Section 5: *Scheduling*

Overview

A primary function of *Open Workbench* is to schedule resources to their assigned tasks. To do this *Open Workbench* needs to know certain criteria about the tasks. Some of the criteria include: task type (fixed or variable), locked? (yes or no), priority, resource assigned, resource availability, loading pattern (how the resource is assigned to do the work), and start date for scheduling. From this information *Open Workbench* performs a series of steps based on certain rules. This results in a schedule that may or may not include a resource's availability to do the work (resource constraints).

Initial Schedule

A schedule is a timetable for performing tasks, utilizing resources or allocating facilities. Based on the "*fast, cheap, and good*" criteria, does the schedule meet the time constraints for major deliverables/milestones? If not, what must be adjusted: Time?, Cost?, or Quality?.

First, create the initial schedule. Autoschedule *without* resource constraints to create an early start schedule based solely on dependencies. Look at how tasks are scheduled relative to each other to determine the adequacy and accuracy of dependency definition. Resources will probably be over committed. Can you increase resource availability? Can you reassign work to other resources? Does this schedule meet critical milestone dates?

Using the **Resource Load (All Resources)** view in the **Assurance and Compliance** folder of the standard *Open Workbench* view library, look for blue highlighting in the **Time Scale** portion of the view for tasks with resources having work assigned greater than their availability. Look at resource utilization across employees in the resource summary section of this view. Key resources are considered those resources on the project that are allocated over 90% of their normal availability for several weeks. Look for blue highlighting, and scan for negative numbers in availability fields. These signs indicate an over committed resource. Can work be reassigned to under-utilized resources?

The hour column in the **Time Scale** portion of the view indicates the amount of work planned in the period. Scan the hour columns in the **Time Scale** for blanks or zeros. This indicates no planned hours for a resource in the period. Scan the hour columns for small numbers. These resources may be a candidate for possible reassignment. **Unused Availability** totals in the **Resource Summary** portion of the view indicate total unscheduled time for the staff. These numbers should be low if the staff is being fully utilized.

Using the **Resource Load (All Resources)** view, filter on Resource to show only the tasks the *Project Manager* is assigned to. Check to see it the *Project Manager* is spending more than 50% availability on "*doing*" tasks rather than "*managing*" tasks. If so, reassign as many "*doing*" tasks as possible.

Autoschedule

Once the project's initial schedule has been defined, the next step is to improve the schedule using the autoschedule tool. Autoschedule uses task duration, constraint, and dependency information to identify the project's critical path – the best way to schedule project tasks while minimizing the delays and expansions that can cause deadline slippage, and at the same time minimizing resource overallocation. The critical path determines the earliest possible finish date of the project.

When autoscheduling a brand-new project that has not been tracked, use the planned project start date for the autoschedule **Start Date**. For a started project that has been updated through weekly tracking, use the previous Monday's date.

1. Within *Open Workbench*, click the **Autoschedule** option from the **Project** menu bar.

Field Name (Characters)	Usage	Value
Start Date	Required	Enter the date from which to begin scheduling tasks. If time has not been tracked to the project, use the anticipated project start date. For a started project, use the previous Monday's date.
Ignore Tasks Starting Before	Optional	If needed, enter a date to exclude tasks stating before that date.
Ignore Tasks Starting After	Optional	If needed, enter a date to exclude tasks stating after that date.
Resource Constraints	Required	This field must be checked. Autoschedule will attempt to avoid resource over commitment when scheduling tasks. Resource availability is taken into account.
Schedule from Finish Date	Optional	If checked, autoschedule will move backward from the Finish Date. This can be a useful planning tool, especially when a project has a predefined deadline date. However, once a project has started, scheduling from the Finish Date doesn't change the schedule and provides little or no useful information.
Honor Constraints on Started Tasks	Optional	If checked, autoschedule will attempt to schedule using all dependency and task date constraints on tasks with a status of "started." By using this option, you run the risk of overallocating resources and violating task dependencies.
Schedule Assignments on Locked Tasks	Required	This field must be checked. Autoschedule will move the assignment ETC within the scheduling Start Date and the task's Finish Date.
Start Successors on Next Day	Required	This field must be checked. Autoschedule will schedule successor dependency tasks to start on the next day, instead of on the finish day of the predecessor task. This applies to variable-duration tasks only.

