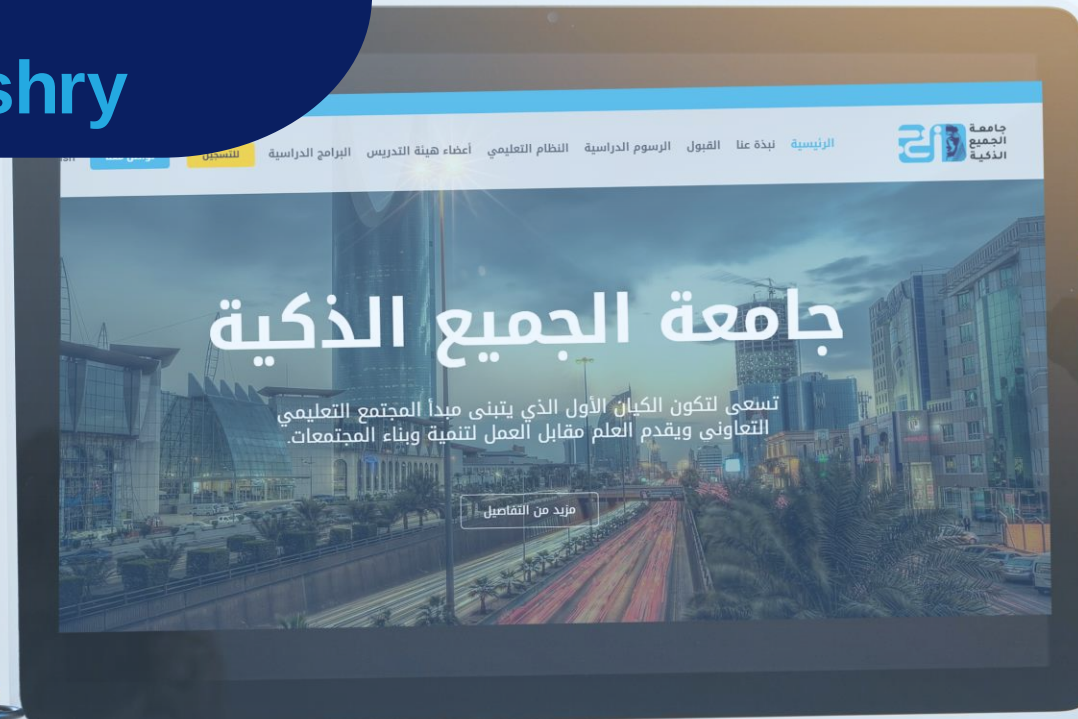


Project Management Technologies

Prepared by:

Dr. Mona Moustafa Elashry



PMG 312- L10

Section VI - Advanced tools and techniques

Ch. 21 - Simulation modeling

Ch. 23 - Team tools: RAM charts and staffing profile

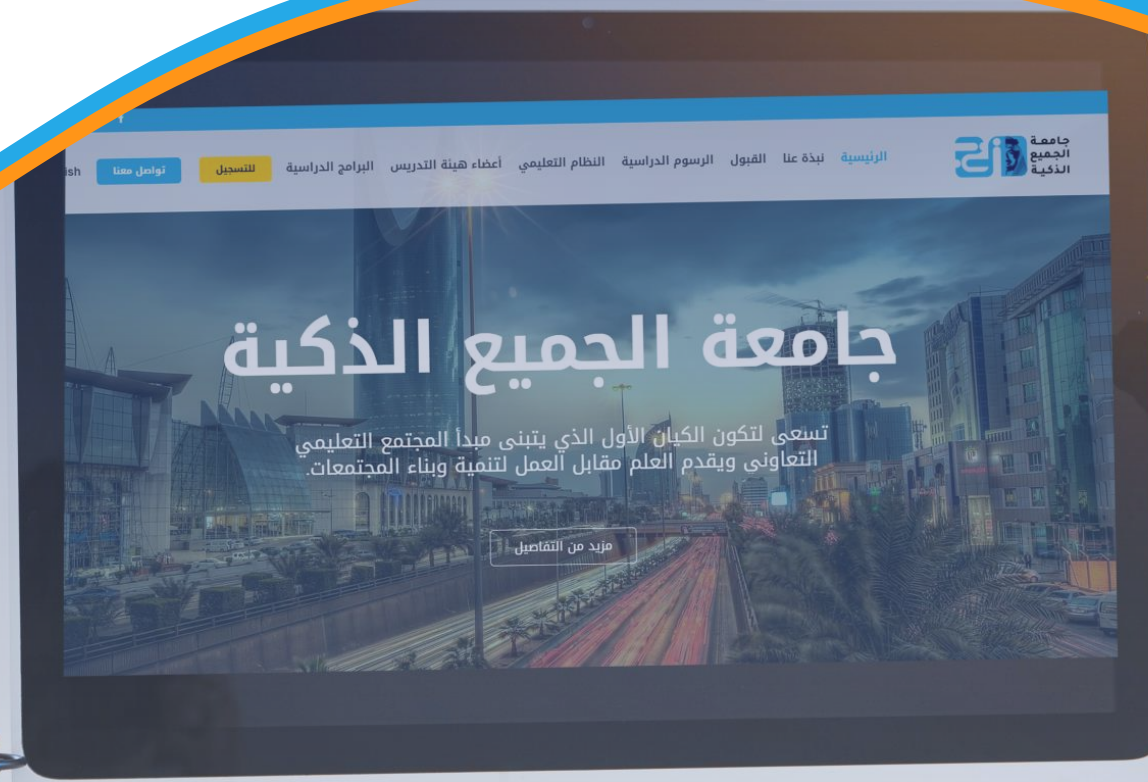
Ch. 24 - Enterprise project management Office - EPMO



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SVI - Advanced tools and techniques
Ch. 21 - Simulation modeling

- **Chapter 21 Simulation modeling**
- Introduction to simulation modeling
- Monte Carlo
- How does Monte Carlo work?
- Benefits of Monte Carlo
- Examples
- Executing the model
- Summary

- ❑ The goal here is to describe modeling and simulation as it pertains to the project model.
- ❑ The modeling methodology will be based on Monte Carlo type random value generation used to simulate variable performance for specific tasks.
- ❑ Modeling and simulation is an analytic discipline that allows us to develop a level of understanding regarding the interaction of the parts of a system, or tasks within a project, as well as the system or rather the project as a whole.
- ❑ Model dynamics produced through this technology can then simulate project probabilistic outcomes by assigning variable time values to project activities.

- ❑ Uncertainty is simulated using a computational algorithm tool such as Monte Carlo, which allows real-world phenomena to behave in variable forms.
- ❑ In the simplest terms, the Monte Carlo technique uses random numbers to describe these variable events.
- ❑ For this, the underlying model simulates the likelihood and impact of risk events such as predicting ranges of project cost or schedule.
- ❑ Full Monte is an MS Project add-in software utility that uses the Monte Carlo technique to produce time and cost analysis of a project model.
- ❑ Customized software such as this is extremely helpful in gaining a better understanding of the uncertainty present within the project environment.
- ❑ One of the outputs of simulation modeling is sensitivity analysis, which can be used in determining which risks have the most potential impact on the project.

