

Section Four

Learning Module C:

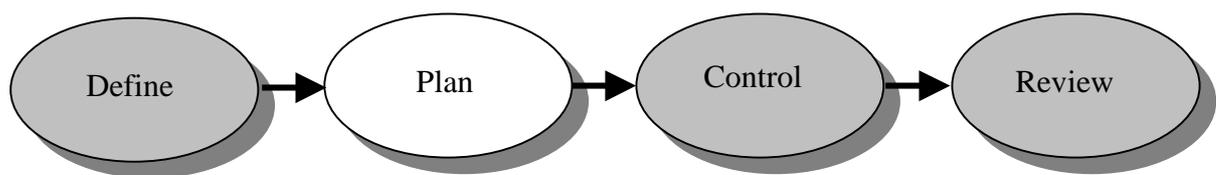
Planning For Project Success

4.1 Module C: Objectives

At the conclusion of this module you will be able to:

- Explain the process of planning.
- Produce an effective plan to achieve project success.

4.2 Content of Module



This module introduces you to the second phase of the Project Management Cycle, the **Plan**. You will learn about the processes involved in planning a project including, developing a detailed Work Breakdown Structure (WBS), scheduling, allocation, communications, resource loading, costing and documenting. Participants will also learn how to schedule out a project using the Critical Path Method (CPM). This will involve task identification, predecessor relationships, identification of the critical path and resource allocation. The planning process will be demonstrated using a generic project.

4.3 Planning the Project

A project plan is the mechanism that allows you to convert the outcomes that you want in a project to concrete reality. The project plan goes beyond the project definition to provide you with the specific actions that are required, the timeframe in which the actions need to occur, who will do them, how much they will cost, what is needed to complete them and to what level of quality. **The definition provides the overview of the project; the planning provides the specific details that allow us to get the job done.** In larger projects it is normal to require approval before proceeding to detailed planning. If this is not the case, after the project has been defined, you should be clear that you have a viable project. If you are not clear on your outcome, it is unlikely that you will be able to plan it in detail.

The project plan is represented in a number of ways. If you think about it carefully, the plan needs to represent your progress. In its simplest form, this is usually presented as a Gantt chart (or bar chart). A Gantt chart represents tasks over time; it consists of a horizontal time scale, a vertical list of activities, and a horizontal line or bar for each activity (See the example Diagram 4.3.1).

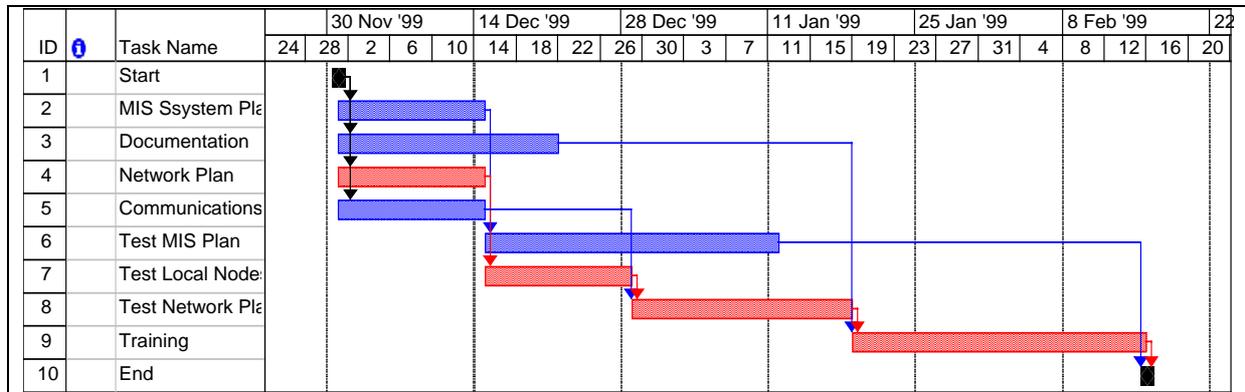


Diagram 4.3.1: A Typical Gantt chart.

The typical Gantt chart diagram illustrated above provides a clear and unambiguous pictorial representation of the project plan.

