


PROJ5016
Project Time Management Strategies
Module 2- Planning & Scheduling
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- ▶ Project Time Management
- ▶ Planning vs Scheduling
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- ▶ Project Scheduling
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Time Management

- ▶ Time management involves managing both the time spent, and the progress made on tasks and activities during project life cycle.
- ▶ Excellent time management involves planning, scheduling, monitoring, and controlling of all project tasks and activities.
- ▶ This process is the framework for developing a sequence of activities, their respective durations, an estimation of the needed resources and how these fit into the overall project management plan.



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Project Time Management

- ▶ Project Time management includes the processes to manage the timely completion of the project.
- ▶ Project Time Management is mainly concerned with developing a realistic project schedule and controlling changes to the schedule



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Why is Project Time Management Important?

- ▶ Project time management impacts the overall quality, scope, and cost of a project. It is one of the most important project management knowledge areas.
- ▶ Successful time management helps the project manager ensure the completion of the project within the time and budget allocated.
- ▶ In addition, project time management helps in determining the time required to complete project, what stakeholders are needed to be involved in the process, and which expertise are needed to be included at any given point.



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Planning vs scheduling

- ▶ Planning and scheduling are two distinctive terms but are crucial terms of managing any successful project.



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Planning

- ▶ The process of project planning involves choosing the appropriate and most effective procedures in order to achieve and achieve the objectives of the project.
- ▶ It includes creating a work breakdown structure.
- ▶ Project planning takes place before project scheduling
- ▶ In other words, project planning is the process of communicating what and how much needs to be done.

Scheduling

- ▶ Project scheduling includes an in-depth examination of the details of a project.
- ▶ The process of assigning tasks and allocating budgets to convert the project action plan into an operating timetable.
- ▶ In other words, project scheduling is the process of allocating resources needed, and determining the time frame during which the tasks need to be performed.

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Project Planning

▶ It doesn't matter if the project is a new restaurant, a website, an online business, or a new building. Project planning determines the tasks that are crucial to achieve any project objectives.

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Project Planning

Project planning occurs when a project manager creates the project guide which includes:

- ▶ The project plan
- ▶ A detailed outline of all aspects of a project (aka project scope).
- ▶ Project duration.
- ▶ Project budget.
- ▶ Project restrictions.
- ▶ A detailed structure of the work breakdown.
- ▶ Risk analysis.

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Phases of Project Planning

- ▶ The project planning phases are :
- ▶ Initiating the project:
 - ▶ Identify the main project stakeholders, determine the basis of project scope, the budget, and the time-frame allocated for completing the project.
- ▶ Planning the project
- ▶ Determining project objectives.
- ▶ Deliverables
 - ▶ Determining the project deliverables that are crucial to achieve the project objectives.
- ▶ Creating the project schedule
- ▶ Risk assessment and tracking
 - ▶ Through identifying the project risks, if any, and develop suitable mitigation plans.
- ▶ Evaluating and closing.
 - ▶ Communicating the project plan to stakeholders and seeking feedback.

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Benefits of Project Planning

- 1- A guideline:
 - ▶ The project plan offers a roadmap that guides the projects starting at the initiation stage until the end and closing.
- 2- Documentation:
 - ▶ A concrete, effectively communicated project plan helps in having a reference through documenting the requirements of the customer which is crucial in providing concrete information rather than using assumptions that can be inaccurate and result in so many project errors.
- 3-Task Autonomy:
 - ▶ Planning helps the project manager to distribute tasks among the team members involved which gives them autonomy. In fact, involving employees in project planning inspires them to contribute to the project with their point of views, opinions, experiences, and skills which helps the project above and beyond the tasks assigns to each member. This helps the team members feel a sense of ownership and help them take pride in being a valued part of the team.

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Benefits of Project Planning (Cont'd)

- 4-Ensure the best optimal use of Resources :
 - ▶ Project planning provides a structure that enables the project manager to estimate resources, costs and time. It helps the project manager to eliminate wasteful activities that costs the projects money and time. In addition, it helps identifying any possible delays.
- 5- Mitigation Plan:
 - ▶ The project plan helps in predicting risks and avoiding mistakes through the planning of mitigations strategies that would help in identifying and employing actions that reduce or eliminate risks to the project.
- 6- Strengths and weaknesses of Previous Projects:
 - ▶ Project plans help the project manager to evaluate and improve the lessons learned whether it is the strengths or short comings of the previous projects. This is very important for tracking projects goods and end results.

