Planning Reference

Project Planning uses the information developed in Project Definition to assign resources and construct a realistic project schedule. Responsibility for each work package is assigned, and the sequence of tasks is confirmed. A schedule is completed and tested, and resource scheduling is assessed. Finally, the plan is examined critically and action is taken to manage threats and opportunities. By the end of Project Planning, the project plan is ready to be implemented.

Assign Responsibility

Once work and resources are identified, staff each work package in the work breakdown structure with individuals or groups, assign responsibilities, determine roles, and establish reporting relationships. Responsibility assignment takes place in several rounds of negotiation. The first round is called the initial work negotiation.

The work to be performed by each resource must be precisely described, and applicable standards and measures determined. Specific performance expectations must be documented and any issues related to either the resource or the task must be identified and addressed.

A ***Responsibility Assignment Matrix (RAM***) can be used to chart which resource will have primary or secondary responsibility for managing or completing tasks in each work package. The RAM shows WBS work packages down the vertical axis and the names of individuals, departments, or resource groups (both internal and external) across the horizontal axis. Each cell in the matrix contains a brief description of the work to be done by the individual or group. While several people can be assigned to complete the tasks in a work package, only a single individual is given primary responsibility for ensuring its completion.

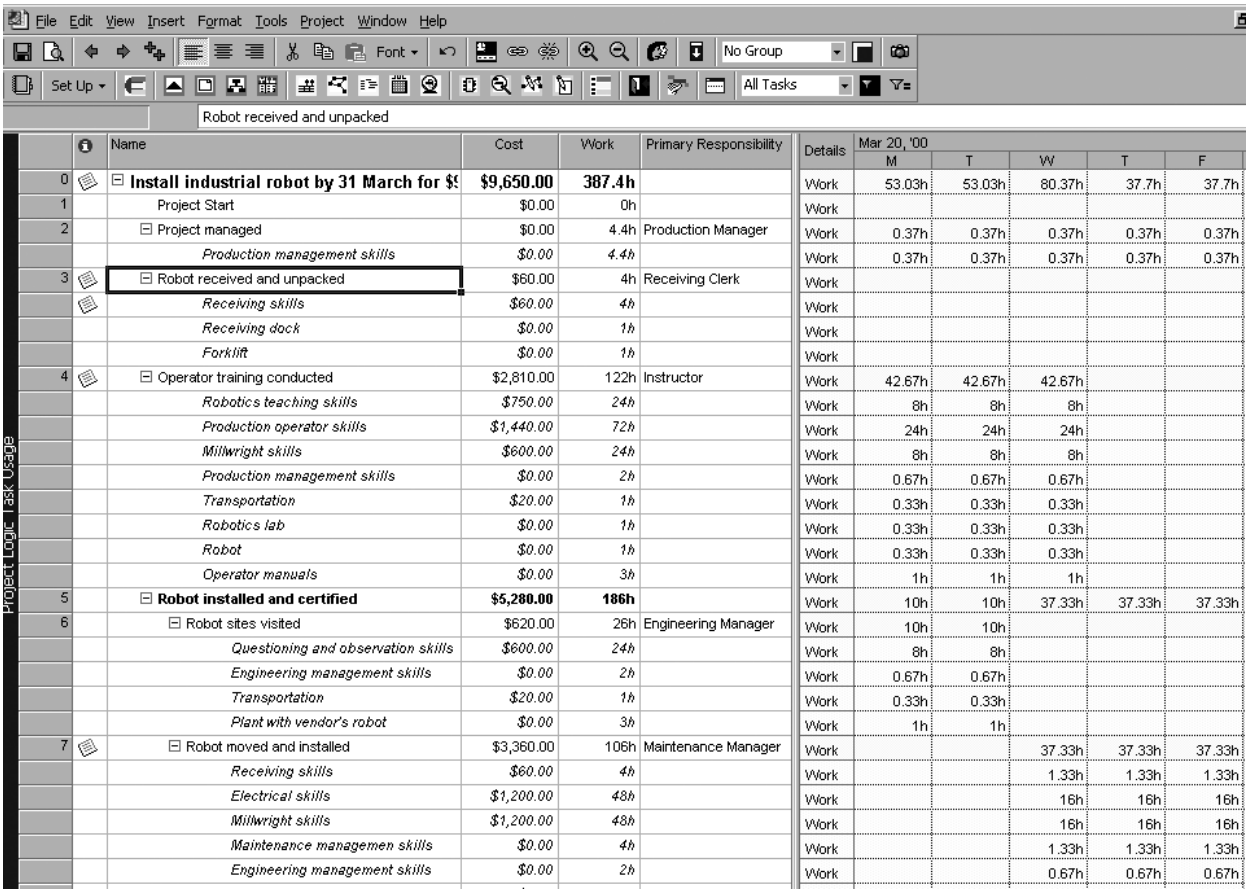
Use the process questions in the workshop materials to help you Assign Responsibility. Use the criteria listed below to assess responsibility assignments.

Responsibility Assignment Matrix Criteria:

- ✓ Contains a list of work packages
- ✓ Contains a list of individuals, departments, or resource groups (internal/external)
- ✓ Has each work package broken down into tasks with descriptions
- ✓ Has people assigned to each task
- ✓ Includes performance expectations documented with measures and standards for each task
- ✓ Has primary responsibility (P) assigned for each work package
- ✓ Includes notes about resource negotiations

For example…

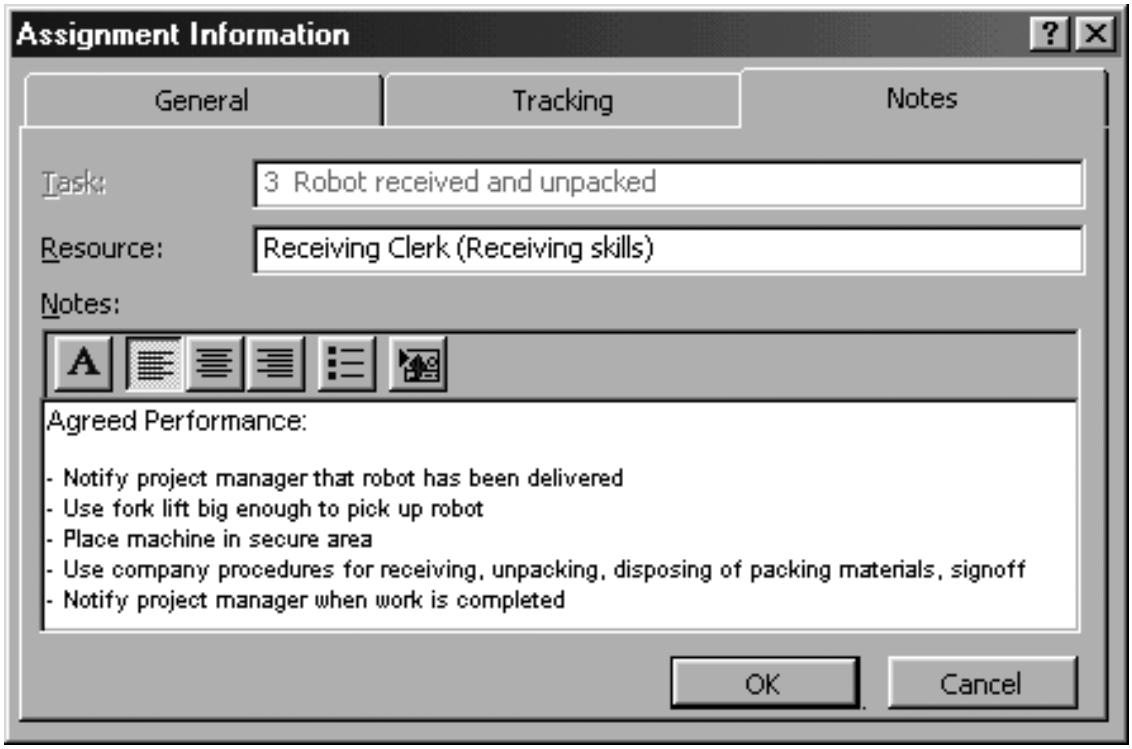
Microsoft Project does not have a specific function for establishing primary responsibility. Project Logic provides a specially formatted view that enables the project manager to assess resource assignments for each task and enter information about primary responsibility. This enables users to immediately see who has responsibility and accountability, as well as all of the resources assigned to that work package.