- ❑ Therefore, it often explains when or during what period a task is on the critical path.
- ❑ In the case of the Full Monte software, it displays the optimistic and pessimistic duration times for each task.
- ❑ The format of this is a vertical bar histogram chart with the data category being the time range for a task.
- ❑ A tornado diagram format is also created in this process.
- ❑ These diagrams help us provide an expanded view of potential project outcomes and show where attention should be focused.
- ❑ The Full Monte report format provides an optimistic and pessimistic time range for when a task or total project is active.

- ❑ On the basis of defined probability distributions, the Monte Carlo technique provides an array of outcomes that could occur, resulting in a better schedule and cost overview when compared with a deterministic approach.
- ❑ Monte Carlo defines uncertainty through a probability distribution specification for each project task.
- ❑ From this, it can evaluate plan status by sampling each task with randomly generated values over thousands of cycles, and calculating values, again and again, using different random values from the probability functions.
- ❑ The iterative analysis process results in a histogram distribution of possible outcomes.
- ❑ Probability distributions for model components provide a realistic method for an improved understanding of real-world system behavior.

- ❑ Different probability distribution options can be used as noted in Table 21.1.
- ❑ Full Monte offers a range of these distributions that can be selected for this purpose.
- ❑ From these options, it is possible to generate random time and cost events such that the frequency of occurrence of any particular value is proportional to its probability of occurrence.
- ❑ Full Monte uses this data to simulate the probabilistic behavior of each task.
- ❑ Then, it uses these values to compute the MS Project plan, except that it now also stores the results for each iteration as it repeats the entire process hundreds or even thousands of times.

- ❑ The end result of this is a repository of model results that reveals the probabilistic range of outcomes resulting from the iterations.
- ❑ One typical way of displaying these results is in the form of a project completion histogram for time and/or cost.
- ❑ A project finish histogram describes the probability of a project finishing at each time within the calculated range.
- ❑ The corresponding project cost histogram calculates similar histogram data for the total cost of the project.
- ❑ Data of this type can be used to evaluate the variability of the project time or cost outcomes.

How does Monte Carlo work?

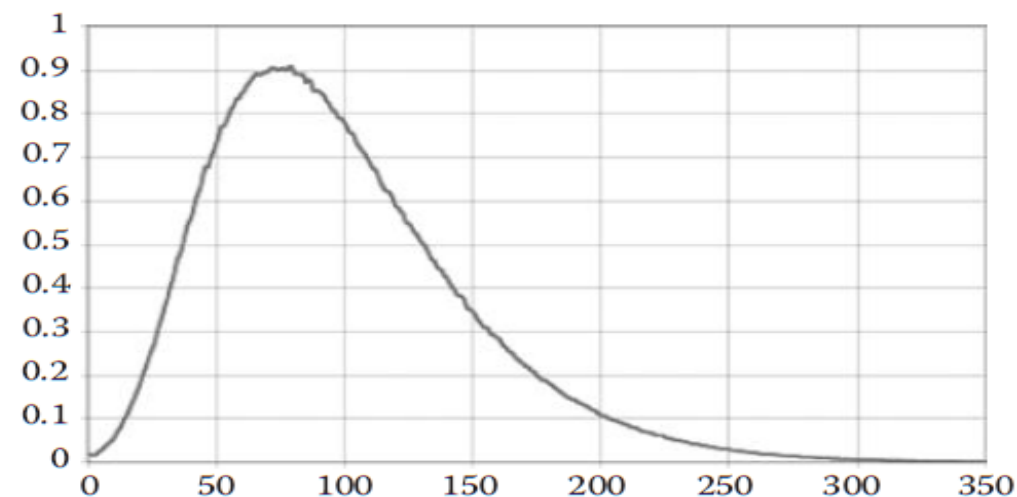
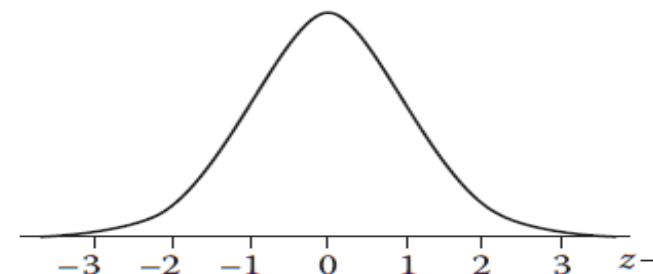
- ❑ Depending upon which probability distribution shape is chosen, the required data entry is either a 2 or a 3 data value.
- ❑ On the basis of these data values and the defined probability distribution, it is possible to define the various characteristics of the task.
- ❑ Once this is accomplished, a simulation can be executed based on random samples from those distributions.
- ❑ Iteration is the term given for each time the model is sampled and the outcome recorded.
- ❑ This generates a single value for the time and cost histogram.
- ❑ Repeating this process generates a comprehensive view of what may happen as well as how likely it is to happen.

How does Monte Carlo work?

Table 21.1 Probability Distribution Types

Type of probability distribution	Description
Normal	The symmetrical bell-shaped curve is concentrated in the center and decreases on either side with the values in the middle near the mean most likely to occur. It has less of a tendency to produce unusually extreme values, compared to some other distributions. It describes natural phenomena such as inflation or individual's weights
Lognormal	This curve has values that are positively skewed. It is used to represent values that do not go below zero but have unlimited positive potential. Examples of variables described by lognormal distributions include real estate property values, stock prices, and oil reserves

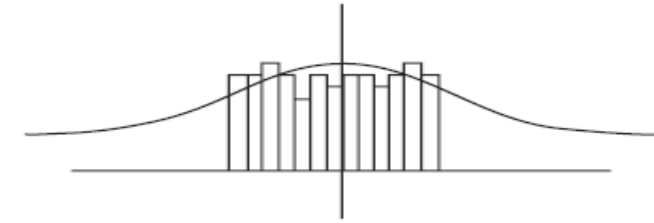
Visual



How does Monte Carlo work?

Uniform

All values have an equal chance of occurring such as tossing a coin with equal chances of getting heads or tails. The minimum and maximum values need to be identified



Triangular

It favors the most likely value and gets its name because the most likely value that is referred to as the mode creates the top point of the triangle. There is no requirement that the distribution is symmetrical about the mean and therefore depending on the estimates for minimum, maximum and most likely, the shape of the triangle may be skewed to the left (minimum) or right (maximum) values. Although the triangular distribution can model a variety of different circumstances, it can produce too great a value for the mean of the risk analysis where the maximum for the distribution is very large. An example of variables include past historical data such as sales