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It is crucial at the planning stage for Project Managers to have answers to the following:



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What product(s) or service(s) are we delivering?



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What is the project scope?



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What is the project cost?



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What is the project schedule?



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How can we meet the needs of our Stakeholders?



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How are we going to measure our progress?




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Project Scheduling

- ▶ Estimation of essential materials and human resources at every stage of the project as well as an approximate calculated time to complete tasks at each stage.
- ▶ It specifies the start and end date of each project task and provides a logical association among different project tasks and activities.



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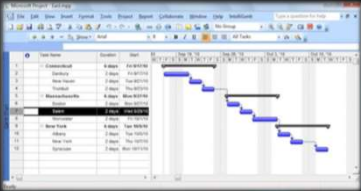
Project Scheduling

- ▶ The project schedule is the tool that guides the project management team of what work needs to be done, who will perform the work and the timeframes within which that work needs to be accomplished.
- ▶ A project schedule reflects all the work that needs to be done for the project to be completed on time.
- ▶ A project schedule assigns a duration to the project activities and the activities are sequenced in a logical order.

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Project Schedule

- ▶ Project schedule defines the start and end dates of the project and its activities.
- ▶ CPM, PERT, scheduling software are used to develop the project schedule. Microsoft Project is the most common tool used for project schedule development.



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Benefits of Project Scheduling

- ▶ Reduces Lead Time
- ▶ Cost Reductions
- ▶ Facilitates Productivity
- ▶ Identify and foresee problems in advance
- ▶ Sets a Goal
- ▶ Monitor Progress Updates and Alerts

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What happens if we do not have a schedule?


- ▶ Without a full and complete schedule, the project manager will fail to communicate the complete work done, in terms of resources used and costs, which are crucial in delivering the project.



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Causes & Impact of Poor Planning and Scheduling

- ▶ Poor time management
- ▶ Poor definitions of project objectives
- ▶ Poor budget and timeline estimates
- ▶ Poor control of the project scope
- ▶ Lack of support from stakeholders
- ▶ Dissatisfied customers
- ▶ Exposing the project to the highest risks
- ▶ All of which will eventually lead to **the project failure**

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Causes & Impact of Poor Planning and Scheduling

Unrealistic Schedules

Symptoms

The subject of poor scheduling comes up frequently. Let's look first at the symptoms for a better perspective.

- ▶ - Project costs are overrun
- ▶ - Milestone dates are missed, sometimes by a wide margin
- ▶ - The performance measurement methods are revised as schedules slip or the project control function is revamped each time there is a major crisis

[Project management problems which can be avoided - anticipating conflict \(pmi.org\)](#)

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Causes & Impact of Poor Planning and Scheduling


Unrealistic Schedules

Causes

Now to the causes. Seldom do we find just one cause, it's usually a combination that is responsible.

- Competitive situations may result in bidders proposing unrealistic schedules.
- The contract terms do not impose a penalty on poor schedule performance.
- Project changes which add requirements don't take into account possible adverse schedule effect.
- Planning is not based on past experience. Organizations that don't maintain a data base of schedule and cost performance are particularly at a disadvantage.
- Minimal, and therefore insufficient, time is spent developing schedules and analyzing the relevant factors influencing the realism of those schedules.

[Project management problems which can be avoided - anticipating conflict \(pmi.org\)](#)

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Causes & Impact of Poor Planning and Scheduling

Unrealistic Schedules

Action

There are steps which an organization can take to reduce the causes. For instance, using a strong project management concept coupled with a central data base for comparable estimates and actuals in both schedule and cost information; application of the resulting past experience on like projects when estimating initial schedules; using a network-based management approach to clearly identify the relevant factors influencing the project schedule. The use of performance-incentive type contracts by clients and proposing use of same by contractor/vendors will inject both realism into schedule commitments and a pragmatic approach to schedule planning..

- Optimistic scheduling is used as a lever to force high personnel performance, a play which reduces the probability of meeting contract commitments rather than enhances it.