Another way of representing the project plan is a Program Evaluation Review Technique (PERT) chart or network diagram. This type of representation became popular in the late 1950s concurrent with the growth in complex projects such as the US Navy’s Polaris Missile Submarine program. They provide a good indication of the flow of the project (see Diagram 4.3.2).

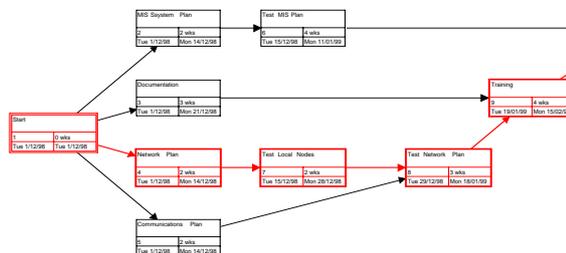


Diagram 4.3.2: A Typical PERT chart.

The two representations discussed above (the Gantt chart and the PERT chart) provide the simplest form of a project plan. There is obviously a lot more involved including breaking down resources and costs as well as effective documentation. All this information together is your project management information system. That is, the information you need to be able to effectively conduct your project.

We encourage the use of specialised project management computer software which allows you to represent all aspects of a project plan. The one used at UNE in 2000 was MS-Project. In our experience, MS-Project is an appropriate package to use for teaching and learning projects.



Together all this information is your project management information system. This is the information you need to be able to effectively conduct your project.

4.4 Developing a Project Schedule

In the project definition stage we broke down the work that needs to be done into a broad breakdown of work which we called the work breakdown structure or WBS. Now in the detailed planning process we need to look at it in more detail. Firstly, a detailed WBS is required before we can produce a meaningful schedule. Once the entire schedule has been completed then we are in a position to allocate resources, develop an effective communication plan and produce an appropriate recording system.



The steps required to produce a project schedule are:

- **produce a detailed work breakdown;**
- **schedule the project using the critical path method (CPM); and**
- **allocate resources and costs.**

Step One: The detailed work breakdown

As with all aspects of project planning, the detailed WBS is best achieved through using all project team members. We recommend a team brainstorming session to identify the particular tasks that are required. It should be noted that the brainstorming activity is a good team building exercise because it brings people together as well as gaining commitment from the entire team of what is to be achieved. The team are more likely to have ownership of the project if they have had a role in its production.

The project is broken down into ‘bite-sized’ chunks such that the big picture is decomposed into smaller and smaller segments. The broad tasks have generally been identified during the project definition phase. These broad tasks are written separately on ‘post it’ notes. These are then broken down into smaller sub-tasks and written on different coloured ‘post it’ notes. Depending on the complexity of the project, the sub tasks may then be broken even down further.

Successful Brainstorming involves:

- Ensuring all the project team are familiar with the project definition before the planning brainstorming session.
- Considering the use of an external facilitator to conduct the brainstorming.
- Ensuring an appropriate and accurate recording system (for example, a computer with project management software is ideal to create the WBS).
- Discussing the duration, resources etc, for each element.
- Using the six rules of brainstorming (listed in Section 7 Planning sheets and forms).



Diagram 4.4.1: A project team brainstorming using ‘post-it’ notes to create a suitable WBS.

Once the tasks have been identified then you need to determine four aspects of each task:

- the objective and/or deliverable of that task;
- the dependency relationship;
- the duration of the task;
- the resources required for that task.

You should note the following when determining these four aspects:

1. The objective and deliverable is best agreed upon during the brainstorming session by the project team members.
2. The dependency relationship is important. The easiest way is to work out what has to come before that task - this is its predecessor.
3. The duration of the task is often the most difficult to work out. This requires a realistic estimation of the duration. This will be dealt with in greater detail below. The key here is to avoid 'blue skying' (that is, unrealistic estimations of duration).
4. The finalisation of resources is best left until after the schedule has been determined (this is called the critical path method (CPM)). However, it is important at this early stage to identify who will be doing what. Particularly, as this will assist in your accurate estimation of task durations.

Once these tasks have been identified then a suitable WBS can be developed. In the example illustrated below, a simple university research project has been identified. Note that each element of the WBS structure is numbered. This is called a WBS code.