2. Enter all required fields.
3. Click the **OK** button.

> **S** *All approved, committed project plans must be autoscheduled using **Resource Constraints, Schedule Assignments on Locked Task,** and **Start Successors on Next Day.***

Autoschedule will create a project schedule based on task priority, dependencies between tasks, resource estimate to complete (ETC), and resource availability. Autoschedule will adjust variable duration tasks and front, back or contour loaded tasks. Autoschedule will *not* impact tasks that start earlier than the **Ignore Tasks Starting Before** date, or tasks that start later than the **Ignore Tasks Starting After** date, or tasks that are locked. Autoschedule does not change the resource ETC or adjust the schedule for a fixed-duration task. However, unused ETC in the past will be automatically reduced if the task has a fixed loading pattern.

Autoschedule Control

The following table indicates Autoschedule Control:

Clarity Field	*Project Manager Control*	*Autoschedule Control*
Availability	Always	Never
Estimate To Complete	Always (except tasks with fixed loading patterns)	Never
Start	Locked	Unlocked
Duration	Fixed	Variable
Loading Pattern	Fixed, Uniform	Front, Back, Contour

Priorities

A priority is a code used by autoschedule to define the importance of one task relative to others. The order of priorities is 0-36, with 0 being the highest priority and 36 being the lowest. The default priority is 10. Be aware that started tasks will override the priority code.

Priorities assigned at higher WBS levels (phase or activity) are attributed to subordinate levels (task) if the subordinate level has no assigned priority.

In the case of dependencies, autoschedule assumes that a predecessor task has a priority at least equal to its successor. In some cases, dependency relationships can override individual task priorities during the scheduling process.

> **S** *Use priorities sparingly, as a refining tool, and autoschedule often. Since the priority defaults to 10, you may want to use a higher priority (i.e., a lower number) when trying to schedule one task before another.*

For example, if your highest priority phase/activity/task is set at 10 and you set the next task's priority to 9, autoschedule will attempt to schedule the task with the 9 priority first.

Rules of Autoschedule

Autoschedule operates on the entire project, with the following exceptions:
1. Autoschedule does not reschedule tasks that

- Are locked for scheduling.
- Are completed.
- Have a fixed duration and are started.
- Have a current **Start Date** earlier than the **Ignore Tasks Starting Before** date.

2. The **Start Dates** of tasks that are already started are not changed.
3. The duration of a fixed duration task is not changed.
4. Assignments with fixed loading patterns are not changed.

Steps and Results of Autoschedule

Autoschedule attempts to create a schedule that satisfies all dependencies and does not overallocate resources. Tasks are scheduled to minimize the critical path and to use resource availability as early as possible. Autoschedule performs three passes to create this schedule:

Pass One
- Calculates the durations of all tasks based on ETC and default availability.
- Ignores tasks with fixed durations.
- Calculates the critical path.
- Schedules to satisfy dependencies, assuming unlimited resource availability.
- Schedules tasks on the critical path.
- Schedules tasks *not* on the critical path based on the least amount of float.
- If resource constraints have been applied, resource availability is used on the critical path first. Remaining availability is applied to task not on the critical path in order of float.

Pass Two
- Takes resource availability into account.
- Resolves conflicts between tasks scheduled in parallel, using the following factors in this order:
  - The task has a **Must Start On** or **Must Finish On** scheduling constraint.
  - The task's priority. Lower values rank higher.
  - The task's float. Lower value rank higher.
  - The task has started.
  - The task's physical location. Tasks at the top of the WBS rank higher.
- Schedules tasks with no dependencies in top-down order.

Pass Three
- Recalculates the critical path based on the schedule developed in Pass Two.