[Project management problems which can be avoided - anticipating conflict \(pmi.org\)](http://Project management problems which can be avoided - anticipating conflict (pmi.org))



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Example of Poor Project Planning

- ▶ The failure of the Chrysler PT Cruiser is an example of how poor project planning can lead to project failure.
- ▶ Chrysler had set up an finalized the design, production, and marketing of the launch of their new product (The Chrysler PT Cruiser).
- ▶ However, due to lack of proper scheduling and the fragile project plan, they didn't not anticipate the dealers showroom delivery times into their overall project plan.
- ▶ What they tragically missed was to verify their timeline for production starting at the manufacturer, to the end user (Customers/dealers)



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Example of Poor Project Planning

- ▶ Chrysler production facilities tried so hard to rectify this situation while being bombarded with call from dealership owners.
- ▶ All suggestions were to simply ship out the cars to old rails and cities and let the dealers deal with the situation later.
- ▶ This proved to be a nightmare as dealers started losing their deposits as they had to refund the unsatisfied customers and the customers purchasing cars from other auto brands.
- ▶ This is a great example of the importance of a concrete project plan. If product delivery




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Guidelines on Avoiding Project Failure

The reality is that there will always be elements that can't be planned for. However, there are some steps you can take to minimize the number of incidents that can occur.

- ▶ Vision & Mission
- ▶ Work Breakdown Structures (WBS)
- ▶ User Stories
- ▶ Critical Path and good scheduling
- ▶ Milestones/ Status meeting
- ▶ Communication



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Project Management Plan

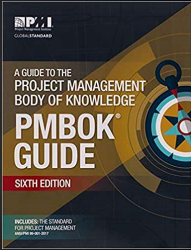

- ▶ Project management plan is different from the project management schedule.
- ▶ Project management plan has other important project related plans like cost management plan, risk management plan.....etc.




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Project Schedule Management

- ▶ Another term used in the PMP examination and PMBOK 6th Edition is Schedule Management Plan.
- ▶ Schedule Management Plan is part of the Project Management Plan and has information on the plan project schedule and its management and control.
- ▶ Section 6 of the PMBOK 6TH Edition, Project Time management was renamed from Project Time Management to Project Schedule Management. Research indicated support for the name change as project managers do not manage time, they define and manage the project schedule.

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Project Schedule Management

Knowledge Area	Process Groups				
	Planning	Monitoring & Controlling	Executing	Closing	Managing & Controlling
Integration	Develop project charter, identify stakeholders, develop project management plan, define scope, manage communications, monitor project performance, close project or phase	Monitor project performance, manage communications, close project or phase	Direct and manage project work, manage quality, acquire resources, manage risks, manage communications, manage procurement, manage stakeholder engagement	Close project or phase	Close project or phase
Scope	Define scope, create work breakdown structure, create WBS dictionary, validate scope, control scope	Monitor scope performance, control scope	Direct and manage project work, manage quality, acquire resources, manage risks, manage communications, manage procurement, manage stakeholder engagement	Close project or phase	Close project or phase
Schedule	Identify activities, sequence activities, estimate activity durations, develop project network, calculate early start, early finish, late start, late finish, float, free float, total float, critical path, identify critical activities, monitor project performance, control schedule	Monitor project performance, control schedule	Direct and manage project work, manage quality, acquire resources, manage risks, manage communications, manage procurement, manage stakeholder engagement	Close project or phase	Close project or phase
Cost	Plan project costs, estimate costs, determine budget baseline, monitor project performance, control costs	Monitor project performance, control costs	Direct and manage project work, manage quality, acquire resources, manage risks, manage communications, manage procurement, manage stakeholder engagement	Close project or phase	Close project or phase
Quality	Plan quality, manage quality, control quality	Monitor project performance, control quality	Direct and manage project work, manage quality, acquire resources, manage risks, manage communications, manage procurement, manage stakeholder engagement	Close project or phase	Close project or phase
Resources	Identify resources, estimate resource requirements, acquire resources, develop resource management plan, manage resource usage, control resource usage	Monitor project performance, control resource usage	Direct and manage project work, manage quality, acquire resources, manage risks, manage communications, manage procurement, manage stakeholder engagement	Close project or phase	Close project or phase
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Risk	Identify risks, analyze risks, plan risk responses, implement risk responses, monitor risk, control risk	Monitor project performance, control risk	Direct and manage project work, manage quality, acquire resources, manage risks, manage communications, manage procurement, manage stakeholder engagement	Close project or phase	Close project or phase
Procurement	Plan procurement, procure, manage procurement, control procurement	Monitor project performance, control procurement	Direct and manage project work, manage quality, acquire resources, manage risks, manage communications, manage procurement, manage stakeholder engagement	Close project or phase	Close project or phase
Stakeholder	Identify stakeholders, analyze stakeholders, plan stakeholder engagement, manage stakeholder engagement, control stakeholder engagement	Monitor project performance, control stakeholder engagement	Direct and manage project work, manage quality, acquire resources, manage risks, manage communications, manage procurement, manage stakeholder engagement	Close project or phase	Close project or phase