		Name	Cost	Work	Primary Responsibility	Details	Mar 20, '00 M	T	W	T	F
0		**Install industrial robot by 31 March for $9**	**$9,650.00**	**387.4h**		Work	53.03h	53.03h	80.37h	37.7h	37.7h
1		Project Start	$0.00	0h		Work					
2		Project managed	$0.00	4.4h	Production Manager	Work	0.37h	0.37h	0.37h	0.37h	0.37h
		Production management skills	*$0.00*	*4.4h*		Work	0.37h	0.37h	0.37h	0.37h	0.37h
3		Robot received and unpacked	$60.00	4h	Receiving Clerk	Work					
		Receiving skills	*$60.00*	*4h*		Work					
		Receiving dock	*$0.00*	*1h*		Work					
		Forklift	*$0.00*	*1h*		Work					
4		Operator training conducted	$2,810.00	122h	Instructor	Work	42.67h	42.67h	42.67h		
		Robotics teaching skills	*$750.00*	*24h*		Work	8h	8h	8h		
		Production operator skills	*$1,440.00*	*72h*		Work	24h	24h	24h		
		Millwright skills	*$600.00*	*24h*		Work	8h	8h	8h		
		Production management skills	*$0.00*	*2h*		Work	0.67h	0.67h	0.67h		
		Transportation	*$20.00*	*1h*		Work	0.33h	0.33h	0.33h		
		Robotics lab	*$0.00*	*1h*		Work	0.33h	0.33h	0.33h		
		Robot	*$0.00*	*1h*		Work	0.33h	0.33h	0.33h		
		Operator manuals	*$0.00*	*3h*		Work	1h	1h	1h		
5		**Robot installed and certified**	**$5,280.00**	**186h**		Work	10h	10h	37.33h	37.33h	37.33h
6		Robot sites visited	$620.00	26h	Engineering Manager	Work	10h	10h			
		Questioning and observation skills	*$600.00*	*24h*		Work	8h	8h			
		Engineering management skills	*$0.00*	*2h*		Work	0.67h	0.67h			
		Transportation	*$20.00*	*1h*		Work	0.33h	0.33h			
		Plant with vendor's robot	*$0.00*	*3h*		Work	1h	1h			
7		Robot moved and installed	$3,360.00	106h	Maintenance Manager	Work			37.33h	37.33h	37.33h
		Receiving skills	*$60.00*	*4h*		Work			1.33h	1.33h	1.33h
		Electrical skills	*$1,200.00*	*48h*		Work			16h	16h	16h
		Millwright skills	*$1,200.00*	*48h*		Work			16h	16h	16h
		Maintenance managemen skills	*$0.00*	*4h*		Work			1.33h	1.33h	1.33h
		Engineering management skills	*$0.00*	*2h*		Work			0.67h	0.67h	0.67h

For example…

Microsoft Project enables users to document specific performance expectations for each resource. This information can be easily viewed in Project Logic.



For example…

Below is a Microsoft Excel worksheet for the sample project showing resources assigned to the entire project.

Project Planning
Responsibility Assignment Matrix

Project Title: Install Robot | Date: 15 March
Project Manager: Production Manager | Page: 1 of 1

Project Statement: Install industrial robot by 31 March for $9,500

Assign Responsibility
- *Who has resources for this work package?*
- *Who has knowledge, skills, and experience?*
- *Whose commitment is needed?*
- *Who will have primary responsibility for each work package?*

WBS Code	People/Departments: Production Manager	Line A Operators	Maintenance Manager	Maintenance Technician (Millwright)	Engineering Manager	Engineer	Electrician	Receiving Clerk
1 Project start								
2 Project managed	Manage project (P)		Provide input and feedback		Provide input and feedback			
3 Robot received and unpacked								Receive and unpack robot Notify Production Manager Dispose of packing materials (P)
4 Operator training conducted	Schedule training Select attendees	Attend training Pass certification exam		Attend training to be able to troubleshoot during install and debugging				
5 Robot installed and certified								
5.1 Robot sites visited					Select engineer to observe other robot installations Schedule visits (P)	Observe other robot installations: note problems, opportunities, verify timing, resources		
5.2 Robot moved and installed			Schedule work and resources Supervise work (P)	Run portable crane to set robot in place Complete install per vendor instruction manual	Provide technical assistance as needed		Complete electrical hook-up per vendor instruction manual	Release robot from secure area Move to production line A
5.3 Robot operation debugged	Provide assistance as needed		Schedule work and resources Supervise work (P)	Complete debug per vendor instruction manual	Provide technical assistance as needed			
5.4 Robot certified	Inspectors notified Certifications filed with Production Manager (P)				Assistance provided as needed			

KT

Sequence Deliverables

An important first step in establishing a time-based project plan is to understand the order or sequence of tasks. This will help schedule work efficiently to minimize the amount of time required to complete the project. It will also help identify critical parts of the project as well as opportunities to shorten the project's timeline.

To sequence work packages you must understand **precedence**—the relationship between a work package and those that must be completed before it can begin. Once precedence is established, a **network diagram** can be used to show the relationships between work packages and determine the shortest total time to complete the project. A network diagram consists of nodes or boxes containing information about each work package, and arrows indicating precedence.

To establish the shortest time in which the project can be done, you have to first establish the **duration** (elapsed time) of each work package.

Next, establish the total duration of each "path" through the network, from the start of the project to the finish. The longest path through the network represents the overall time to complete the project. Work packages on this path must begin and end precisely as planned in order for the project to be completed on time. If the duration of any work package on the longest path becomes longer, the entire project will take longer. These packages are deemed critical to the successful on-time completion of the project; thus this longest path is called the **critical path**. Work packages not on the critical path may be able to start or finish sooner or later without affecting the overall duration of the project. These work packages are said to have **slack** or **float time** associated with them.

Use the process questions in the workshop materials to help you Sequence Deliverables and develop a network diagram. Use the criteria listed below to assess your network diagram.

