personnel need for your current launch. Another method is **parametric estimation**, which uses mathematical formulas based on known variables. For instance, if one customer service rep can resolve 20 support tickets per day, and the project anticipates 200 tickets, it would require 10 person-days.

While estimating, it's important to consider **availability and skill levels** of your team members. A senior developer might complete a coding task in half the time of a junior developer. Similarly, bottlenecks may occur if multiple tasks require the same person or tool at the same time. Time buffers or contingency time should be built into estimates to accommodate potential delays such as sick days, rework, or unexpected challenges.

One of the major challenges in this phase is uncertainty. Early in a project, you may not have all the information needed to make precise estimates. Stakeholders may push for overly optimistic timelines, or team members may underestimate how long tasks take. To reduce risk, project managers often create **estimation tables** that include best-case, worst-case, and most likely durations for each task—an approach known as **three-point estimating**.

Analogous Estimation (Top-Down) Example

Analogous Estimation in a For-Profit Business:
A retail chain is planning to open a new store in a nearby city. The last store of similar size and location cost **$1.2 million** to build and took **24 weeks** to complete. Based on this, the project manager estimates the new store will also cost around $1.2 million and take 24 weeks.

- **Pros:** Quick, uses historical data
- **Cons:** May miss cost differences due to inflation, labor rates, or unique site issues

Parametric Estimation Example

Parametric Estimation in a For-Profit Business:
A software development firm knows from past projects that developing a standard app feature takes **40 hours** at a labor rate of **$100/hour**, for a total of **$4,000** per feature.
For a new client app that requires **15 features**, the cost is estimated as:
15 features × $4,000 per feature = **$60,000**.

- **Pros:** More accurate if data is reliable
- **Cons:** Requires detailed and consistent historical data

Example: Resource Estimation Report for a Marketing Campaign Project

Task	Assigned Resource	Type of Resource	Estimated Duration	Estimation Method
Design Social Media Graphics	Graphic Designer	Human	5 days	Expert judgment
Create Campaign Landing Page	Web Developer + QA Tester	Human	8 days	Historical data
Run Paid Ads	Marketing Specialist	Human	4 days	Analogous estimation
Purchase Ad Space and Licensing	Ad Budget ($5,000)	Financial	1 day	Fixed cost, internal policy
Print Promotional Materials	External Vendor	Material + Financial	3 days	Vendor quote
Set up Analytics Tools	Google Analytics, Meta Ads Manager	Technology	2 days	Parametric estimation

This table helps the project manager clearly document each task, determine who or what will be used to complete it, and estimate the time and cost involved. This also supports later schedule development, resource allocation, and risk planning.

Validating Resource Estimation

Whenever resources are being estimated for use on a project, it is assumed that those resources cover the needs and will be available for the duration needed on the project and for the cost estimated. As a project manager, it is good practice to validate the information in the estimate that you create. Even once you have consulting with subject matter experts and leadership, it is good to review the overall estimate for a final approval. Here's how to validate resource estimates effectively setting:

1. Cross-Check with Historical Data

- Compare your estimates against similar past projects in your organization or industry.
- Look for differences in scope, complexity, or conditions that could affect the estimate.
- **Example:** If a previous retail store build required 8 electricians for 4 weeks, but your current estimate has 4 electricians for 3 weeks, you may be underestimating.

2. Involve Subject Matter Experts (SMEs)

- Ask team leads, technical experts, or vendors to review your estimates.
- They can identify unrealistic productivity assumptions or overlooked resources.
- **Example:** A senior developer may tell you that integrating a third-party API typically takes 3 days, not the 1 day you've planned.

3. Validate Availability

- Confirm that the resources you've listed are available when needed.
- Check calendars, contract start dates, procurement lead times, and equipment schedules.
- **Example:** Your marketing team may be busy with another campaign during your planned project window, meaning you'll need either different resources or to shift the timeline.

4. Use Multiple Estimation Methods

- Compare estimates from different methods (analogous, parametric, bottom-up, three-point).
- If they vary widely, investigate why and adjust.
- **Example:** If your analogous estimate says 200 hours but your bottom-up says 280 hours, you need to reconcile the difference.

5. Account for Risk and Contingency

- Add contingency buffers based on known risks (e.g., supplier delays, high turnover, equipment downtime).
- This is especially important for critical-path resources.
- **Example:** For a manufacturing line installation, you might add 10% extra labor hours in case of mechanical issues.

6. Review with Stakeholders and the Project Management Office (PMO)

- Present your estimates, assumptions, and supporting data for review and approval.
- This creates transparency and ensures alignment with organizational capacity.
- **Example:** The PMO may reject an estimate if it exceeds the company's resource allocation limits for the quarter.

7. Pilot or Prototype Where Possible

- For high-uncertainty work, do a small test run to validate effort and resource needs.
- **Example:** Test a single e-commerce page redesign to confirm time and staff requirements before committing to producing 100 pages.

References

Project Management Institute (PMI). (2021). *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)* – Seventh Edition. Newtown Square, PA: Project Management Institute.

Larson, E. W., & Gray, C. F. (2020). Project Management: The Managerial Process. McGraw-Hill Education.

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