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The 6 Project Schedule Management processes are:


- ▶ **Plan Schedule Management**—The process of establishing the policies, procedures, and documentation for planning, developing, managing, executing, and controlling the project schedule.
- ▶ **Define Activities**—The process of identifying and documenting the specific actions to be performed to produce the project deliverables.
- ▶ **Sequence Activities**—The process of identifying and documenting relationships among the project activities.
- ▶ **Estimate Activity Durations**—The process of estimating the number of work periods needed to complete individual activities with the estimated resources.
- ▶ **Develop Schedule**—The process of analyzing activity sequences, durations, resource requirements, and schedule constraints to create the project schedule model for project execution and monitoring and controlling.
- ▶ **Control Schedule**—The process of monitoring the status of the project to update the project schedule and manage changes to the schedule baseline.

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Project Schedule Management

- ▶ Establishing policies, procedures and documentation for planning, developing, managing, executing, and controlling project schedule.
- ▶ Project Schedule Management includes the processes required to manage the timely completion of the project.
- ▶ Project Schedule Management provides guidance and direction on how the project schedule will be managed.



The diagram shows the Project Schedule Management processes categorized into four groups:

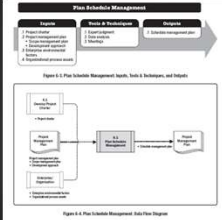
- 1.1 Plan Schedule Management:** Develop a schedule management plan, identify schedule activities, group related activities into schedule activities, define activities, estimate activity durations, and create a project schedule.
- 1.2 Monitor Schedule:** Monitor project progress against the project schedule, identify schedule variances, and forecast the impact of any changes to the project schedule.
- 1.3 Control Schedule:** Identify the causes of schedule variances, manage schedule changes, and update the project schedule.
- 1.4 Close Schedule Management:** Finalize all activities for the project schedule management process.

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1. Plan Schedule Management- Inputs

- ▶ **Project Management Plan**
 - ▶ Scope Management Plan
 - ▶ Development Approach
- ▶ **Project Charter**
- ▶ **Enterprise Environmental Factors**
- ▶ **Organizational Process Assets**
 - ▶ Include existing formal and informal activity planning related policies
 - ▶ Procedures and guidelines – Lessons-learned knowledge base (contains historical information)



The diagram illustrates the Plan Schedule Management process flow:

- Inputs:** Project Management Plan (Scope Management Plan, Development Approach), Project Charter, Enterprise Environmental Factors, Organizational Process Assets.
- Tools & Techniques:** Expert Judgement, Data Analysis, Meetings.
- Outputs:** Schedule Management Plan, Project Schedule.

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1. Plan Schedule Management- Tools & Techniques

- ▶ **Expert Judgement**
 - ▶ Opinions, advice, recommendations offered by people recognized as having specialized knowledge or training in a specific area
 - ▶ As with other areas, you can start with people who are part of the stakeholder group and then move out to external groups if needed
- ▶ **Data Analysis**
 - ▶ Process may involve choosing strategic options to estimate and schedule the project such as (but not limited to): scheduling methodology, scheduling tools and techniques, estimating approaches, formats, and project management software. Techniques may include, but are not limited to: rolling wave planning, applying leads & lags, alternatives analysis and variance analysis
- ▶ **Meetings**

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1. Plan Schedule Management- Outputs