Next, you would break each of these elements into sub-elements so that the list becomes a hierarchical structure as shown below. Consider the example below. Note also, the columns for predecessors (PRD) and durations. **A simple WBS planning sheet is provided in Section Seven.**

A Simple University Research Project

WBS	Phases/Tasks	Deliverables	PRD
1	Initial Research Clarification		
1.1	Interview key stakeholders	Broad summary of interviews	Start
1.2	Undertake initial literature review	Written review available	Start
1.3	Produce research outline	Detailed research proposal	1.1,1.2
1.4	Proposal acceptance	Signed approval of acceptance	1.3
2	Detailed Research		
2.1	Detailed review of literature	Draft literature review	1.4
2.2	Conduct of qualitative research	Production of research summary	1.4
2.3	Summary of data	Summary of data brief prepared	2.2,2.1
2.4	Brief agreed to be research team	Team sign brief	2.3

WBS	Phases/Tasks	Deliverables	PRD
3	Draft Production		
3.1	Preparation of manuscript Ver1	Manuscript prepared	2.4
3.2	Revision of manuscript	Revised manuscript produced	3.1
3.3	Preparation of Manuscript Ver2	Manuscript prepared	3.2
3.4	Team edits document	Signed copies from team	3.3,3.2
3.5	Deliver to key stakeholder	Stakeholder copy	3.4
3.6	Final approval	Stakeholder signature	3.5
4	Final Production		
4.1	Produce printer proofs	Commercial printer copy	3.6
4.2	Final modifications	Final copy	4.1
4.3	Commercial Printing	Three printed copies	4.2
4.4	Delivery to Stakeholder	Signature of acceptance	4.3

The above example is obviously simplistic. It is designed to highlight the principles of a WBS. Note the identification of deliverables and dependencies. Note also in the first phase, that two tasks (1.1 & 1.2) can be undertaken concurrently and the others tasks are linear. Throughout the project some tasks have multiple predecessors and others do not. The final phase is totally linear. There is a rich diversity to how the task allocation falls out. Many project plans are often produced lineally when there is no need.

The next step is to agree on the duration of each task. You are then in a position to be able to establish a schedule. The ultimate project completion time will depend on the interrelationship of tasks. The accurate estimation of task durations is dealt with in greater detail in **Part 4.5**.



The use of a WBS allows you to focus on specific areas of the work and to identify the tasks associated with each. You can use a top-down method of planning, that is, commence with the big picture and then break the broad tasks into sub-tasks and even sub-sub tasks.

Step Two: Schedule the project using the critical path method (CPM)

Now that we have a breakdown of work to be done it is time to schedule out the project. As already discussed the project schedule is usually depicted as a Gantt chart. From the Gantt chart, it is possible to identify when tasks should start and finish. It is a very simple mechanism for illustrating a timeline. Creating a Gantt chart involves determining the tasks, the predecessor relationships, the critical path and then allocating people to those tasks. The most effective way to work it out is using the critical path method.

If a project that you undertake is very small, say less than ten tasks, or linear (i.e. sequential tasks) then it is a relatively easy to simply plot a Gantt chart on paper. However, for anything more complicated using the CPM is very useful. We recommend this be achieved through using specialised project management software. We use and therefore recommend MS-Project as it is available for both the Macintosh and the PC. Scheduling is much easier to do on a computer using project management software. **We strongly recommended that you use project management planning software.**

There are a number of tools and techniques to produce a schedule. One of the most useful is the Critical Path Method (CPM). The PMBOK defines CPM as:

A network analysis technique used to predict project duration by analysing which sequence of activities (which path) has the least amount of scheduling flexibility (the least amount of float). Early dates are calculated by means of a forward pass using a specified start date. Late dates are calculated by means of a backward pass starting from a specified completion date (usually the forward pass's calculated project early finish date).

(The Project Management Institute (PMI) p.162)

The concept of the critical path is useful to understand but difficult to explain. We have found no better an explanation of the CPM than that produced by Numerix Pty Limited. Numerix is a specialist project management consulting organisation that we recommend to Universities. They also provide MS-Project training.

If you would like to understand the CPM complete the exercise below then read through the explanation provided by Numerix on the following pages.