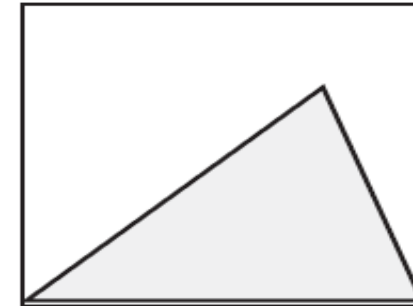
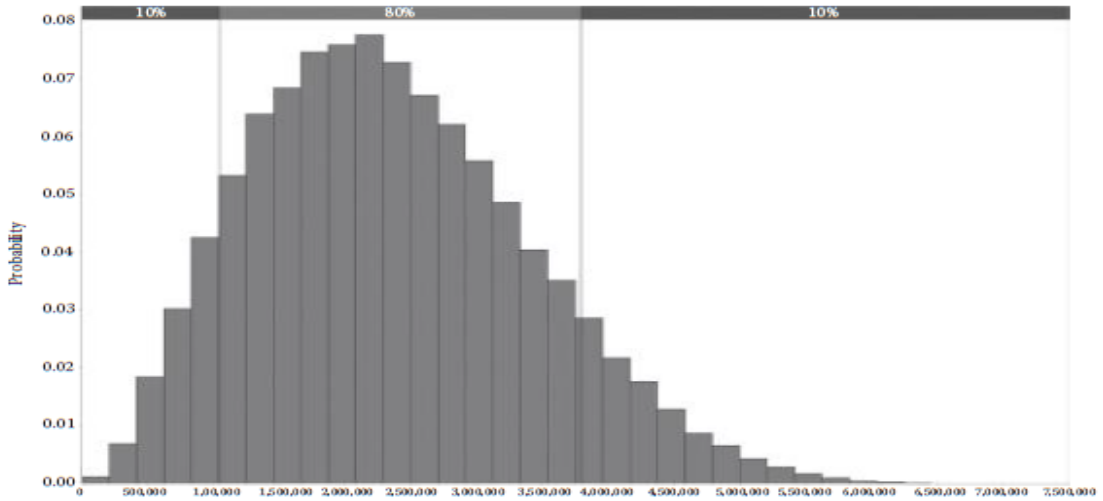
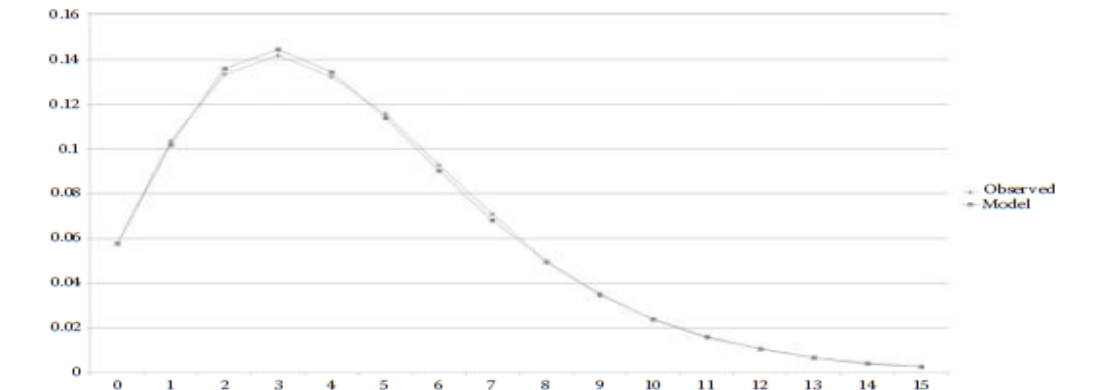


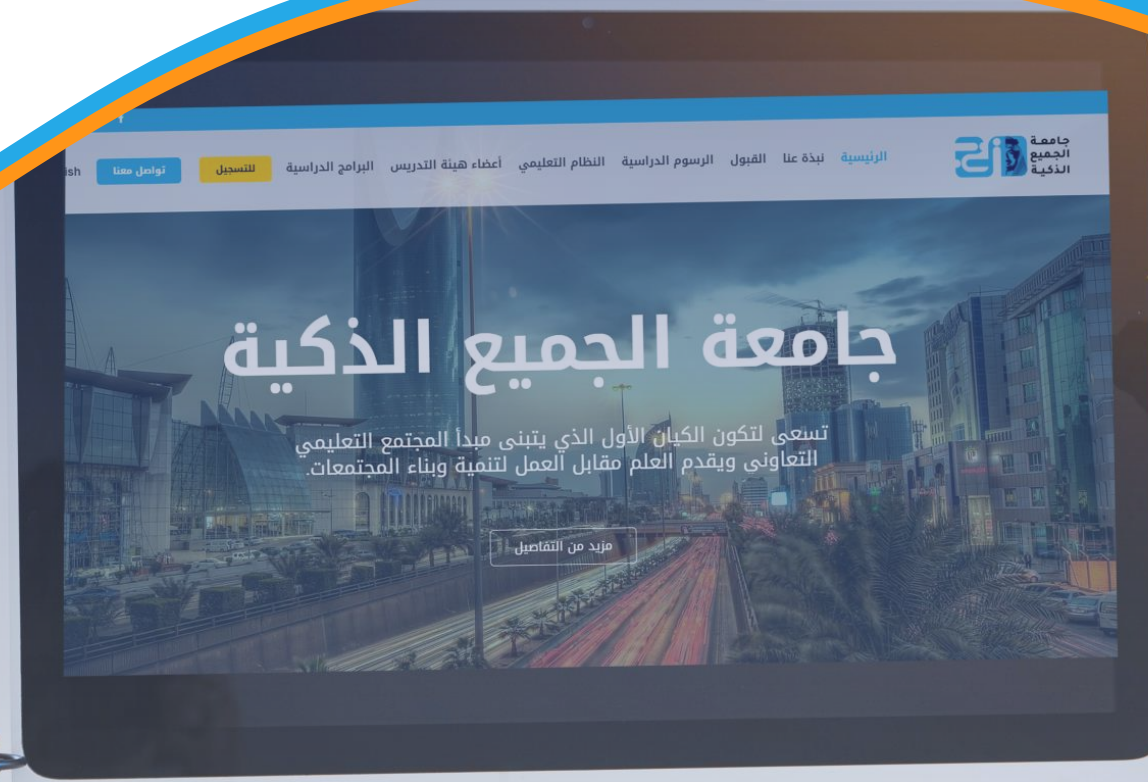
Table 21.1 (continued) Probability Distribution Types

Type of probability distribution	Description	Visual
PERT-Beta	This distribution is used for identifying risks to the project as well as cost models to predict the likelihood of the project in meeting specific goals. The PERT also known as PERT-Beta, which is a version of the formal beta distribution, yet requires the same three parameters as the triangle distribution consisting of the minimum, mode, and maximum. An example usage is to describe the duration of a project task	
Discrete	This distribution is used when there is a specific probabilistic value that occurs with each event. For example, flipping a coin 20 times will result in specifically 0–20 tails occurring as opposed to 2.3 times a tails occurring (as this is not possible because it is either heads or tails). An example might be the number of accidents on a college campus in a given month	

- ❑ Monte Carlo simulation has many benefits over deterministic or “single-point estimate” analysis.
- ❑ A sample of these benefits is listed as follows:
 - 1) Provides reasonable probabilistic estimates of the true project length.
 - 2) Provides a full probabilistic distribution showing the range of outcomes and how likely different potential outcomes are occurring.
 - 3) Permits use of various distributional assumptions for activity times.
 - 4) Does not require extensive historical data.
 - 5) Does not require assumption on linearity, distribution, correlation, or volatilities.
 - 6) Performs sensitivity analysis providing awareness regarding which inputs have the greatest effect on bottom-line results.
 - 7) Provides a greater problem understanding by having the data behind an outcome such as which input most affected a specific outcome.