Schedule Management Plan

- ▶ The schedule management plan is a component of the project management plan that establishes the criteria and the activities for developing, monitoring, and controlling the schedule. The schedule management plan may be formal or informal, highly detailed, or broadly framed based on the needs of the project and includes appropriate control thresholds.
 - ▶ Project schedule model development.
 - ▶ Release and iteration length
 - ▶ Level of accuracy.
 - ▶ Units of measure.
 - ▶ Organizational procedures links
 - ▶ Project schedule model maintenance
 - ▶ Control thresholds
 - ▶ Rules of performance measurement (Earned value management)
 - ▶ Reporting formats.



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The schedule management plan can establish the following:

- ▶ Project schedule model development. The scheduling methodology and the scheduling tool to be used in the development of the project schedule model are specified.
- ▶ Release and iteration length. When using an adaptive life cycle, the time-boxed periods for releases, waves, and iterations are specified. Time-boxed periods are durations during which the team works steadily toward completion of a goal. Time-boxing helps to minimize scope creep if forces the teams to process essential features first, then other features when time permits.
- ▶ Level of accuracy. The level of accuracy specifies the acceptable range used in determining realistic activity duration estimates and may include an amount for contingencies.
- ▶ Units of measure. Each unit of measurement (such as staff hours, staff days, or weeks for time measures, or meters, liters, tons, kilometers, or cubic yards for quantity measures) is defined for each of the resources.
- ▶ Organizational procedures links. The work breakdown structure (WBS) (Section 5.4) provides the framework for the schedule management plan, allowing for consistency with the estimates and resulting schedules.



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The schedule management plan can establish the following:

- ▶ Project schedule model maintenance. The process used to update the status and record progress of the project in the schedule model during the execution of the project is defined.
- ▶ Control thresholds. Variance thresholds for monitoring schedule performance may be specified to indicate an agreed-upon amount of variation to be allowed before some action needs to be taken. Thresholds are typically expressed as percentage deviations from the parameters established in the baseline plan.
- ▶ Rules of performance measurement. Earned value management (EVM) rules or other physical measurement rules of performance measurement are set. For example, the schedule management plan may specify:
 - ▶ Rules for establishing percent complete. EVM techniques (e.g., baselines, fixed-formula, percent complete, etc.) to be employed (for more specific information, refer to the Practice Standard for Earned Value Management [17]), and Schedule performance measurements such as schedule variance (SV) and schedule performance index (SPI) used to assess the magnitude of variation to the original schedule baseline.
- ▶ Reporting formats. The formats and frequency for the various schedule reports are defined.



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2. Define Activities

- ▶ Identifying & documenting specific actions to be performed to produce project deliverables.
- ▶ Break work packages into activities that provide a basis for estimating scheduling, executing, monitoring, and controlling the project work.

Figure 6.3 Define Activities: Inputs, Tools & Techniques, and Outputs

Figure 6.4 Define Activities: Key-Flow Diagram

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2. Define Activities -Inputs

- ▶ **1-Project Management Plan**
 - ▶ Schedule management plan
 - ▶ Scope baseline
 - Composed of scope statement, WBS, and WBS dictionary
- ▶ **2-Enterprise Environmental Factors**
- ▶ **3-Organizational Process Assets:** includes:
 - ▶ Existing formal And informal activity planning related
 - ▶ policies, procedures, and guidelines.
 - ▶ Lessons-learned knowledge base (contains historical information)

Figure 6.3 Define Activities: Inputs, Tools & Techniques, and Outputs

Figure 6.4 Define Activities: Key-Flow Diagram

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2. Define Activities– Tools & Techniques

- ▶ **1. Expert Judgement**
 - ▶ Opinions, advice, recommendations offered by people recognized as having specialized knowledge or training in a specific area
 - ▶ As with other areas, you can start with people who are part of the stakeholder group and then move out to external groups if needed
- ▶ **2. Decomposition:**
 - ▶ Work packages reduced to activities / tasks
 - ▶ Final outputs are described as schedule activities rather than deliverables
- ▶ **3. Rolling wave planning**
 - ▶ Form of progressive elaboration planning where the immediate work to be accomplished is planned in detail at a low level of the WBS, while future work is planned at a relatively high level of the WBS
- ▶ **4.Meetings**

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2. Define Activities– Outputs

- ▶ Activity List
- ▶ Activity Attributes
- ▶ Milestone List
- ▶ Change Requests
- ▶ Project Management Updates
 - ▶ Schedule baseline: Throughout the project, work packages are progressively elaborated into activities. This process may reveal work that was not part of the initial schedule baseline, necessitating a change to delivery dates or other significant schedule milestones that are part of the schedule baseline.
 - ▶ Cost baseline: Changes to the cost baseline are incorporated in response to approved changes in schedule activities.