Exercise Four

Food for Thought – The Problem

Suppose you are planning dinner for two. Your menu consists of a very special soup and a baked chicken main course. The soup must be boiled for 35 minutes and you should allow 15 minutes to serve and consume it. The chicken dish requires a fair amount of preparation: You have to boil rice (for 30 minutes), lightly fry the chicken (for 15 minutes), and then bake the chicken and rice for 15 minutes. It takes 5 minutes to prepare a sauce and 15 minutes to boil peas. You have a fine red wine. Allow 5 minutes to uncork it and then let it stand for 30 minutes before serving. Allow 25 minutes to serve and eat the main meal and wine.

You have unlimited staff at your disposal. The utensils you have available are two boiling pots, a frying pan, saucepan and cork-screw.



Question 1. How quickly can you prepare and consume the entire dinner if there were no resource constraints?



Question 2. Which tasks should not be delayed if the project is to be completed on time?



Question 3. What are the other considerations?

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To schedule this project, we need to find the start and finish times for each task. A useful approach is to determine the earliest possible start and finish times (subject, of course, to predecessors). These may not represent the best possible times since there may well be reasons for delaying some of the tasks. Also, the early schedule may not satisfy some of our resource constraints. However, the earliest times provide a platform from which refinements can easily be made.

In the table below, we will develop the schedule, ignoring for the moment considerations other than durations and predecessors.

ID	NAME	DUR	PREDS	START	FINISH
1	Start	0			
2	Open Wine	5	1		
3	Boil Soup	35	1		
4	Boil Rice	30	1		
5	Boil Peas	15	1		
6	Fry Chicken	15	1		
7	Breathe Wine	30	2		
8	Eat Soup	15	3		
9	Bake Meal	15	4,6		
10	Prepare Sauce	5	6		
11	Eat Meal	25	5,7,8,9,10		
12	Finish	0	11		

This simple rule is sufficient to produce the required schedule. We need to set a base starting time, which is usually zero. This zero point can be mapped onto any real-time point in the calendar. The starting milestone is therefore set to zero.

The method is worked through in the context of our “unit notes” problem in the tables that follow.

ID	NAME	DUR	PREDS	START	FINISH
1	Start	0		0	0
2	Open Wine	5	1	0	5
3	Boil Soup	35	1	0	35
4	Boil Rice	30	1	0	30
5	Boil Peas	15	1	0	15
6	Fry Chicken	15	1	0	15
7	Breathe Wine	30	2		
8	Eat Soup	15	3		
9	Bake Meal	15	4,6		
10	Prepare Sauce	5	6		
11	Eat Meal	25	5,7,8,9,10		
12	Finish	0	11		

Clearly, tasks 2 to 5 all have the same predecessor (the starting milestone) and therefore can all start at its completion (time zero). Add their durations to determine their finish times as shown in the table above.

Now task 7 cannot start until its predecessor (task 2) is complete. This will happen after five minutes. Since its duration is 30 minutes, the task will then end at 35 minutes at earliest. The rest of the table is filled out in the same way.

ID	NAME	DUR	PREDS	START	FINISH
1	Start	0		0	0
2	Open Wine	5	1	0	5
3	Boil Soup	35	1	0	35
4	Boil Rice	30	1	0	30
5	Boil Peas	15	1	0	15
6	Fry Chicken	15	1	0	15
7	Breathe Wine	30	2	5	35
8	Eat Soup	15	3	35	50
9	Bake Meal	15	4,6	30	45
10	Prepare Sauce	5	6	15	20
11	Eat Meal	25	5,7,8,9,10	50	75
12	Finish	0	11	75	75

The Case of Multiple Predecessors

The only other possible complications occur where more than one predecessor exists (see tasks 9 and 11). In these cases, the highest (that is, latest) of the earliest finishes of the predecessors must be used. In the case of task 9, the two predecessors are tasks 4 and 6, which finish after 30 and 45 minutes, respectively. Following the basic method box above, the 30-minute finish (task 4), known as the “driving predecessor” must therefore be used since it finishes last. Similarly, task 11 has five predecessors and the driving one (task 8) has the latest finish (50 minutes). The full earliest schedule is shown in the table.