Network Diagram Criteria:

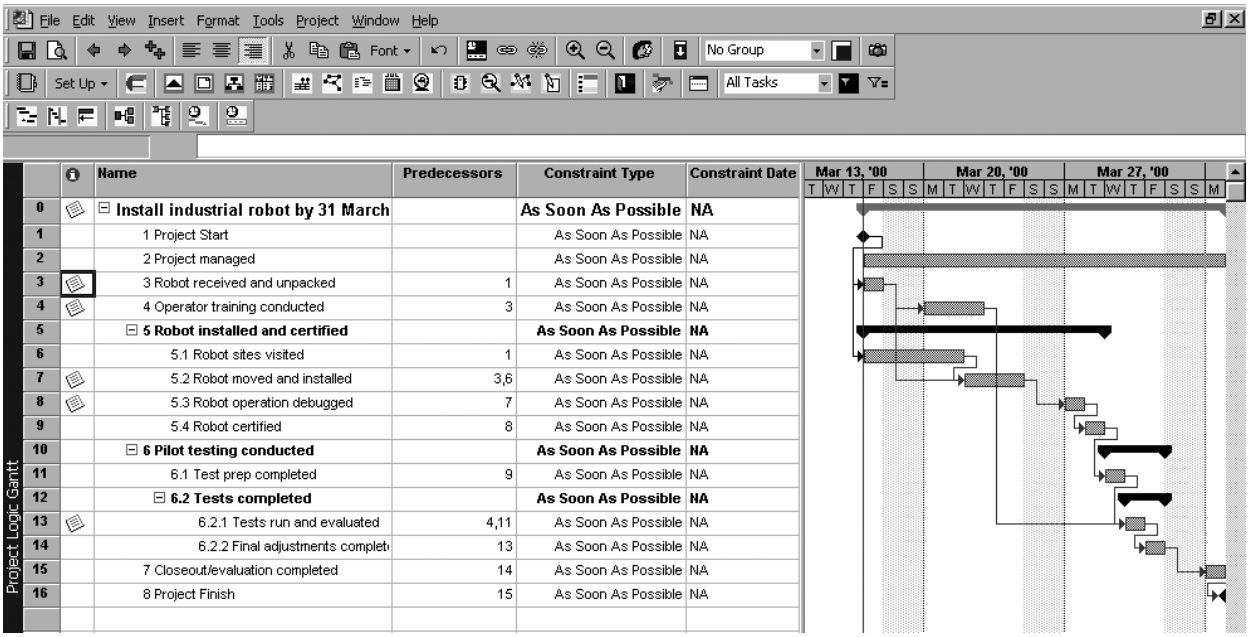
- ✓ Contains a list of work packages
- ✓ Shows precedence for each work package
- ✓ Indicates duration for each work package
- ✓ Diagrams project precedence by (software will do this automatically):
  - Drawing Start and Finish nodes
  - Making sure nodes include work package description, code, duration
  - Ensuring there are arrows into and out of every node (no loops)
  - Calculating total duration for each path
  - Highlighting Critical Path (longest path)

For example…

Sequence Deliverables

Microsoft Project will develop the network diagram and calculate the critical path once precedence and duration are entered. Duration estimates were entered when you selected an estimating approach while identifying resources. (Note: Although that was out of sync with the way Kepner-Tregoe's process deals with duration, Microsoft Project now applies those estimates to calculate critical path and construct the network.)

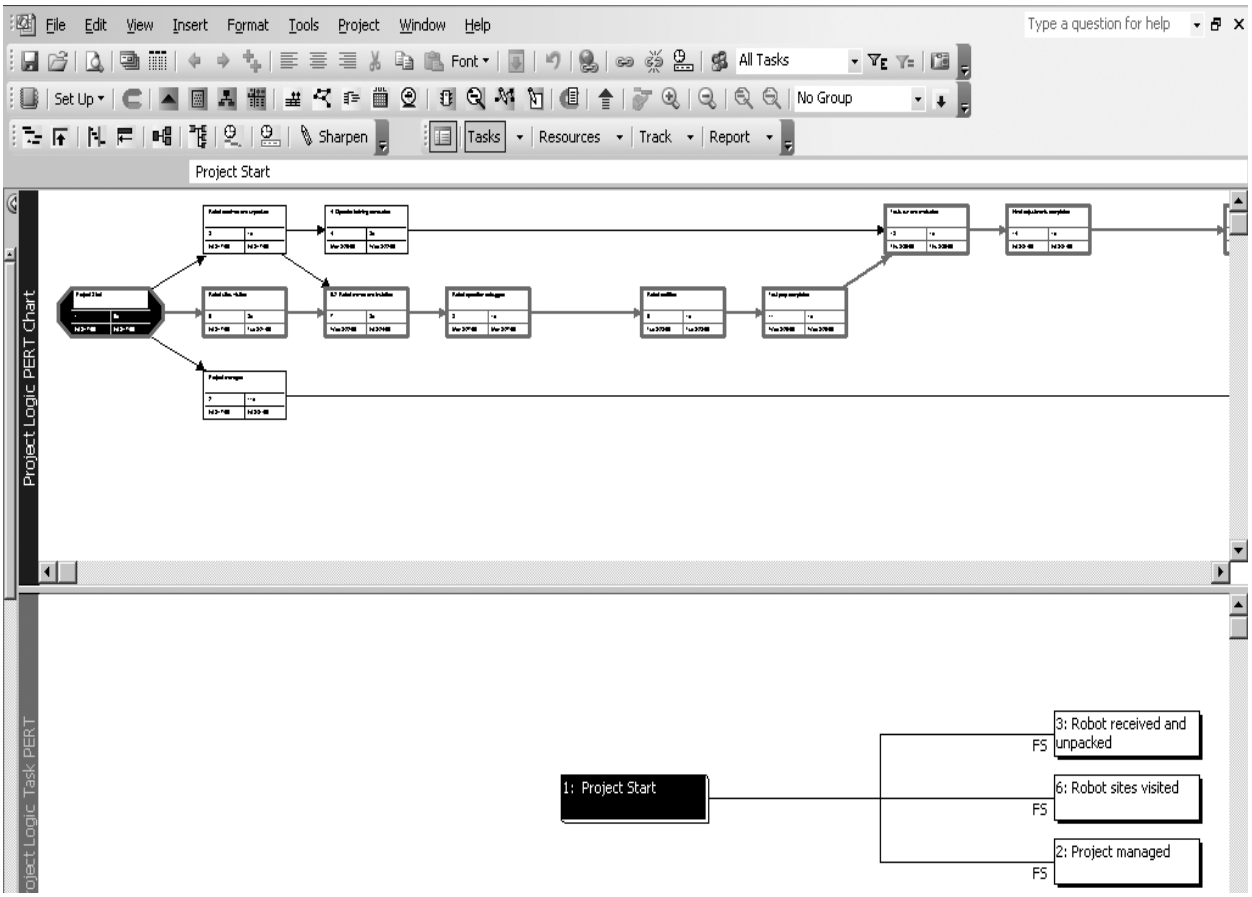
Project Logic also locates assignment of constraints with sequencing of deliverables. This is often when specific, date-driven limitations come to light—a task must be finished prior to a certain date, or cannot begin until a certain date, for example. Easy-to-use functions enable the user to make these choices and view the impact.



	Name	Predecessors	Constraint Type	Constraint Date
0	**Install industrial robot by 31 March**		**As Soon As Possible**	**NA**
1	1 Project Start		As Soon As Possible	NA
2	2 Project managed		As Soon As Possible	NA
3	3 Robot received and unpacked	1	As Soon As Possible	NA
4	4 Operator training conducted	3	As Soon As Possible	NA
5	**5 Robot installed and certified**		**As Soon As Possible**	**NA**
6	5.1 Robot sites visited	1	As Soon As Possible	NA
7	5.2 Robot moved and installed	3,6	As Soon As Possible	NA
8	5.3 Robot operation debugged	7	As Soon As Possible	NA
9	5.4 Robot certified	8	As Soon As Possible	NA
10	**6 Pilot testing conducted**		**As Soon As Possible**	**NA**
11	6.1 Test prep completed	9	As Soon As Possible	NA
12	**6.2 Tests completed**		**As Soon As Possible**	**NA**
13	6.2.1 Tests run and evaluated	4,11	As Soon As Possible	NA
14	6.2.2 Final adjustments complet	13	As Soon As Possible	NA
15	7 Closeout/evaluation completed	14	As Soon As Possible	NA
16	8 Project Finish	15	As Soon As Possible	NA