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SVI - Advanced tools and techniques
Ch. 23 - Team tools: RAM charts and
staffing profile

- **Chapter 23 Team tools: RAM charts and staffing profile**
- Organizational definition
- Roles and responsibilities matrix
- Tracking tools and techniques
- Project close-out

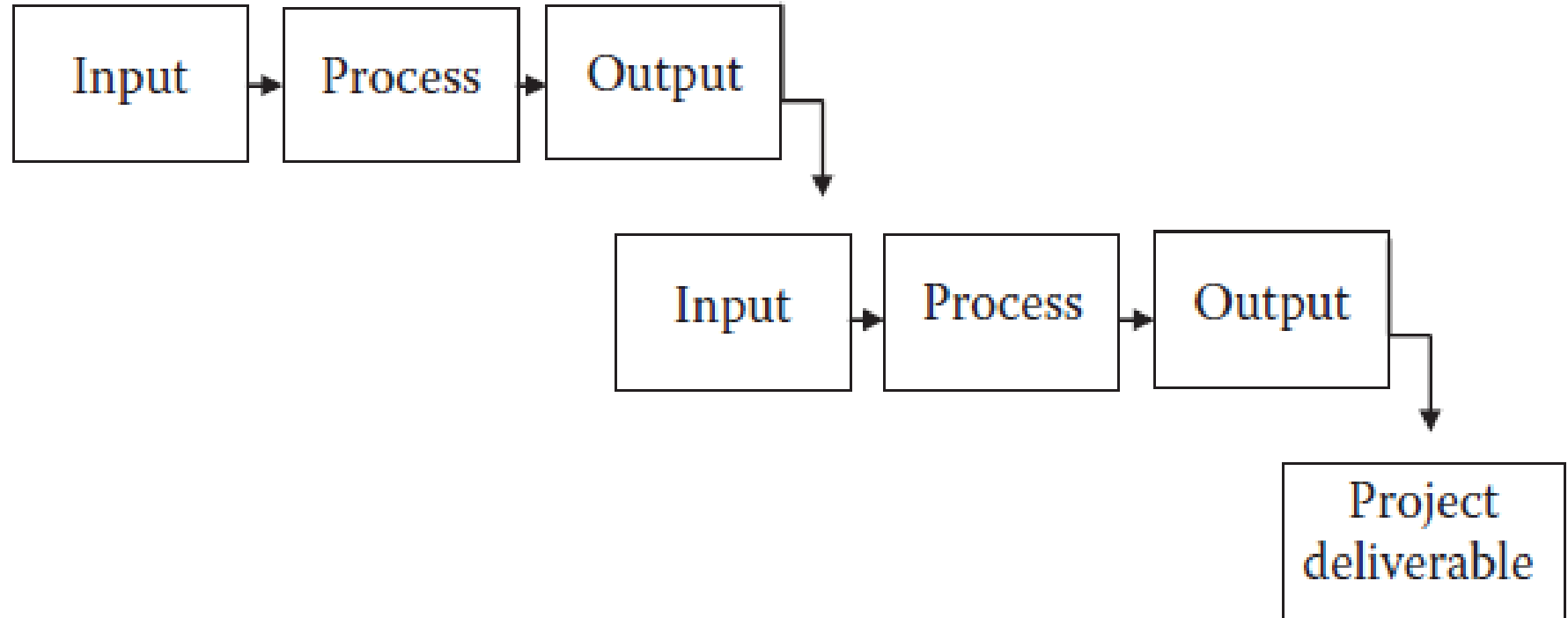


Figure 23.1 Team member's input and output.



Figure 23.2 Microsoft project Gantt chart.

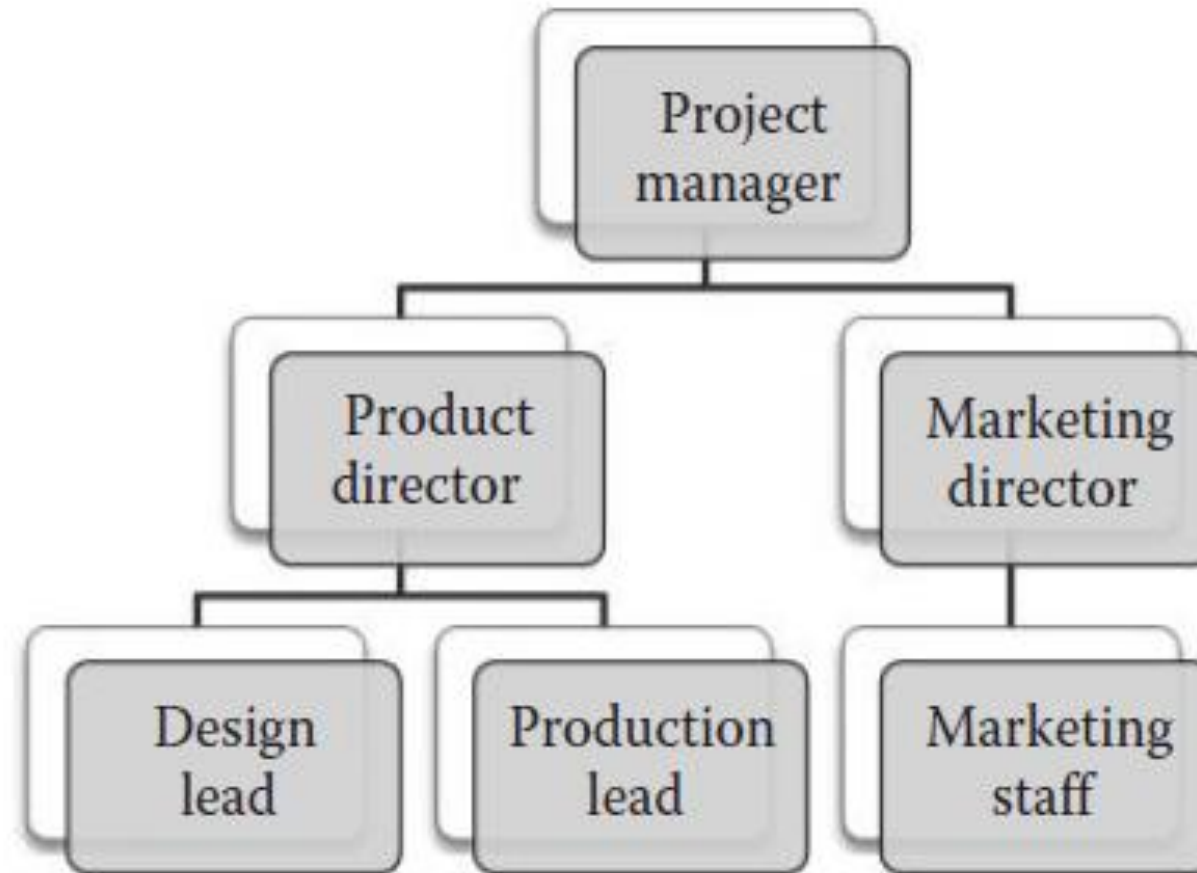


Figure 23.3 Organizational chart.