Activity List

Activity ID	Name	Activity	Start	Finish	Duration

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3. Sequence Activities

- ▶ **Sequence Activities** is the process of identifying and documenting relationships among the project activities.
- ▶ The key benefit of this process is that it defines the logical sequence of work to obtain the greatest efficiency given all project constraints.
- ▶ This process is performed throughout the project.
- ▶ Every activity except the first and last should be connected to at least one predecessor and at least one successor activity with an appropriate logical relationship.

Predecessor Activities

Activity	Activity	Activity

Figure 3-1 Predecessor Activities, Splits, Joins, & Sub-Process, Gantt Chart

Figure 3-2 Predecessor Activities, Gantt Chart

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3. Sequence Activities- Inputs

- ▶ Project Management Plan
 - ▶ Schedule management plan
 - ▶ Scope baseline
- ▶ Project Documents
 - ▶ Activity attributes
 - ▶ Activity list
 - ▶ Assumption log
 - ▶ The milestone list
- ▶ Enterprise Environmental Factors
- ▶ Organizational Process

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3. Sequence Activities- Tools & Techniques

- ▶ Precedence Diagramming Method (PDM)
 - ▶ Finish-to-start (FS)
 - ▶ In PDM, FS is the most commonly used type of precedence relationship
 - ▶ Finish-to-finish (FF)
 - ▶ Start-to-start (SS)
 - ▶ Start-to-finish (SF)
- ▶ Dependency Determination and Integration
 - ▶ Mandatory dependencies
 - ▶ Discretionary dependencies
 - ▶ External dependencies
 - ▶ Internal dependencies
- ▶ Leads and Lags
- ▶ Project Management Information System (PMIS)

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3. Sequence Activities- Outputs

- ▶ Project Schedule Network Diagrams
- ▶ Project Documents Updates
 - ▶ Activity Attributes
 - ▶ Activity List
 - ▶ Assumption Log
 - ▶ Milestone List

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4. Estimate Activity Durations


- ▶ Estimate Activity Durations is the process of estimating the number of work periods needed to complete individual activities with estimated resources.
- ▶ The key benefit of this process is that it provides the amount of time each activity will take to complete.
- ▶ This process is performed throughout the project.

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4. Estimate Activity Durations- Inputs


- ▶ **Project Management Plan**
 - ▶ Schedule management plan
 - ▶ Scope baseline
- ▶ **Project Documents**
 - ▶ Activity attributes
 - ▶ Activity list
 - ▶ Assumption log
 - ▶ Lessons learned register
 - ▶ The milestone list
 - ▶ Project team assignments
 - ▶ Resource breakdown structure
 - ▶ Resource calendar
 - ▶ Resource requirements
 - ▶ Risk register



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4. Estimate Activity Durations- Inputs

- ▶ **Enterprise Environmental Factors**
 - ▶ Duration estimating databases and other reference data
 - ▶ Productivity metrics
 - ▶ Published commercial information
 - ▶ Location of team members
- ▶ **Organizational Process Assets**
 - ▶ Historical duration information
 - ▶ Project calendars
 - ▶ Estimating policies
 - ▶ Scheduling methodology
 - ▶ Lessons learned repository



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4. Estimate Activity Durations- Tools & Techniques


- ▶ **Expert judgment**
- ▶ **Analogous estimating**
- ▶ **Parametric estimating**
- ▶ **Three-point estimating**
 - ▶ Most likely (M)
 - ▶ Optimistic (O)
 - ▶ Pessimistic (P)
- ▶ **Bottom-up estimating**
- ▶ **Data analysis**
 - ▶ Alternatives analysis
 - ▶ Reverse analysis
- ▶ **Decision making**
- ▶ **Meetings**