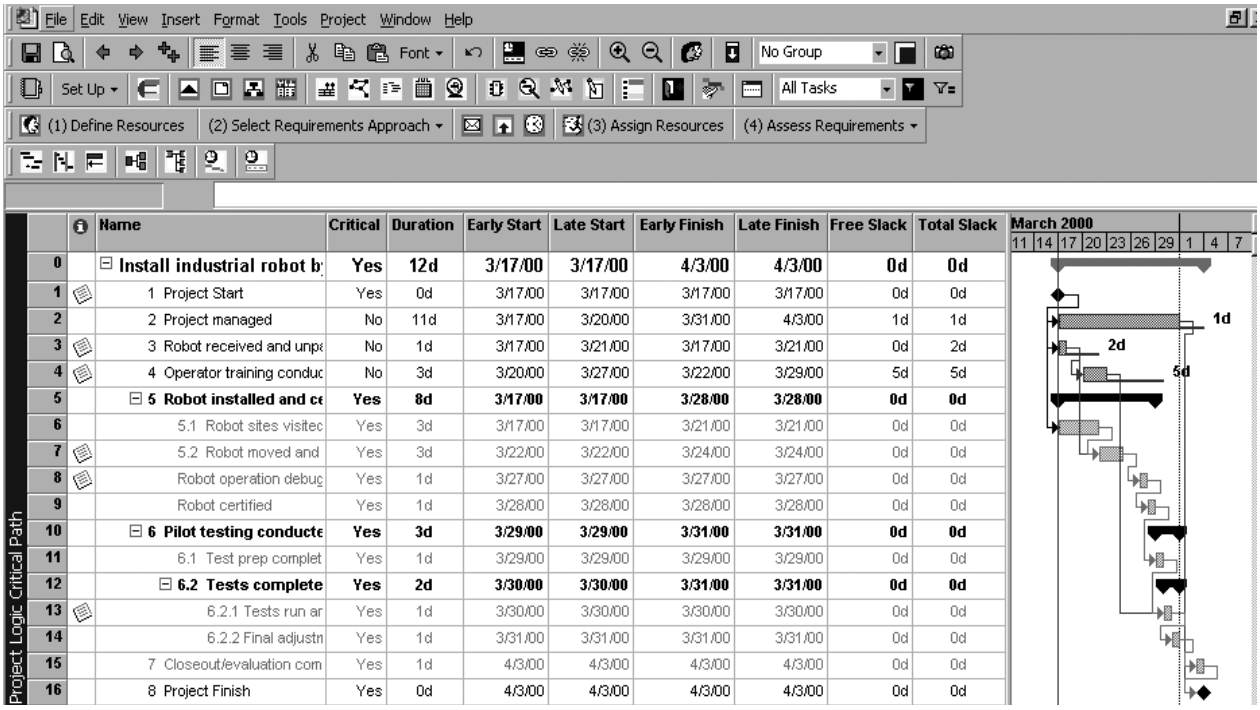
For example…

Once precedents are entered, a network diagram can be viewed, along with detailed visual information about predecessor and successor tasks. In the example, there are four paths through the network, with durations of 7, 9, 10, and 12 days. Since the critical path is the one with the longest total duration, the path with 12 days is the critical path. The critical path is highlighted in the example shown below.



For example…

Another view available from the Sequence Deliverables toolbar in Project Logic shows all the critical path data in numeric form as well as graphically, with slack time indicated on the Gantt chart. See the next section for additional discussion of Gantt charts and slack time.



		Name	Critical	Duration	Early Start	Late Start	Early Finish	Late Finish	Free Slack	Total Slack
0		**Install industrial robot b**	**Yes**	**12d**	**3/17/00**	**3/17/00**	**4/3/00**	**4/3/00**	**0d**	**0d**
1		1 Project Start	Yes	0d	3/17/00	3/17/00	3/17/00	3/17/00	0d	0d
2		2 Project managed	No	11d	3/17/00	3/20/00	3/31/00	4/3/00	1d	1d
3		3 Robot received and unpa	No	1d	3/17/00	3/21/00	3/17/00	3/21/00	0d	2d
4		4 Operator training conduc	No	3d	3/20/00	3/27/00	3/22/00	3/29/00	5d	5d
5		**5 Robot installed and ce**	**Yes**	**8d**	**3/17/00**	**3/17/00**	**3/28/00**	**3/28/00**	**0d**	**0d**
6		5.1 Robot sites visitec	Yes	3d	3/17/00	3/17/00	3/21/00	3/21/00	0d	0d
7		5.2 Robot moved and	Yes	3d	3/22/00	3/22/00	3/24/00	3/24/00	0d	0d
8		Robot operation debuc	Yes	1d	3/27/00	3/27/00	3/27/00	3/27/00	0d	0d
9		Robot certified	Yes	1d	3/28/00	3/28/00	3/28/00	3/28/00	0d	0d
10		**6 Pilot testing conducte**	**Yes**	**3d**	**3/29/00**	**3/29/00**	**3/31/00**	**3/31/00**	**0d**	**0d**
11		6.1 Test prep complet	Yes	1d	3/29/00	3/29/00	3/29/00	3/29/00	0d	0d
12		**6.2 Tests complete**	**Yes**	**2d**	**3/30/00**	**3/30/00**	**3/31/00**	**3/31/00**	**0d**	**0d**
13		6.2.1 Tests run ar	Yes	1d	3/30/00	3/30/00	3/30/00	3/30/00	0d	0d
14		6.2.2 Final adjustn	Yes	1d	3/31/00	3/31/00	3/31/00	3/31/00	0d	0d
15		7 Closeout/evaluation com	Yes	1d	4/3/00	4/3/00	4/3/00	4/3/00	0d	0d
16		8 Project Finish	Yes	0d	4/3/00	4/3/00	4/3/00	4/3/00	0d	0d

Schedule Deliverables

Using precedence and duration, determine when each work package will be performed in clock or calendar time—i.e., when the anticipated start and finish of each work package will be, as well as the overall start and finish dates of the project. Armed with this information, test timing expectations of resources and stakeholders, look for potential problems or opportunities, and set up a baseline for monitoring.

Determine whether there is a prescribed start or finish date for the project, and whether any work packages have constraint dates. Also see if the calendar of available time is constrained by holidays, scheduled downtime, resource availability conflicts, etc. Using these factors and duration and precedence, compute when each work package can start and finish.

Use this information to "map" the project schedule. Tools available for this include calendars, bar graphs, and spreadsheets. One of the most commonly used tools is called a ***Gantt Chart,*** named after Henry Gantt who used the technique to plan military supply logistics in the early 1900s. It has become a mainstay of project planning for its ability to communicate schedule and other information quickly and efficiently.

A Gantt chart lists work packages on the vertical axis and clock or calendar time on the horizontal axis. Bars that span the duration of the work package represent the timing of work. Software packages can show precedence, resource assignments, critical path, and a variety of other parameters overlaid on the basic bar graph. Gantt charts help to identify which work can be done concurrently, whether it is possible to overlap work packages to shorten the project, where critical dates may impact the overall schedule, when critical path tasks are scheduled, etc.

Gantt charts can also show the earliest and latest start or finish dates of work packages with slack or float time. This allows you to see when and by how much those tasks could be moved to resolve schedule or resource conflicts without impacting the critical path of the project.

Use the process questions in the workshop materials to help you Schedule Deliverables. Use the criteria listed below to assess and improve your Gantt chart.

Gantt Chart Criteria:

- ✓ Contains a list of work packages
- ✓ Indicates a timeline (days, weeks, months, etc.)
- ✓ Includes start and finish dates for each work package (based on precedence, duration and constraints)
- ✓ Has bars showing start, finish, and duration of each work package
- ✓ Has arrows or links showing precedents
- ✓ Contains additional notations (resource names, non-working time, slack, precedence, etc.)