Table 23.1 Example of the RAM Chart

Tasks	Richie	Craig	Natalie	Mark	Ryan	Lindsay
Develop the database	X	X		X		X
Perform the statistical analysis			X		X	
Develop the website				X		X
Create the training manual	X	X			X	
Create the training survey		X				X
Conduct the training			X			

Roles and responsibilities matrix

Table 23.2 RACI Matrix

Task number	Tasks	Completed	Date task identified	Task due date	Richie	Craig	Natalie	Mark	Ryan	Lindsay
1	Develop the database	X	Month/ day/year	Month/ day/year	A	R	C	I		C
2	Perform the statistical analysis				A		R		I	C
3	Develop the website	X				R	C	A	R	I
4	Create the training manual	X			C	I		R	A	
5	Create the training survey					A	R		C	I
6	Conduct the training				R	I	I	C	A	R

Table 23.3 Examples for Roles and Responsibilities for a Team Member

Mark Bell's responsibilities	Task	Subtask
Task 1	Serve as a lead database designer responsible for assigning work and monitoring the work of other team members with a database role	• Identify database tasks • Assign database tasks to team members • Monitor each team member's progress on tasks weekly
Task 2	Serve as a lead website developer responsible for assigning work and monitoring the work of other team members with a website role	• Identify website tasks • Assign website tasks to team members • Monitor each team member's progress on tasks weekly • Update the website in terms of information • Design the website in terms of function • Arrange access for all team members to the employee login of the website and shared drive • Arrange access for all team members to the employee login of the shared drive

Table 23.4 Staff Management Plan Template

Table of contents for a staff management plan	Description
Introduction	This section typically contains the purpose of the plan, scope of the plan and processes, and the procedures or documentation used as part of the management of the staff
Process for the staff management	This section will contain how the PM will conduct planning of the staff, acquiring of the staff, training of the staff, tracking of the staff member's work and performance, and transitioning of the staff throughout the life cycle of the project
Roles and responsibilities	This section contains the specific roles and responsibilities of different categories of team members (the technical staff, the engineering staff, etc.), and different project stakeholders
Glossary / acronyms	A list of glossary terms specific to the project should be included in the plan as well as an acronym table
RACI (or RAM)	A RACI table or a RAM table should be included to ensure that this all the staff-related material is in the plan

Table 23.5 Commitment-Tracking Document

Commitment	Date of commitment	Person making the commitment	Person to which the commitment was made	Date commitment is to be completed	Comments
Demonstration of the website prototype	Month/day/year	Project team member Mark Bell	Customer Stan Thomas	Month/day/year	Team member Mark Bell will present the demonstration
Quarterly status review to the management	Month/day/year	Project team member Joseph Jones	Customer Norma Smith	Month/day/year	Team member Joseph Jones and the PM to present

Table 23.6 Communication-Tracking Document

Type of communication	Schedule	Communication initiator	Communication recipient	Communication format
Weekly status review	Every Thursday at 10 a.m.	Project Manager	Project team	Meeting/teleconference
Weekly team progress report	Close of business on Monday	Project Manager	Program Manager	Email
Monthly team progress report	First Monday of every month at 2 p.m.	Project Manager	Program Manager	Meeting
Project review	First and third Monday of every month at 10 a.m.	Project Manager	Project team	Meeting
Customer reviews	Second Monday of every month at 2 p.m.	Program Manager Project Manager	Customer	Meeting containing the customer and the responsible team members

Table 23.7 Project Description Document

Document name	Document developer	Document reviewer	Document distribution date	Distribution list
Commitment-tracking document	Project Manager	Program Manager Project team	Month/day/year	Program Manager Project team
Communication-tracking document	Project Manager	Program Manager Project team	Month/day/year	Program Manager Project team

Table 23.8 Revision-Tracking Document

Name of the person submitting the revision	Date the submission was received	Document affiliated with the submission	Submission accepted or rejected and reason	Date the submission was accepted or rejected	Reason for submitted change
Project team member John Smith	Month/ day/year	Communication-tracking document	Accepted	Month/ day/year	Provide an additional day of slack time between the team status review and the customer review
Project team member Alicia Gomez	Month/ day/year	Commitment-tracking document	Rejected because the PM prefers items that occur less than monthly to remain on the commitment document	Month/ day/year	Communication matrix may be an easier way to track the quarterly management status meeting

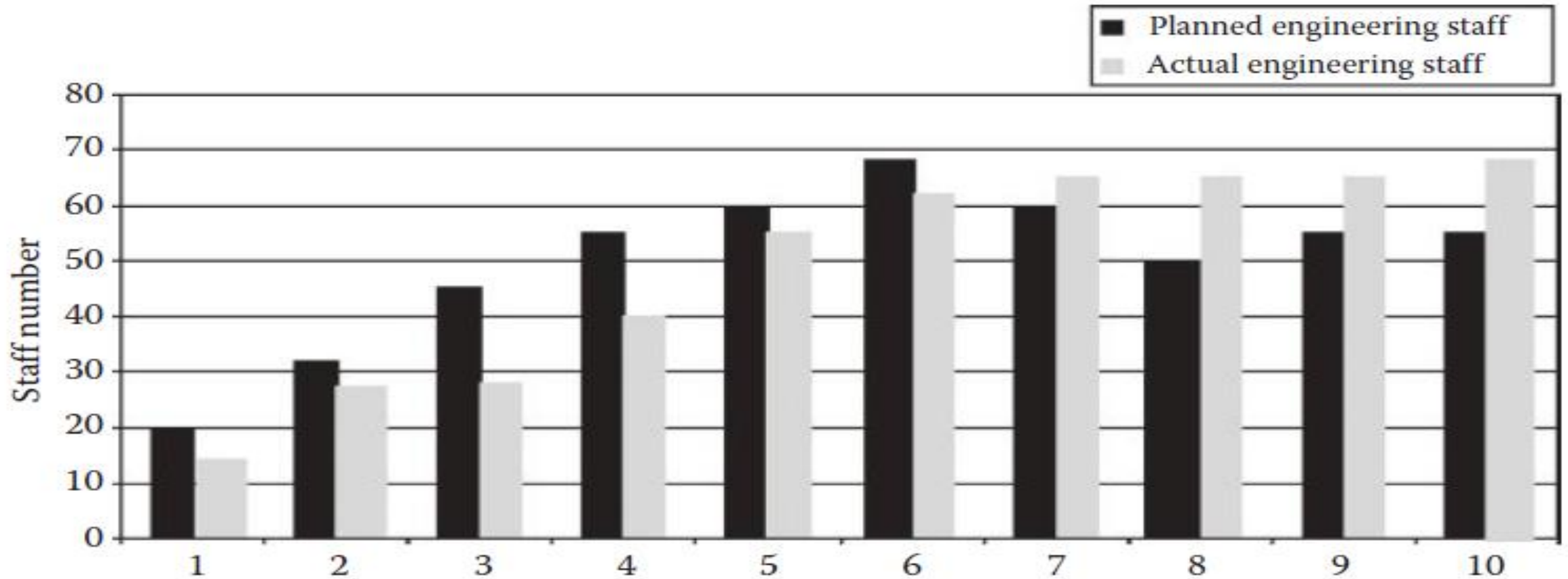


Figure 23.4 Staffing profiles.