Questions to Ask During Initial Autoscheduling

Following are some questions to review before moving on with tracking the project. Each question is followed by the *Open Workbench* view a *Project Manager* can use to answer the question.

Question	View/Folder
Does the project or phase meet the target end date?	**Standards Review** view, **Assurance & Compliance** folder
Are any resources over committed?	**Resource Load (All Resources)** view, **Assurance & Compliance** folder
Are any resources underutilized?	**Resource Load (All Resources)** view, **Assurance & Compliance** folder
What is the technical risk associated with this project (failure to complete the project to a required degree of technical excellence)? Have I assigned my best resources to high-risk tasks?	**Resource Load (All Resources)** view, **Assurance & Compliance** folder
What is the schedule risk (failure to complete deliverables within the target dates)? Has contingency time been included? Is every task planned and scheduled based primarily on *"most optimistic"* estimates?	**Standards Review** view, **Assurance & Compliance** folder
What is the cost risk (failure to complete within the estimated cost or budget)? Do I have the financial backing to fund the project at a level that will meet the technical requirements?	**Standards Review** view, **Assurance & Compliance** folder
What is the network risk (related to dependency relationships)? Have I scheduled high risk tasks early and off the critical path to allow recovery time? Have I considered interproject dependencies for tasks done by other departments or vendors?	**Dependency Status** view, **Assurance & Compliance** folder
What is the overall risk (a composite of all risk factors)? Is the plan realistic and attainable?	**Standards Review** view, **Assurance & Compliance** folder
Are there any dependency violations not resolved by autoschedule (*e.g., due to locked tasks*)?	**Dependency Violations** view, **Assurance & Compliance** folder
Which are the *key* tasks (on or near the critical path, with insufficient resources to do the tasks in the required time)?	**Critical Path** view, **Weekly Tracking** folder
Who are the *key* resources (allocated over 90% of their normal availability for several weeks together)? Any over 100%?	**Resource Load (All Resources)** view, **Assurance & Compliance** folder
Is the Project Manager allocated to productive work more than 50% of the time?	**Resource Load (All Resources)** view, **Assurance & Compliance** folder

Troubleshooting After Autoscheduling

The following are some questions to pursue should you have problems with the autoschedule results:

- Are the durations fixed?

- Are there any locked tasks?

- Is there a lag of 1 day in the dependency status?

- Are priorities used?

- Are there any over commitments?

- What are the resource availabilities?

- What is the autoschedule Start Date?

- Were Resource Constraints used?

Autoschedule after Time Tracking

The following table summarizes the effect autoschedule has once time has been tracked:

Will	*Will Not*
Reschedule the remaining estimate to complete of a started task which has a variable duration.	Reschedule the remaining estimate to complete of a started task which has a fixed duration.
Assume a higher priority for a started task than an unstarted task.	Schedule an unstarted task before a started task regardless of priority.
Reschedule unstarted tasks with start dates prior to the autoschedule Start Date.	Reschedule a task that is marked complete.

Resource Availability Analysis

Often a resource is working on multiple projects across the department. The **Resource Planning: Workloads** and **Resource Allocations: Detail** portlets can be used to determine availability of a resource across all divisions. Refer to *Section 10: Reporting and Portlets* for more information.

It is the *Project Manager's* responsibility to negotiate resource availability and work to resolve any over commitment of the needed resource with the *Resource Manager* prior to submitting a project for *Project Management Office (PMO) Assurance and Compliance Review.*

S	*Resources may not be assigned in excess of 10 hours per month above their availability, or allocated by more than 120% per month, across all projects.*

Projects should not be submitted to *PMO* until all resource over commitment has been resolved. A copy of the **Resource Utilization Summary** and the **Resource Utilization Detail** report should be generated and submitted along with the *Assurance and Compliance Review* request.