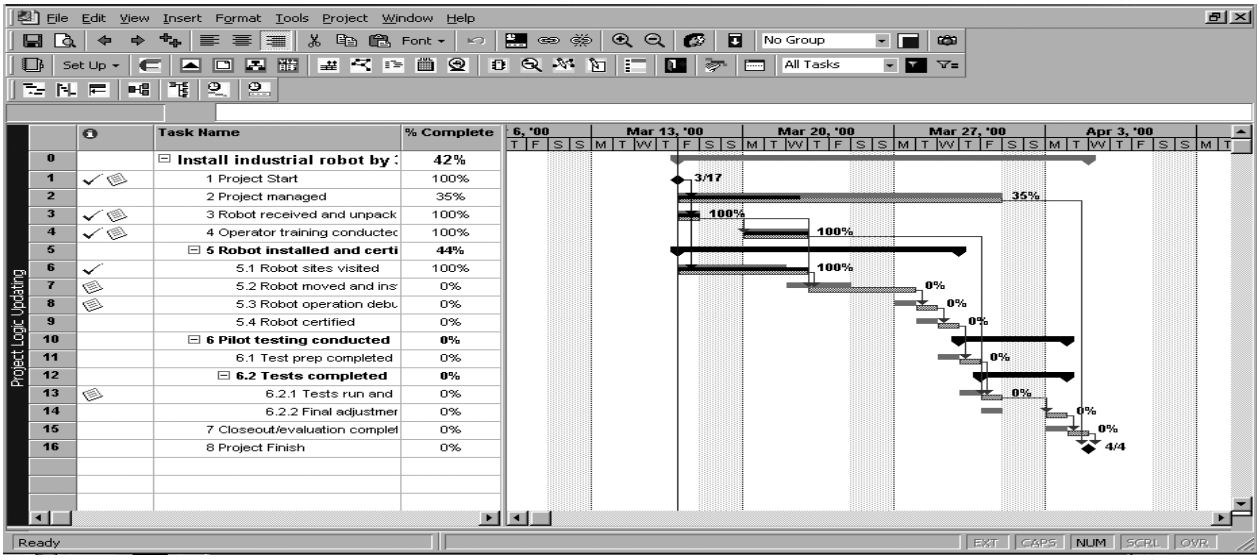
For example…

Schedule Deliverables

Microsoft Project creates Gantt charts from information about work packages, resource assignments, precedence and duration, and start and finish dates. Project Logic harnesses this power by making views available that enable users to see key scheduling data.

These views enable the user to assess sequencing and scheduling, identify critical areas, and assess task constraints. The user can experiment with changes and see the impact in terms of the data as well as on the Gantt chart.

One of the things that Microsoft Project facilitates is the addition of pertinent data to the basic Gantt format to improve communication of project planning information. Microsoft's Gantt Chart Wizard automates this process, making it simple to customize the Gantt chart. The example below shows a number of customized additions to the Gantt chart for the sample project, including critical tasks, slack, percent complete and milestone dates. (See also the view referenced above in the discussion of critical path and slack.)



Schedule Resources

Resource scheduling is the process of confirming the allocation of resources to scheduled work. Now it's time to assess the availability and loading of resources, gain final commitment from resources and their managers, and resolve potential resource conflicts before they impact project implementation. Resource scheduling refers primarily to human resources, but it can also refer to equipment, facility, and materials.

This assessment should include confirmation that resources are available when needed, and that they are clear about expectations, constraints, reporting, etc. It is also important to confirm that critical path work packages have all needed resources, that any changes in resourcing are feasible and do not impact other work, that individual resource constraints have been considered, that resource costs linked to scheduled work can be supported over time (spend plan), and that slack time is being used prudently to manage resources.

Examine all work packages assigned to each resource to see if/when they will be working on things simultaneously (either within this project or with other planned projects). Look for periods when more work is assigned than the resource can perform, or when very little work is assigned. If a resource is overloaded, assess whether additional resources must be added, work must be redistributed, or work can be delayed. Determine whether slack time or under-utilized resources can be used to resolve allocation issues. Focus primarily on the critical path and significant over- and under-allocations. Use tools like resource calendars, loading diagrams, and scheduling software to assist in assessment and leveling of resources in your project.

Use the process questions in the workshop materials and the criteria listed below to help you Schedule Resources. Use the criteria listed below to assess and improve resource scheduling.

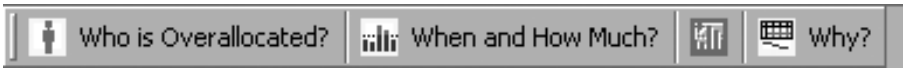
Resource Scheduling Criteria:

- ✓ Uses Definition and Planning outputs
- ✓ Considers the schedule and availability of each resource
- ✓ Addresses critical path work packages first
- ✓ Examines options before choosing method for resolving resource conflicts
- ✓ Involves resources and managers in resolutions
- ✓ Helps to select appropriate resource scheduling assessment tools
- ✓ Assists in getting commitment before proceeding with implementation

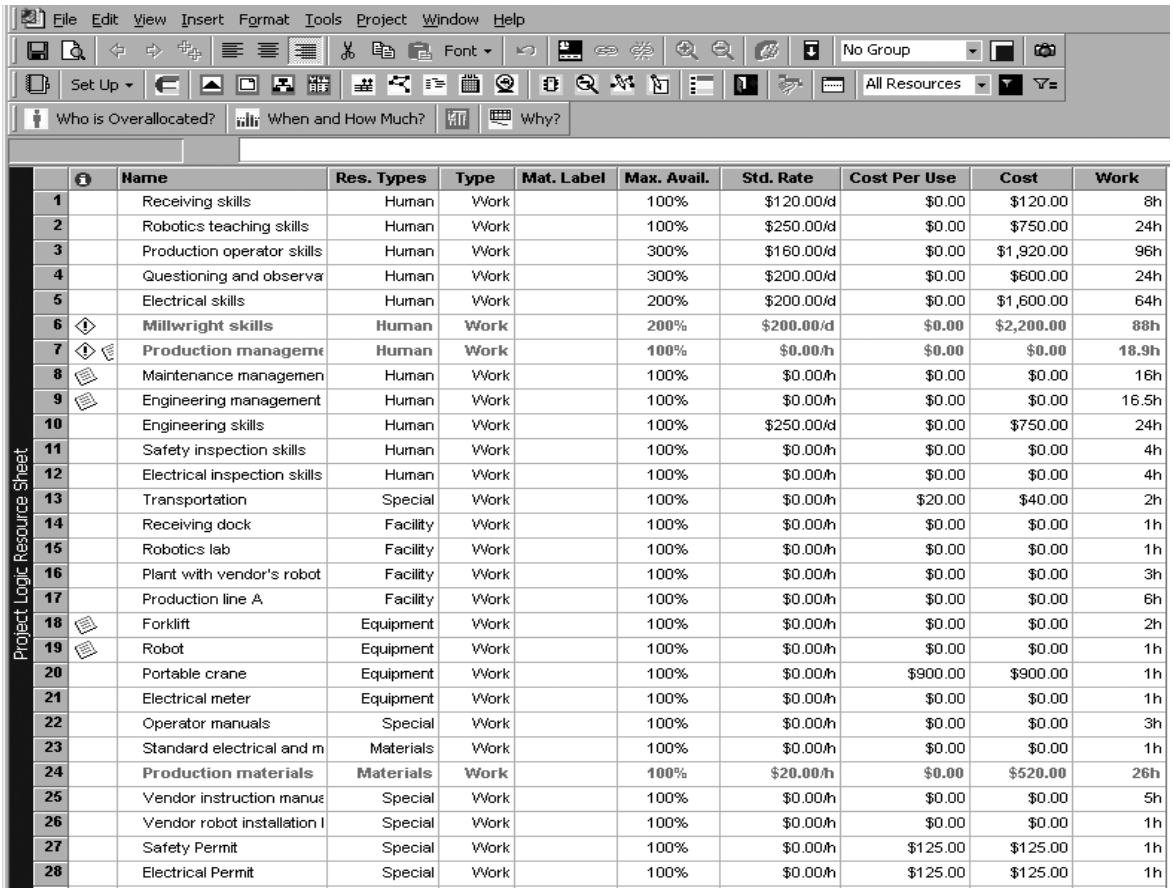
For example…

Schedule Resources

Microsoft Project can "look" at resource assignments and readily identify where there is more demand than available resources. Project Logic provides a simple three-step process for assessing and resolving resource allocation issues. The steps of this process are presented in a sub-toolbar. Users click on the steps to view data related to any overallocation of resources, and to look at resource use across the project to search for ways to resolve the overallocations.