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4. Estimate Activity Durations- Outputs

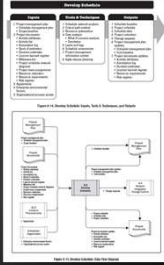

- ▶ Duration estimates
- ▶ Basis of estimates
 - ▶ Documentation of the basis of the estimate
 - ▶ Documentation of all assumptions made
 - ▶ Documentation of any known constraints
 - ▶ Indication of the range of possible estimates
 - ▶ Indication of the confidence level of the final estimate
 - ▶ Documentation of individual project risks influencing this estimate
- ▶ Project documents updates
 - ▶ Activity attributes
 - ▶ Assumption logs
 - ▶ Lessons learned register



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5. Develop Schedule


- ▶ Develop Schedule is the process of analyzing activity sequences, durations, resource requirements, and schedule constraints to create a schedule model for project execution and monitoring and controlling.
- ▶ The key benefit of this process is that it generates a schedule model with planned dates for completing project activities.
- ▶ This process is performed throughout the project.

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5. Develop Schedule- Inputs

- ▶ **Project management plan**
 - ▶ Schedule management plan.
 - ▶ Scope baseline. The scope statement, WBS, and WBS dictionary have details about the project deliverables that are considered when building the schedule.
- ▶ **Project Documents**
 - ▶ Activity attributes
 - ▶ Activity list
 - ▶ Assumption log
 - ▶ Basis of estimates
 - ▶ Duration of estimates
 - ▶ Lessons learned
 - ▶ Milestone list
 - ▶ Project schedule network diagrams
 - ▶ Project team assignments
 - ▶ Resource calendar
 - ▶ Resource requirements
 - ▶ Risk register



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5. Develop Schedule- Inputs

- ▶ Agreements
- ▶ Enterprise Environmental Factors
- ▶ Organizational process assets
 - ▶ Scheduling methodology
 - ▶ Project calendar[s]

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5. Develop Schedule- Tools & Techniques

- ▶ Schedule Network Analysis
- ▶ Critical Path Method (CPM)
- ▶ Resource Optimization
 - ▶ Resource leveling
 - ▶ A technique in which start and finish dates are adjusted based on resource constraints with the goal of balancing the demand for resources with the available supply. Resource leveling can be used when shared or critically required resources are available only at certain times or in limited quantities.
 - ▶ Resource smoothing
 - ▶ A technique that adjusts the activities of a schedule model such that the requirements for resources on the project do not exceed certain predefined resource limits. In resource smoothing, as opposed to resource leveling, the project's critical path is not changed and the completion date may not be delayed.

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5. Develop Schedule- Tools & Techniques

Activity	ES	EF	LS	LF	TF	FF
A	0	1	0	1	0	0
B	1	2	1	2	0	0
C	1	3	1	3	0	0
D	2	3	2	3	0	0
E	2	4	2	4	0	0
F	3	4	3	4	0	0
G	3	5	3	5	0	0
H	4	5	4	5	0	0
I	4	6	4	6	0	0
J	5	6	5	6	0	0
K	5	7	5	7	0	0
L	6	7	6	7	0	0
M	6	8	6	8	0	0
N	7	8	7	8	0	0
O	7	9	7	9	0	0
P	8	9	8	9	0	0
Q	8	10	8	10	0	0
R	9	10	9	10	0	0
S	9	11	9	11	0	0
T	10	11	10	11	0	0
U	10	12	10	12	0	0
V	11	12	11	12	0	0
W	11	13	11	13	0	0
X	12	13	12	13	0	0
Y	12	14	12	14	0	0
Z	13	14	13	14	0	0

Figure 9-16. Example of Critical Path Method

Figure 9-17. Resource Leveling

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5. Develop Schedule- Tools & Techniques

- ▶ Data Analysis
 - ▶ What-if scenario analysis
 - ▶ Simulation
- ▶ Leads and Lags
- ▶ Schedule Compression
 - ▶ Crashing
 - ▶ Fast tracking
- ▶ Project Management Information System (PMIS)
- ▶ Agile Release Planning
 - ▶ Agile release planning provides a high-level summary timeline of the release schedule (typically 3 to 6 months) based on the product roadmap and the product vision for the product's evolution