Project Plan Approval Process

Before any work can begin on a project, the project must be reviewed and approved by the *IT Steering Committee*. *Project Approval* meetings are held weekly, at 9:00 am every Wednesday. Prior to the *IT Steering Committee* review, *PMO* reviews the project to verify that it adheres to standard and to coordinate the weekly *Project Approval* meeting. *PMO* must receive the final version of the project by 5:00 pm the previous Wednesday for the project to be included on the following Wednesday's meeting agenda. Typically, it takes more than one review before a project is approved, so it is recommended that projects be submitted to *PMO* early in the week in order to allow time for revisions by the Wednesday deadline.

Before submitting a project for approval, the *Project Manager* should do the following:

- Complete the *Project Planning Checklist*. Refer to *Appendix I: Project Planning Checklist* for more information.

- Review the *Scope & Approach* and *Return on Investment (ROI) Analysis* with your *IT Manager*.

- Review the *Project Plan, Scope & Approach*, and *ROI Analysis* to verify that these items comply with all *IT Project Management (PM)* standards.

Verify that the information in these documents is consistent, specifically:

- The **Project Hours** and **Project Cost** on the *Authorization* page of the *Scope & Approach* match the detail project plan. For each *IT Division* that has resources assigned to the project, check the appropriate **Cost Detail by Billing Rate** view in the **Assurance and Compliance** folder of the view library.

- Likewise, the *ROI Analysis* should also reflect these hours and costs. Note that the *ROI Analysis* cost may differ from the *Scope & Approach* if zero bill rate employees are assigned to the project.

Review the *Scope & Approach, IT Strategic Plan Alignment, ROI Analysis,* and project plan with the *Project Sponsor*. Confirm that the labor estimate is within the *Leadership Group Master Plan Allocation* and the *ROI Analysis* indicates 6-year payback.

Once the *Project Manager* is satisfied with the project plan, the *Scope & Approach, IT Strategic Plan Alignment* and the *ROI Analysis*, the following steps are needed for project approval:

> **S**   *The steps below must be completed before a project plan is considered approved and tracking begins.*

1. The *Project Manager* creates a detailed *Scope & Approach, ROI Analysis,* and detailed plan using actual committed resources and autoschedule using the planned start date of the project.

2. The *Project Manager* verifies the *Scope & Approach and ROI Analysis* documents have been attached to the project in *Clarity*.

3. The *Project* Manager notifies *PMO* via email that the project is ready for *Assurance and Compliance* review and attached a copy of the *Resource Utilization* report showing that no assigned resources are overcommitted by more than 10 hours per month.

4. *PMO* will perform an *Assurance and Compli*ance review. The results will be returned to the *Project Manager* via an *Assurance and Compliance Results* form indicating any required or recommended changes.

5. **The project must be submitted to *PMO* by 5:00 pm on Wednesday in order to be on the agenda for the following Wednesday's *Project Approval Meeting*.**

6. *PMO* creates a *Project Approval* packet, consisting of the *Scope & Approach*, the *ROI Analysis*, *Resource Utilization Summary, Project Cost,* and *Task Plan.*

7. *PMO* will email the *IT Steering Committee* once the *Project Approval Packet* and meeting Agenda are complete for review. The *IT Steering Committee* will review and approve/deny the project, the project delivery dates, and resource commitments.

8. *Project Approval* meetings are held every Wednesday at 9:00 am*.* The *Project Manager* will present the plan at the meeting. If necessary, the *Project* Manager will make any negotiated changes, revise the *Scope & Approach, IT Strategic Plan Alignment, ROI Analysis*, and project plan, then re-submit the *Project Approval Packet* to *PMO* for another *Assurance & Compliance* review.

9. The *Project Manager* will obtain final signatures from each *IT Manager* on the *Project Approval Packet.*

10. The *Project Manager* will obtain *Project Sponsor* approval and return the signed *Project Approval Packet* to *IT Administration*.

11. If the project is approved at the meeting, *PMO* will baseline and activate the project in *Clarity*. The *Project Manager* will be notified via email when this is complete.