The **first** step in the Schedule Resources process in Project Logic is to determine whether any resources are overallocated. (Overallocated resources are highlighted in red on the screen.) In this example, two resources (6, 7) have more work assigned than they can do in the available time.

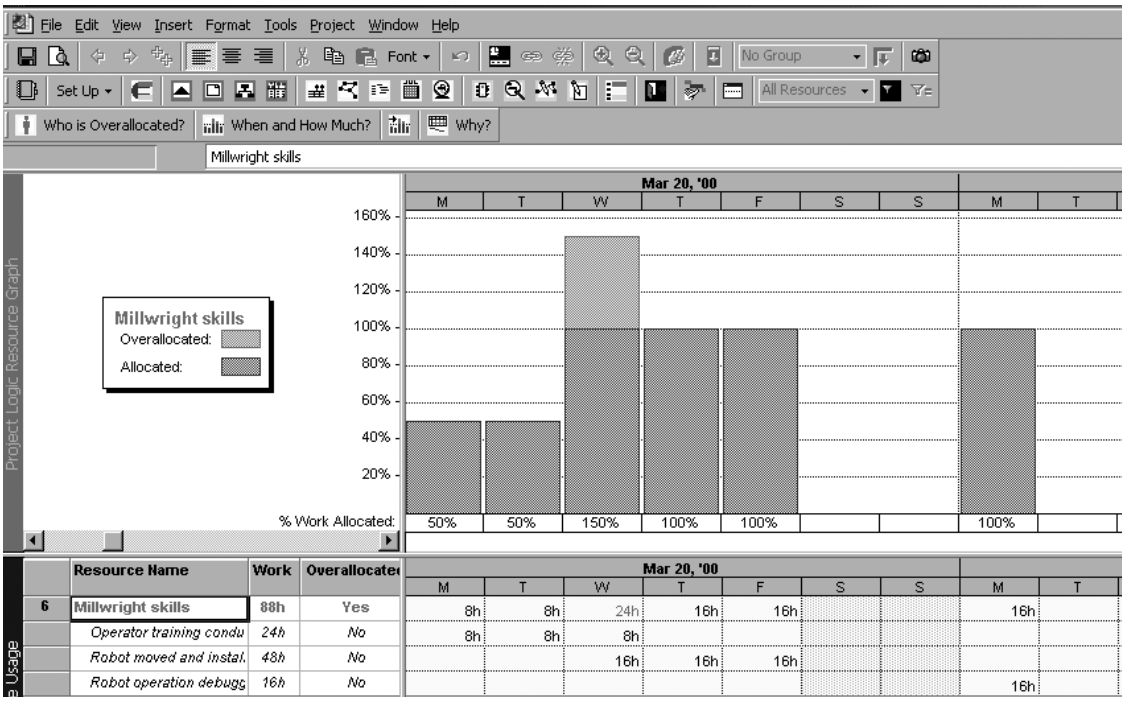


		Name	Res. Types	Type	Mat. Label	Max. Avail.	Std. Rate	Cost Per Use	Cost	Work
1		Receiving skills	Human	Work		100%	$120.00/d	$0.00	$120.00	8h
2		Robotics teaching skills	Human	Work		100%	$250.00/d	$0.00	$750.00	24h
3		Production operator skills	Human	Work		300%	$160.00/d	$0.00	$1,920.00	96h
4		Questioning and observa	Human	Work		300%	$200.00/d	$0.00	$600.00	24h
5		Electrical skills	Human	Work		200%	$200.00/d	$0.00	$1,600.00	64h
6		**Millwright skills**	**Human**	**Work**		**200%**	**$200.00/d**	**$0.00**	**$2,200.00**	**88h**
7		**Production manageme**	**Human**	**Work**		**100%**	**$0.00/h**	**$0.00**	**$0.00**	**18.9h**
8		Maintenance managemen	Human	Work		100%	$0.00/h	$0.00	$0.00	16h
9		Engineering management	Human	Work		100%	$0.00/h	$0.00	$0.00	16.5h
10		Engineering skills	Human	Work		100%	$250.00/d	$0.00	$750.00	24h
11		Safety inspection skills	Human	Work		100%	$0.00/h	$0.00	$0.00	4h
12		Electrical inspection skills	Human	Work		100%	$0.00/h	$0.00	$0.00	4h
13		Transportation	Special	Work		100%	$0.00/h	$20.00	$40.00	2h
14		Receiving dock	Facility	Work		100%	$0.00/h	$0.00	$0.00	1h
15		Robotics lab	Facility	Work		100%	$0.00/h	$0.00	$0.00	1h
16		Plant with vendor's robot	Facility	Work		100%	$0.00/h	$0.00	$0.00	3h
17		Production line A	Facility	Work		100%	$0.00/h	$0.00	$0.00	6h
18		Forklift	Equipment	Work		100%	$0.00/h	$0.00	$0.00	2h
19		Robot	Equipment	Work		100%	$0.00/h	$0.00	$0.00	1h
20		Portable crane	Equipment	Work		100%	$0.00/h	$900.00	$900.00	1h
21		Electrical meter	Equipment	Work		100%	$0.00/h	$0.00	$0.00	1h
22		Operator manuals	Special	Work		100%	$0.00/h	$0.00	$0.00	3h
23		Standard electrical and m	Materials	Work		100%	$0.00/h	$0.00	$0.00	1h
24		**Production materials**	**Materials**	**Work**		**100%**	**$20.00/h**	**$0.00**	**$520.00**	**26h**
25		Vendor instruction manua	Special	Work		100%	$0.00/h	$0.00	$0.00	5h
26		Vendor robot installation l	Special	Work		100%	$0.00/h	$0.00	$0.00	1h
27		Safety Permit	Special	Work		100%	$0.00/h	$125.00	$125.00	1h
28		Electrical Permit	Special	Work		100%	$0.00/h	$125.00	$125.00	1h