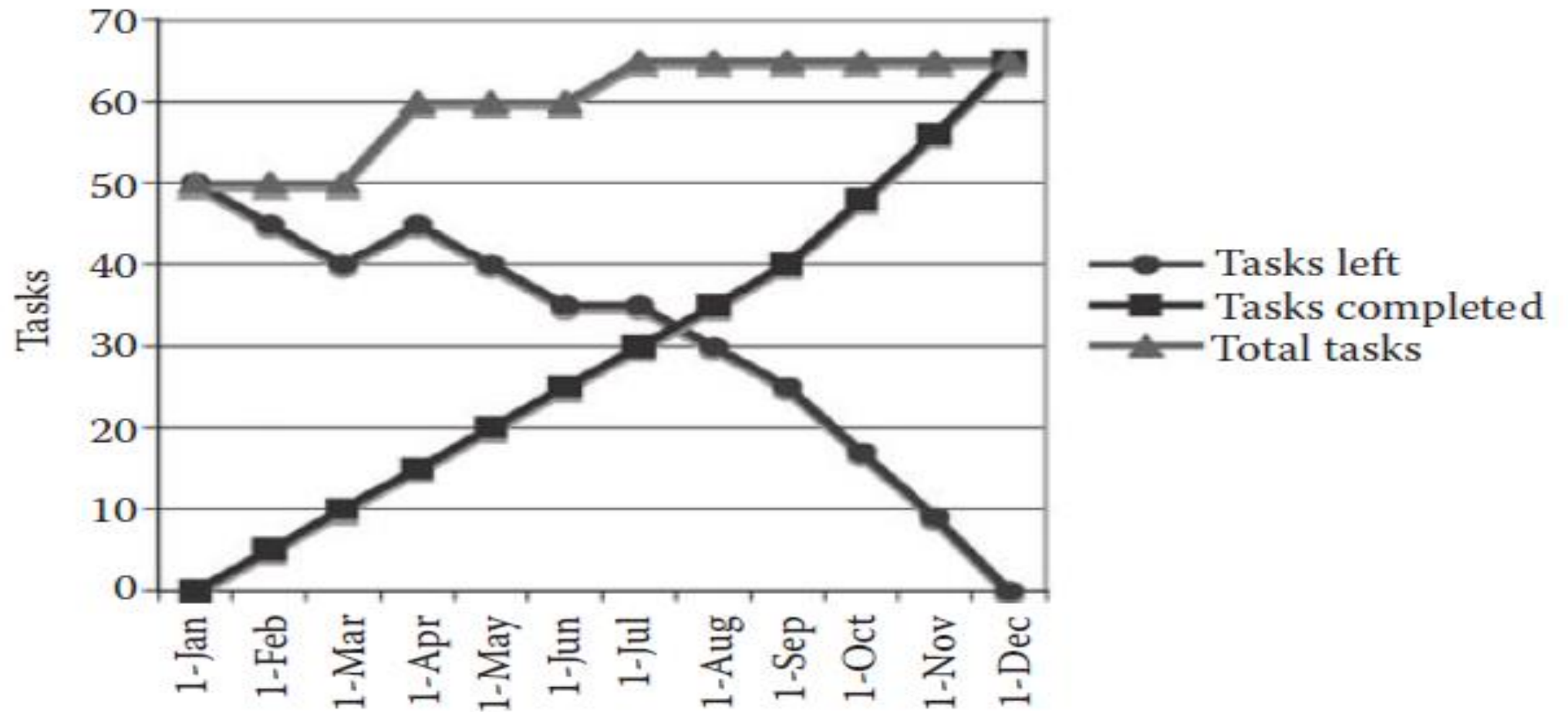


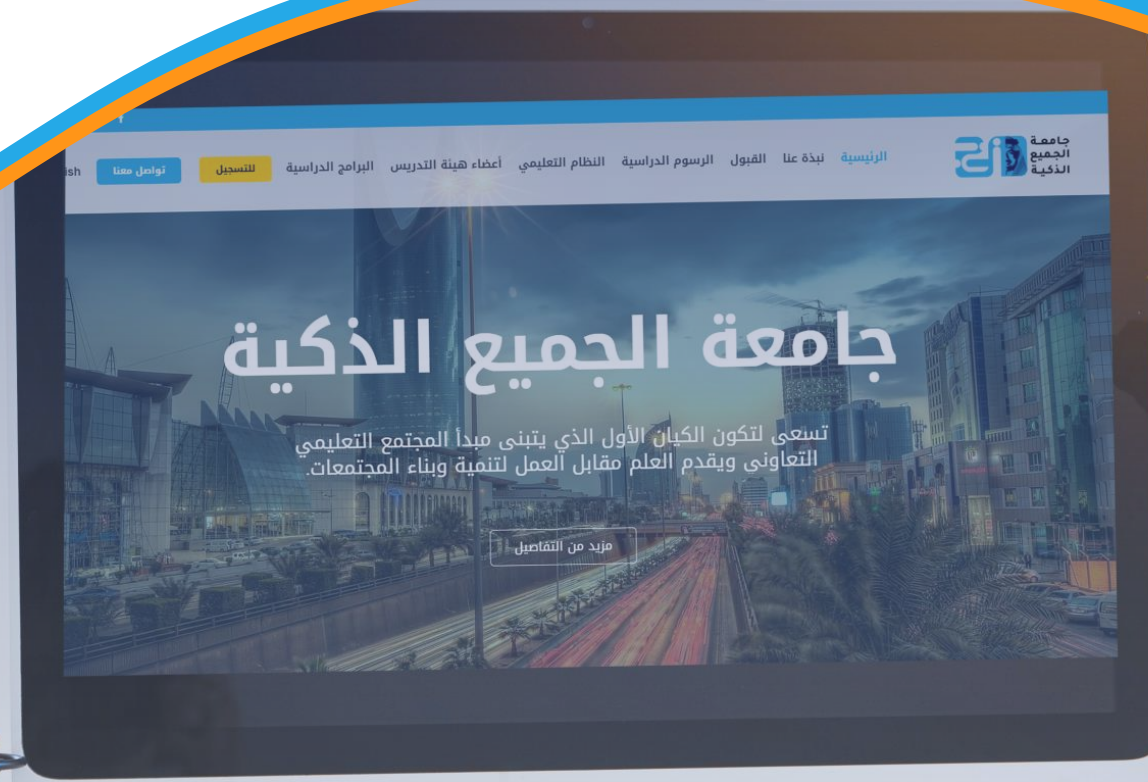
Figure 23.5 Velocity diagram.

Table 23.9 Examples of Metrics

Types of metrics	Examples of different metric types
Financial metrics	• Inventory levels • Cost per unit • Activity-based costing (cost per each sub-subtask activity) • Cost of poor quality
Customer metrics	• Customer satisfaction • On-time delivery
Metrics for internal business processes	• Defects • Inspection data • Supplier quality • Cycle time • Rework hours
Organizational learning metrics	• Training effectiveness • Lessons learned • Project schedule versus actual date • Total project savings



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SVI - Advanced tools and techniques
Ch. 24 - Enterprise project management
Office - EPMO

- **Chapter 24 Enterprise project management office**
- Introduction
- Project, program, and portfolio management
- Prioritize projects to align with strategic plans
- Moving to the enterprise project management office (or the rough road going from point “A” to point “B”).
- What is the organization maturity baseline?
- Steering committee
- Summary

Enterprise project management office-EPMO - Introduction

- ❑ The EPMO is created to assist in decisions related to making sure the right organizational projects are done at the right time, with the right tools and templates, and that they contribute to the organization's strategic plans.
- ❑ The following list summarizes 16 common reasons why this organizational initiative may suffer from mediocre success:

1	Authority	• Many PMO managers report to a functional manager who in turn reports to some higher-level executive. • This multi-layer reporting situation increases the challenge of proving the worth of the organization. • This can be enhanced if the PMO reports directly to the higher-level executive. • PMOs vary in size, responsibilities, and structure, but if they are embedded in a functional unit such as IT, the odds are that it is not a real EPMO because its focus is more limited to that organizational subgroup. • Also, the EPMO organization will be perceived as “just some IT thing” and as a result, it will not be respected as having a more global role.
2	Organizational alignment	• This problem occurs when the location or formal authority of the PMO function does not align or link with its design goals. • For example, this can include the project scope, planning time frame, or overall business objectives. • In addition to this, the PMO needs to align its key status measurements to the business objectives that executives value the most.
3	Process Involvement	• It is imperative that the PMO function be actively involved in the project selection process. • This will help to ensure that the correct projects are being pursued—in short, portfolio assets optimization.
4	Stovepipe view	• This management syndrome relates to the focus of the PMO organization. • In essence, it means that the PMO function should spend most of its time on creating strategic organizational synergy around the overall project portfolio that will add maximum business value.