Baselining

Baselining provides preserved project data for later comparison with the current plan. After a new project has been approved *PMO* will baseline the entire plan, including any preliminary phases. This provides a baselined version against which you may now track status and actuals and analyze variances. Subsequent changes to dates, duration, and estimates are allowed in the current plan; however, they will never affect the baseline values.

> **S**   *A project will not be baselined by PMO until the IT Steering Committee has approved the project (including commitment of exact resources assigned to the project) and PMO has approved the initial plan.*

> **S**   *A project plan may have generic resources assigned to non-preliminary tasks only if the Project Manager has documented in the Scope & Approach the commitment to utilize a pending resource such as the hiring of a contractor or the filling of an open County position.*

Baselining is critical for generating trend analysis data *(e.g., is there a consistent estimate or duration variance).* This allows the *Project Manager* to remain proactive to possible problems in the project lifecycle and to adjust estimates and resource assignments accordingly. The purpose of baselining is to provide an accurate picture of the original project scope.

> **S**   *Baselining will only be performed by PMO.*

> **S**   *Once a plan has been Baselined, do not delete any tasks or resources from the plan. You can add an additional resource to the task and change the ETC on the baselined resource to zero.*

Tasks should never be deleted from an approved project plan. This is especially true for tasks that have been baselined and tasks, both planned and unplanned, that have actuals. If tasks are deleted from a project that is in the repository the baseline information for those tasks will be lost, as will any actuals that have been charged to the tasks. Once baseline data or actuals are deleted it is difficult to recover the information.

In the event that a task is no longer needed, instead of deleting it set the ETC to 0 for each resource assigned to the task and set the status to "completed". It may also be necessary to mark the task as being de-scoped. Refer to *Section 4: Change Request Process* for more information on descoping a task.

When a task is reassigned to a different resource, the original resource must never be released from the task since that person is part of the baseline. If the resource is released the baseline information, and any baseline will be lost. Instead, set the ETC for the original resource to 0. Then assign the new resource and add the appropriate ETC for the new person.

Rebaselining means significant changes have taken place and new commitments on delivery dates, work effort, cost, or deliverables must now be made (scope change). For example, rebaselining may be required when contract negotiations are delayed for a long period of time or procurement takes longer than expected. Rebaselining is done only when the scope of the current effort is no longer realistic or achievable. Rebaselining requires *Project Renegotiation*.

Project Renegotiation Process

During project execution, the *Project Manager* is performing ongoing analysis to ensure the project maintains the following:

- Revised labor estimate remains within the *Leadership Group* allocation.

- *ROI Analysis* continues to indicate a six year payback.

- Project usage variance is less than +20% / - 10%.

- Project duration variance is less than +/- 30 days.

- *Project Sponsor* gives written approval of size estimates and *ROI Analysis* at the end of analysis phase and after every additional 2,200-hour increment.

- Scope increases remain within the established *Scope Change Budget*.

- Work is not done on unapproved (preliminary) tasks.

Once any of the above conditions cannot be met then the *Project Manager* must renegotiate the project. Project rebaselining is also required when phases of the project that had previously been baselined with preliminary role-level estimates are now being planned in detail.

S   *If, at any time during project planning or project execution, the ROI Analysis indicates that the project will not meet 6-year payback, work on the project must stop. The Project Sponsor must review the project with the appropriate Leadership Group before the project can continue.*

S   *The steps below must be completed before a project plan is considered renegotiated, approved, and Rebaselined*

Below outlines the two ways to renegotiate a project:

- Project Renegotiation:
  - Used for extending the end date of the project.
  - Used for adding additional tasks / hours to approved phases of the project.
  - Project Manager will create a Change Request form in Clarity and obtain *Project Sponsor* approval. Refer to *Section 4: Change Request Process* for more information.
  - *Steps 3 – 11* of the *Project Plan Approval Process* must be followed.
  - Project Manager will post time to **Tracking & Control/Replanning** task.