For example…

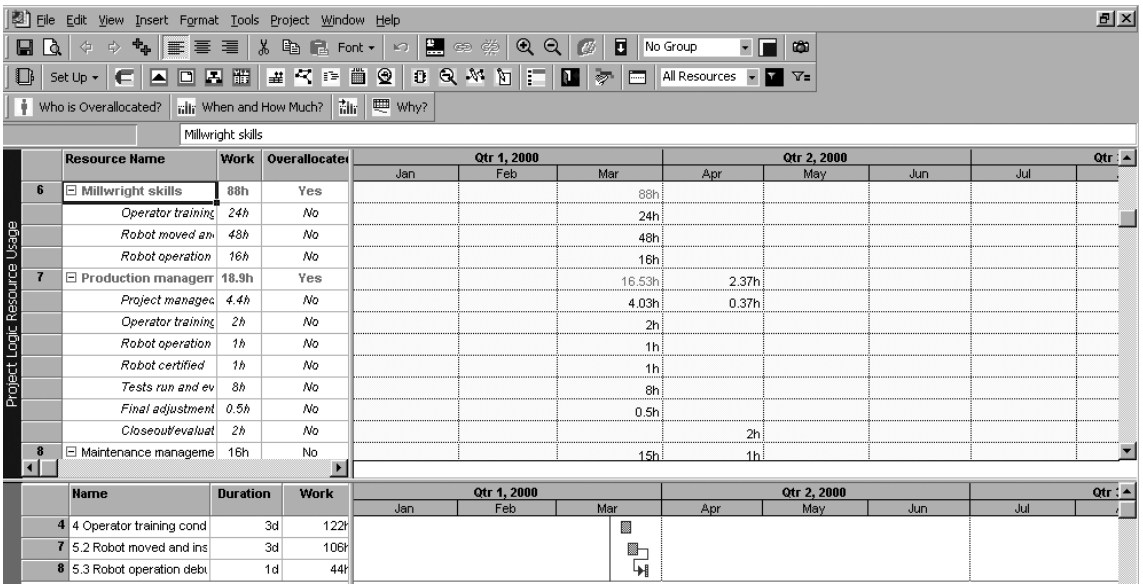
Once you know which resources are overallocated, you then need to see exactly when the overallocation is occurring. The **second** step in Project Logic's Schedule Resources process enables the user to see a graph showing the demand for each resource based on the number of tasks assigned at any one time. Now you see **when** the overallocation occurs, **what** tasks are demanding resource time, and **how much** time each task requires. From this view you can determine the magnitude of the problem.

As an added benefit, Project Logic provides a button for quickly moving from one overallocation to the next, so you don't have to search. This can be extremely helpful in small projects with lots of resources, as well as large projects that have many tasks spread out over a long schedule.



For example…

The **third** step in Project Logic's Schedule Resources process shows us information about **why** certain tasks are competing for a resource's available time and how they relate to each other. With this view, the user can begin to determine whether any of the competing tasks are on or off the critical path (and whether to use slack time to resolve resource conflicts), whether the overallocation is long or short in length, and what other resources might be available to help resolve the overallocation.



Protect the Plan

At this point, your plan is essentially complete and ready for implementation. Or is it? Before beginning work on the project, step back and examine the plan for risks and opportunities. To do this you can use two tools—one to surface and analyze specific threats to success (Potential Problem Analysis or PPA), the other to examine and prepare for opportunities (Potential Opportunity Analysis or POA).

These tools not only will help identify and manage risks and leverage opportunities; in doing so they will help ensure that project objectives are met and that the intended value of the project is delivered (or exceeded).

To do this, examine the project plan and identify where it is most vulnerable and/or where the greatest opportunities lie. Once specific problems or opportunities are identified, their cause must be understood. Problems must be minimized by addressing their causes with preventive action. Likewise, the causes of opportunities must be promoted. In the event that problems cannot be prevented, contingent action must be taken to deal with probable effects, and triggers identified to set those actions in place. For opportunities, capitalizing actions and triggers need to be set in place to leverage the maximum benefit when the opportunity occurs. Finally, these actions need to be built into the plan to account for needed time and resources.

Use the process questions in the workshop materials and the criteria listed below to help you Protect the Plan. Use the criteria listed below to assess and improve use of PPA/POA.

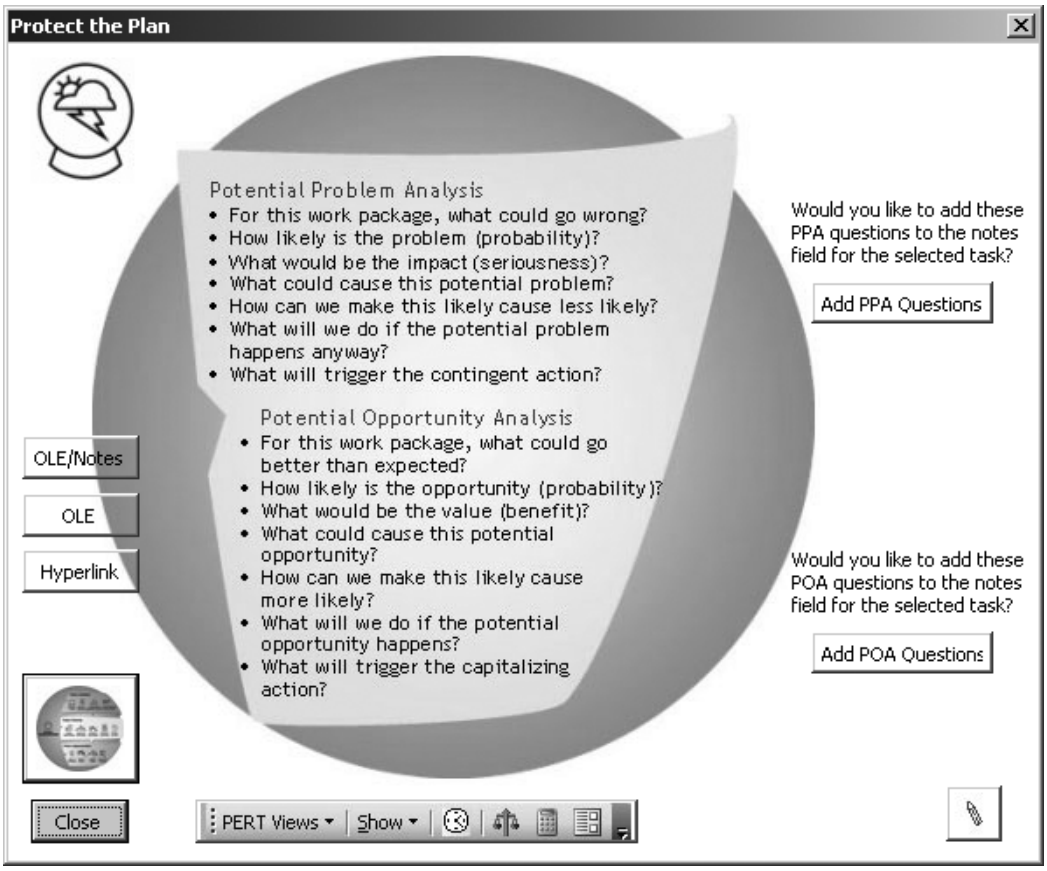
PPA/POA Criteria:

- ✓ Plan assessed to identify critical areas (vulnerable to either problems or opportunities)
- ✓ Specific effects of potential problems/opportunities understood
- ✓ Likelihood and impact of each potential problem/opportunity understood (priority set)
- ✓ Likely causes clearly understood and documented
- ✓ Preventive/promoting actions targeted at causes
- ✓ Contingent/capitalizing actions targeted at specific effects of the problem/opportunity
- ✓ Triggers (manual or automatic) assigned to each contingent/capitalizing action
- ✓ Plan adjusted to incorporate additional work and resources needed