5	Comparing projects	- To evaluate both proposed and in-work projects, it is necessary to develop a common evaluation measurement system. - Failure to accomplish this goal will limit the ability to compare current projects against each other and also to compare current projects against new project requests and strategic goals.
6	Leadership turnover	- Organizations are dynamic entities and key leadership roles often change. - Therefore, having a high personnel turnover in various organizational or PMO roles can negatively impact the value and stability of the PMO. - The importance of good and consistent leadership cannot be overstated. - The elements of quality and stability are the key considerations linked to PMO success.
7	It takes time to mature	- Starting up a PMO is not an overnight event. - This process requires total commitment by the entire organization. - It must be recognized that it takes multiple years for a PMO to mature, have repeatable processes, and fully add value to the overall organization. - If management is expecting quick results, they are often disappointed.
8	No methodology	- The value of a standard development process has been mentioned previously. - Organizations that have ad hoc processes or static ones generally do not profit from standardization and reusability. - A methodology should always be viewed as a living organism that constantly needs to be reviewed and updated. - If this is done, it has the result of producing valuable lessons learned and harvesting best practices from the industry.
9	Not all projects are equal	- In many cases, a PMO will develop a standard methodology and then require that all projects are executed in the same way. - This creates the image of excessive bureaucracy and reflects negatively on the perceived value of the PMO. - Small projects should have fewer required steps to reflect their smaller scope and lower complexity. - The decisions, regarding how to customize the management of various projects, are a key success element for the PMO. - If it is viewed as creating excessive overhead for no value, the organization will be shut down as a failure.
10	Keep projects under a year	- Projects that last longer than one year suffer a host of change dynamics that can negatively impact success. - Scope control is often lost as a result of these dynamics, as well as organizational interest in the goal. - If possible, projects scheduled for longer than a year in duration should be broken down into phases. - This minimizes the change dynamics and reduces the risk of failure.

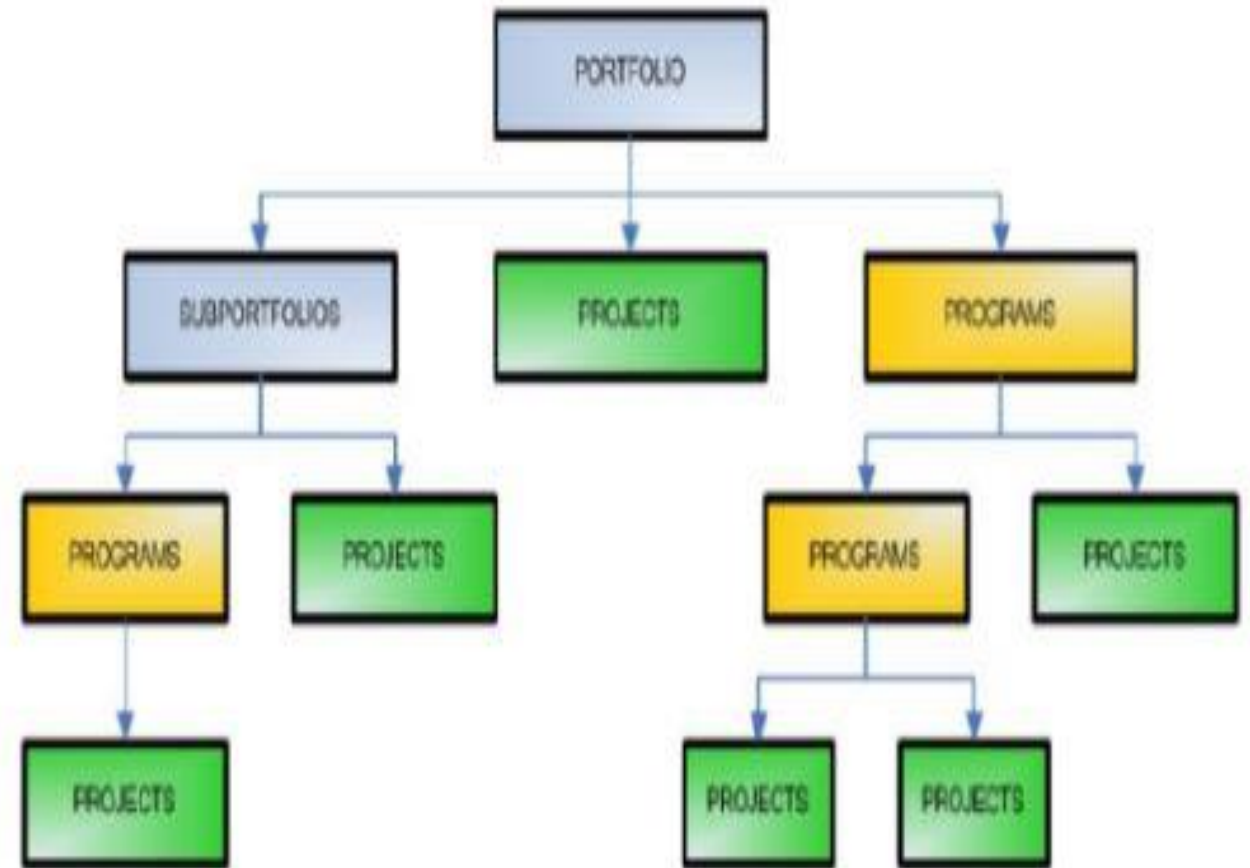
11	Training is important	- The quality movement of the 1940s highlighted the productivity value of training and that lesson is still valid. - If the organization does not invest sufficient resources in training to support formal project management or PMO initiatives, the overall operational maturity value gained will be lost. - Also, having an effective training program can help reduce employee turnover and employee satisfaction and loyalty. - Another HR enhancement strategy is to support various certification initiatives for employees for increased professionalism. - Supporting membership in professional organizations such as PMI should be considered. - In all of these examples, the idea is to make the employee more aware of the underlying theory that improves technical success.
12	Using contractors	- The practice of using contractors on project teams is controversial. - In some cases, an outside contractor can bring increased maturity to the management or technical process. - On the negative side, once they leave, that knowledge goes with them. - So, if supplemental contractors are used, the goal should be to transfer as much of that knowledge to the permanent workforce as possible.
13	Sponsorship is important	- Many projects have no active sponsorship or have weak sponsorship (i.e., lack of participation). - There is a high correlation between poor project sponsorship and project failure. - If the sponsor is not actively involved in the project, the project will often drift away from current goals and result in lower success, or even outright failure.
14	Canceling projects	- Project managers and stakeholders often get so locked into a project objective that they do not see that its value has eroded because of the changing environment. - In this situation, they often resist canceling a failing or redundant project. - One of the key roles of the PMO is to bring a more rational evaluation approach to the ongoing value analysis for the selected portfolio.
15	Resource management	- The process of helping in managing the overall project resource pool is one of the most valuable aspects of the PMO role. - Resource management is one of the most complex challenges for both the PM and PMO. - Many would consider failures in this area as the Achilles' heel of project management. - Failure to successfully link appropriate constrained resources to project needs is a core PMO objective.
16	Risk identification	- The Gartner Group estimates that poor risk management will result in the future cancelation of about 20% of all projects and that number may be conservative. - Since individual projects may not have access to this skill base, the PMO organization can provide this across the total portfolio and add increased value.