- Planning Next Phase(s) of a project:
  - Used when preliminary project phases are now being planned in detail.
  - Additional tasks / hours may be added
  - *Steps 1 – 11* of the *Project Plan Approval Process* must be followed. This includes updating the project *Scope & Approach* document and the *ROI Analysis* for the relevant phases.
  - Project Manager will post time to **Initial Planning – Next Phases** task.

Once the renegotiation has been approved, the project will be baselined, including all remaining preliminary phases.

Commonly Asked Questions

1. **How can I get *Open Workbench* to schedule tasks when I want them to be scheduled? Should I use locked tasks?**

   Locked tasks should be used for tasks that must occur on a particular date. The date for a locked task is honored by autoschedule absolutely, even if it means violating dependencies or overloading resources.

   Using locked tasks is not a good technique for directing autoschedule to force tasks to earlier dates than they would otherwise be scheduled. Locking tasks does not alter the order that autoschedule will attempt to schedule each task. If insufficient duration or availability exists for predecessor tasks, the dependency links with the predecessors will be violated.

2. **If locked tasks are not recommended to allow me to specify what I want to be scheduled first, what should I do?**

   Priorities are designed to allow you to influence the schedule. Tasks with the highest priority will be scheduled first.

3. **This doesn't seem like very many priority levels and it will be very awkward to enter and maintain priorities in all my tasks.**

   Task priority defaults to a value of 10, with 0 being the highest priority and 36 being the lowest. If you enter a priority on a phase or activity all subordinate tasks will be treated at that priority.

   In a similar way, if a successor is assigned a higher priority than the predecessor, that priority is implied for the predecessors.

   Even a few priority changes can allow for very fine control when autoscheduling. Start first at the phase level or near the ends of dependency paths, and then examine the resulting schedule after each change while gradually working towards the required detail.

4. **Why did my tasks not move when I ran autoschedule?**

   Check your **Ignore Tasks Starting Before** date on the autoschedule dialog box. Tasks that start before this date will not be scheduled.

5. **After autoschedule some of my activity names are highlighted. What does this mean?**

   Autoschedule found it necessary to violate your dependencies. This is almost certainly caused by tasks that were not scheduled. Look for tasks that start before the first date displayed, that are locked, that are completed, or that are tracked by status only.

   For tasks that are started and have an ETC greater than zero, note that the start date does not change.

6. **What does "*Include Resource Constraints*" mean?**

   When the **Resource Constraints** option is set to "Yes", autoschedule attempts to relieve resource over commitment. If not, only dependencies are considered for scheduling and resources are treated as if they have unlimited availability.

   Autoscheduling both with and without resource constraints and comparing the results can be a powerful tool, providing insight into what extent your project is limited by available resources. If there is little difference in project end dates without resource constraints, your project is constrained by dependency links and task durations. Examining where resources are overloaded indicates where adding resources should be considered.

7. **I have selected "Yes" for Resource Constraints. Why do I still have overloaded resources?**

   Check for tasks that were not scheduled (as was explained for dependency violations). This may also be caused by inherently over committed tasks.

8. **After autoscheduling I am left with a "*hole*" in my schedule where nothing is scheduled. Why?**

   Tasks may be scheduled later than expected if they are inherently over committed. If variable availability is used, or resource holidays are defined, be certain fixed duration tasks can fit in the time frame desired.

   Another possibility is if a resource is scheduled to leave the project. Autoschedule is telling you that not enough availability exists to complete the assigned tasks prior to the resource's departure.

9. **How can I "*undo*" autoschedule results?**

   Select **Edit, Undo** from the *Open Workbench* menu.

10. **I lowered my resource availability and autoscheduled, but my resources are still overloaded. What's wrong?**

    If availability is lowered for fixed duration tasks, resources may become inherently over committed. Use **Tools, Recalculate** to adjust the task duration and relieve the over commitment. Autoschedule then produces the expected results.

11. **When I use autoschedule, hours are left free in my work week. How do I avoid this?**

    In general, the tightest schedule is obtained when all or most tasks are front - loaded with variable duration. When using fixed duration tasks, uniform, fixed, or contour loading patterns will produce realistic schedules.