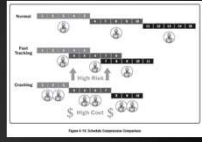


Figure 10.10 Network Diagram Example

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5. Develop Schedule- Outputs

- ▶ **Schedule Baseline**
- ▶ **Project Schedule**
 - ▶ Bar charts
 - ▶ Milestone charts
 - ▶ Project schedule network diagrams
- ▶ **Schedule Data**
 - ▶ Project Calendars
 - ▶ Change Requests

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5. Develop Schedule- Outputs

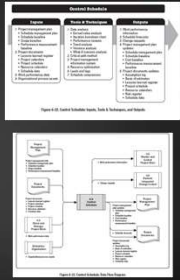
- ▶ **Project Management Plan Updates**
 - ▶ Schedule management plan
 - ▶ Cost baseline
- ▶ **Project Documents Updates**
 - ▶ Activity attributes
 - ▶ Assumption log
 - ▶ Duration of estimates
 - ▶ Lessons learned register
 - ▶ Resource requirements
 - ▶ Risk register

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6. Control Schedule

- ▶ Control Schedule is the process of monitoring the status of the project to update the project schedule
- ▶ and managing changes to the schedule baseline. The key benefit of this process is that the schedule baseline is maintained throughout the project.
- ▶ This process is performed throughout the project



The diagram illustrates the Control Schedule process. It shows a flow from 'Control Schedule' to 'Update Schedule Baseline' and 'Update Project Schedule'. A table below the diagram lists 'Inputs' and 'Outputs' for the process.

Inputs	Outputs
<ul style="list-style-type: none"> Project Management Plan Schedule Management Plan Schedule Baseline Scope Baseline Performance Measurement Baseline Lessons Learned Register Project Calendar Project Schedule Resource Calendar Resource Data Work Performance Data Organizational Process Assets 	<ul style="list-style-type: none"> Updated Schedule Baseline Updated Project Schedule

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6. Control Schedule- Inputs

- ▶ **Project Management Plan**
 - ▶ Schedule management plan.
 - ▶ Schedule baseline
 - ▶ Scope baseline
 - ▶ Performance measurement baseline
- ▶ **Project Documents**
 - ▶ Lessons learned register
 - ▶ Project calendar
 - ▶ Project schedule
 - ▶ Resource calendar
 - ▶ Resource data
- ▶ **Work Performance Data**
- ▶ **Organizational Process Assets**
 - ▶ Existing formal and informal schedule control-related policies, procedures, and guidelines
 - ▶ Schedule control tools
 - ▶ Monitoring and reporting methods to be used.

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6. Control Schedule- Tools & Techniques



- ▶ **Data Analysis**
 - ▶ Earned value analysis
 - ▶ Iteration burndown chart
 - ▶ Performance reviews
 - ▶ Trend analysis
 - ▶ Variance analysis
 - ▶ What-if scenario analysis
- ▶ **Critical Path Method (CPM)**
- ▶ **Project Management Information System (PMIS)**
- ▶ **Resource Optimization**
- ▶ **Leads and Lags**
- ▶ **Schedule Compression**

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6. Control Schedule- Outputs


- ▶ Work Performance Information
- ▶ Schedule Forecasts
- ▶ Change Requests
- ▶ Project Management Plan Updates
 - ▶ Schedule management plan
 - ▶ Schedule baseline
 - ▶ Cost baseline
 - ▶ Performance measurements baseline
- ▶ Project Documents Updates
 - ▶ Assumption log
 - ▶ Basis of estimates
 - ▶ Lessons learned register
 - ▶ Project schedule
 - ▶ Resource calendars
 - ▶ Risk register
 - ▶ Schedule data

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Resources

- ▶ https://lah.elearningontario.ca/CMS/public/exported_courses/BOH4M/exported/BOH4MU05/BOH4MU05/BOH4MU05A01_teacher/PoorProjectPlanning.pdf
- ▶ PMBOK 6TH EDITION
- ▶ <https://www.educba.com/project-planning-and-scheduling/>
- ▶ [Project management problems which can be avoided - anticipating conflict \(pmi.org\)](#)

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