For example…

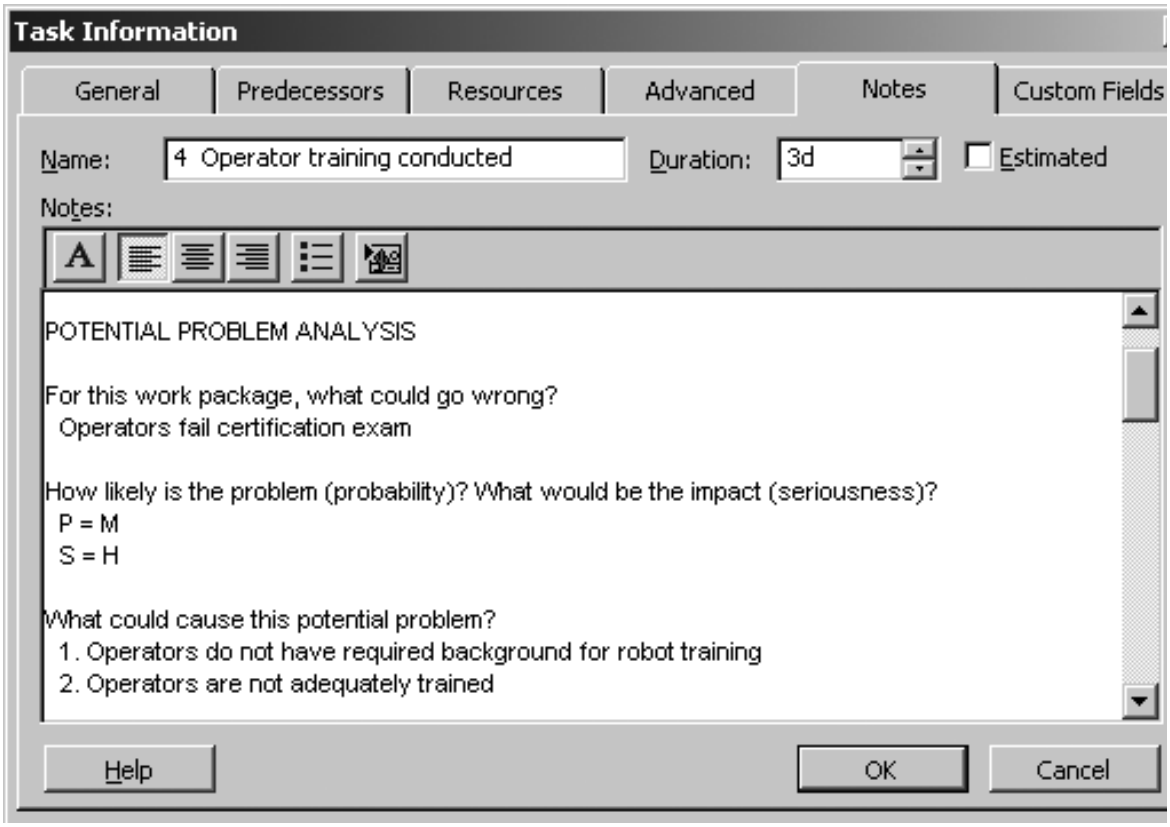
Protect the Plan

Microsoft Project does not have specific features that support identifying or assessing threats and opportunities. Project Logic provides a number of features that promote and support this critical information. First, Project Logic reminds the user of the key questions related to analyzing problems and opportunities. In addition, it offers two options for capturing answers to these questions.



For example…

Project Logic enables the user to embed the PPA questions in the task information dialog box for critical work packages. This facilitates sharing important information about specific tasks with all the resources involved in the task, and provides a visible reminder when particular care must be taken to minimize a risk or leverage an opportunity.



For example…

Project Logic also enables the user to access Microsoft Excel worksheet templates that contain all the appropriate Potential Problem and Opportunity Analysis process questions. The templates can be filled in and attached or embedded in the same manner as described for Project Statement and Objectives. This allows for a more detailed and robust use of the PPA/POA processes, and ensures that this critical documentation is attached to the project plan for future reference. Below is an example of a Potential Problem Analysis on a Microsoft Excel worksheet template.

Project Planning

Potential Problem Analysis (PPA)

Project Title: Install Robot | Date: 15 March

Project Manager: Production Manager | Page: 1 of 1

Project Statement: Install industrial robot by 31 March for $9,500

Protect the Plan

- *Where is time, cost, and performance most at risk?*
- *What could go wrong?*
- *What is the likelihood of this potential problem occurring?*
- *What will be the impact?*
- *What could cause this potential problem?*
- *How can we prevent this likely cause?*
- *What will we do if this happens?*
- *How will we know it has occurred?*

WBS Code	List Potential Problems	P*	S**	Identify Likely Causes	Take Preventive Action	Plan Contingent Action	Identify Triggers	Steps/Modifications to the Plan
1	None anticipated							
2	None anticipated							
3								
4	Operators fail certification exam	M	H	Operators do not have required background for robot training Operators are not trained adequately	Select qualified operators only Provide unqualified operators with training Test operators' knowledge and skill at regular intervals during the training	Provide additional training Extend the training by one day	Check progress with instructor at the end of each day Instructor reports operators' progress is slow Operators' exam results below grade	Screen operators for background in robotics Prepare for training, if necessary Prepare for additional training, if necessary
5								
5.1								
5.2	Robot cannot be installed in 3 days	M	M	More difficult to install robot than planned Power outage in plant	Have vendor on site during installation Accept risk	Work overtime to finish installation	Check progress at the end of each day	Check with other robot users on their experiences with installing the robot Make arrangements for vendor to be on site during installation Prepare for possible overtime
5.3	Robot cannot be debugged in 1 day	H	H	Robot not connected properly during installation Debugging time estimate is incorrect	Have vendor on site during debugging Verify debugging times with other robot users	Work overtime to finish debugging	Check progress frequently during debugging	Verify debugging times with other robot users Prepare for possible overtime Make arrangements for vendor to be on site during debugging
5.4								
6								
6.1								
6.2								
6.2.1	Robot fails during testing	H	H	Production materials are not within specification Robot cycle time is too slow Robot mishandles the product	Verify materials used are within specification Verify cycle time at debugging Verify robot movement at debugging	Distribute April 1 production among other lines	Continuously check test results	Verify materials used are within specification Verify robot cycle time and movement at debugging Adjust production schedule, if needed
6.2.2								
7	None anticipated							
8	None anticipated							

*P = Probability **S = Seriousness

For example…

Below is an example of a Potential Opportunity Analysis on a Microsoft Excel worksheet template.

Project Planning

Potential Opportunity Analysis (POA)

Project Title Install Robot **Date** 15 March

Project Manager Production Manager **Page** 1

Project Statement Install industrial robot by 31 March for $9,500

Enhance the Plan

- *Where are there significant opportunities?*
- *What could go better than expected?*
- *What is the likelihood of this potential opportunity occurring?*
- *What will be the benefit?*
- *What could cause this potential opportunity?*
- *How can we promote this likely cause?*
- *What will we do if this happens?*
- *How will we know if it has occurred?*

WBS Code	List Potential Opportunities	P*	B**	Identify Likely Causes	Take Promoting Action	Plan Capitalizing Action	Identify Triggers	Steps/Modifications to the Plan
1	None anticipated							
2	None anticipated							
3	Robot received earlier than anticipated	L	M	Shipped early from vendor	Have vendor call when robot is shipped	Start installation earlier	Call from vendor when robot ships	Prepare for possible early start (check resource availability, check integration with other lines, check impact on other projects)
					Request expedited shipment		Call from Receiving Sup. when robot arrives	
4	Operator training takes less time than expected	M	M	Operators gain mastery faster than anticipated	Select operators with background in robots	Have operators observe and assist in debugging (since their new training may speed that process)	Check with instructor at end of first day of training and again at noon on second day	Screen operators for background/interest in robotics
					Select operators eager to learn about robotics			
5								
5.1	None anticipated							
5.2	Robot installation takes less time than expected	M	H	Production line prep completed early	Schedule production shut down so line can be prepared in advance	Start debugging and pilot testing tasks earlier than scheduled	Continuously check during installation, review progress at the end of first day	Verify vendor assistance terms in current contract
				Vendor assists more than anticipated	Verify vendor assistance terms in contract			
					Establish additional contract with vendor for robot installation			
5.3	None anticipated							
5.4	None anticipated							
6								
6.1	None anticipated							
6.2	None anticipated							
6.2.1	None anticipated							
6.2.2	None anticipated							
7	None anticipated							
8	None anticipated							

*P = Probability **B = Benefit