❑ What is the difference between project program and portfolio management?

- A program is a group of projects that are similar or related to one another, and which are often managed and coordinated as a group instead of independently.
- A portfolio is a group of different programs and/or projects within the same organization, which may be related or unrelated to one another.
- Generally, a project represents a single, focused effort.
- Programs are collections of projects together that constitute a complete package of work. The program's overall objectives are achieved through the complementarity of the various projects.
- <https://www.simplilearn.com/difference-between-projects-and-programs-article>

❑ What is the difference between project program and portfolio management?

- A portfolio organizes programs, projects, sub-portfolios, sub-programs, and operations to facilitate business benefits
- <https://www.simplilearn.com/difference-between-projects-and-programs-article>



❑ What is the difference between project program and portfolio management?

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- <https://www.simplilearn.com/difference-between-projects-and-programs-article>



Table 24.1 Part 1—Breakdown of Project, Program, and Portfolio Responsibility Areas

Areas	Project managers	Program managers	Portfolio managers
Scope	Project scope must be clearly translated into work (i.e., work included and work excluded). Strive to control scope creep, which is the dreaded scourge for most projects. It is vital to have a good change control process	The scope is larger and provides important benefits. Responsible for on-time delivery of projects that fall within the domain. To be successful, always provide support, assistance, guidance, and mentoring to the PMs	The portfolio view is a top-level view of every project an organization is engaged in and should be closely aligned with the direction of the business. Scope will always change when there are changes to the strategic goals and it is always important to work on the right projects
Planning	Elaborate the high-level project charter and scope into detailed plans to be executed	Create high-level plans to help guide the overall descriptions of the WBS work packages	Create and maintain processes to show you are meeting the aggregate goals
Management	Need to manage the project team to meet its deliverables	Need to manage the staff, including PMs, and provide vision and leadership	Need to coordinate staff and participate in communicating the organization's goals
Change	Change will always happen and it needs processes to keep change under control	Change will happen inside and outside the program and it needs processes to keep change under control	Monitor the constantly changing environment

Table 24.2 Part 2—Breakdown of Project, Program, and Portfolio Responsibility Areas

Monitoring	Monitor/manage the work to provide the expected results. This includes measuring progress regularly to identify variances within the plan, so corrective actions can be taken	Monitor progress of components, overall budgets, goals, schedules, and benefits to make sure they are being met	Monitor aggregate performance and key indicators, especially the financial ones
Success	Is measured by timeliness, quality, being within budget, and client satisfaction	Is measured by the degree of meeting its projected needs and benefits	Is measured by meeting its total needs and aggregate performance
Other	Less uncertainty to manage and project may or may not satisfy the strategic goals of the organization Keep in mind that about 70–75% of all projects come in late or are canceled Say “No” to unrealistic deadlines and propose realistic goals Always make sure the project objectives are well defined—clear, realistic and measurable, and frequently reviewed Communication is critical!	This is usually about satisfying strategic goals and delivering a business vision Greater diligence is needed when chasing a new technology strategy Typically, a program is made up of a group of related projects. It is possible to have such a large and technical project (i.e., ERP implementation) that this single project should be considered a program Communication is critical!	Execution processes must be reviewed and updated annually to stay relevant and useful to the organization The cornerstone of IT portfolio management is the selection process. Prioritization and optimization are vital for all aspects of portfolio management Involvement of key stakeholders is essential to establish, confirm, and focus on business priorities Communication and training are needed to develop stakeholders buy-in and to educate the portfolio management teams

- ❑ The EPMO must have a management-level steering committee for selecting and monitoring strategic and nonstrategic projects and the members would consist of at least
 - EPMO director (i.e., provides meeting agendas and a list of decisions that must be made)
 - VP vice president of business, CFO, and/or CEO
 - Key members from each one of the businesses (could be high-level and/or middle management)
 - CIO or key VP and a few key support members from IT
 - SMEs who would be added for key projects when expertise is needed

- ❑ One of the most important roles the steering committee will play is in the realm of culture change which includes changes to various HR, payroll, and procurement systems (Crawford 2011).

- ❑ These changes in thinking and implementation processes will not happen overnight.
- ❑ The steering committee needs to define what projects belong to what programs and what programs belong to what portfolios.
- ❑ Also, they need to define what projects meet short-term and long-term strategic goals and be able to prioritize the aggregates since there are limited resources available.
- ❑ The selection goal is to pursue high-value priority projects first before the lower-value (or no-value) projects, which would quickly drain the resource pool.

- ❑ Lower-value projects could be dropped or moved to the future.
- ❑ One of the tougher roles of the steering committee is to decide to kill a project that is underway because it is not evolving as planned, or the environment has changed since it started.
- ❑ This should not be looked at as an admission of failure but seen as improving the pursuit of organizational goals by reallocating project resources to more important projects that have a bigger impact and/or payback.

- ❑ In project management, the area of simulation modeling has become increasingly popular as a tool to evaluate variability of project outcomes based on probability estimates for the various tasks.
- ❑ Modeling and simulation is a discipline that allows us to develop an increased level of understanding regarding the interaction of the parts of a system, tasks within a project, as well as the project as a whole.
- ❑ Overall, simulation modeling tends to be more easily understood and more content-rich.
- ❑ The examples shown in this chapter have attempted to demonstrate the data requirements and core outputs of this process regardless of the brand utility used.
- ❑ For all of these reasons, this chapter's material represents a core plan analysis skill area for the PM.
- ❑ The next chapter will continue to broaden this general topic area by focusing on risk management mechanics.

- ❑ This chapter addresses the importance of an organizational chart as it provides all team members with an understanding of how each member fits into the overall project.
- ❑ It also provides the internal and external team members with information regarding the different levels of authority individuals on the project team have.
- ❑ Different roles and responsibilities tables were discussed as a means for the Project Manager and the team members to specifically identify different tasks that individuals have and which team members work together on specific tasks.
- ❑ Tracking tools were also discussed to help a Project Manager and project team track the frequency of meetings, assignments, commitments and revised documentation.
- ❑ A staff management plan also provides information to the Project Manager regarding which skill set is needed throughout the life cycle of a project for it to be successful.
- ❑ Lastly, the area of project close-out was discussed identifying the tasks that the Project Manager and the team members need to complete prior to officially ending a project.

- ❑ Finally, when initiating an EPMO, do not expect immediate overnight success— start out with small-duration projects and build up process maturity to show value to the organization. In the long run, this approach will pay off and people will realize the many benefits of having an EPMO.

Thank You



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