The Critical Path

We have produced an “early start/early finish” schedule. From this we can predict that the entire product cannot be completed in less than 75 minutes. Consider Question Two in the exercise. We need to determine critical tasks.

Definition

A critical task is one which if delayed will cause the entire project to be delayed.

Which tasks in the list are critical? In order to answer this question most easily, it is best to show the schedule we have produced graphically, that is, by means of a Gantt chart. While our table above showing start and finish times is simple enough, the Gantt chart is the most popular and widely used method for representing project schedules.

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Gantt Charts

In this diagram, a horizontal bar is drawn for each task, with a length proportional to its duration and placed in the correct time-frame. The Gantt chart for the schedule we have produced above is shown below. Note that the predecessors are shown as arrow links between tasks. This is an optional device, but quite useful unless the diagram becomes cluttered.

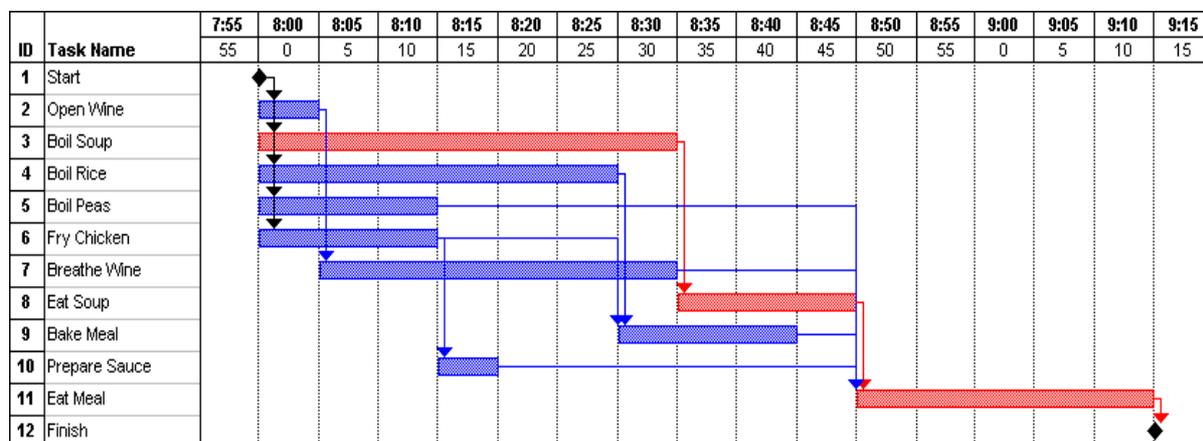


Diagram 4.4.2: “Food for Thought” Gantt chart.

To find the critical tasks, work from the last task in the timeline (that is, the one at the right most side of the Gantt chart). This task is critical by definition since any delay here would clearly delay the project, thus satisfying our definition. Therefore in our “unit notes” project, the “end” milestone (task 12) is critical.

Now any task that, when delayed, would cause the delay of a critical task, must itself be critical. Therefore it follows that the “eat meal” task (task 11) is also critical.

Continuing in this way, let us ask which task threatens “eat meal”. This task has five predecessors, but only the driving one, that is, the one directly causing it to be placed where it is in time, is critical. The driving predecessor for “eat meal” is clearly “eat soup”(task 8), since all of the other predecessors finish earlier as can be seen by tracing back through the predecessor links that enter task 11 (eat Meal).

Working back up the schedule shows that the critical tasks are:

<u>Event</u>	<u>Task</u>	<u>Duration</u>
Start	Task 1	0
Boil Soup	Task 3	35
Eat Soup	Task 8	15
Eat Meal	Task 11	25
End	Task 12	0

These tasks form a path spanning the entire project. The length of the path is exactly 75 minutes, that is, the sum of their durations. Notice that milestones can be critical.

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Total Float and Free Float

The remaining tasks are not critical, that is, they can each be delayed to some (different) degree before they too would have an impact on the 75-minute duration of the project. These latitudes, called total float or total slack, are the amount of time the tasks can be delayed before they too have global ramifications to the project.

Latest Start and Finish

Basic Method (Late Schedule)

- The latest finish of each task is equal to the latest start of its successor (or the first of the last start times of its successors if there are more than one)
- The latest start time of each task is equal to the latest finish already found minus the duration

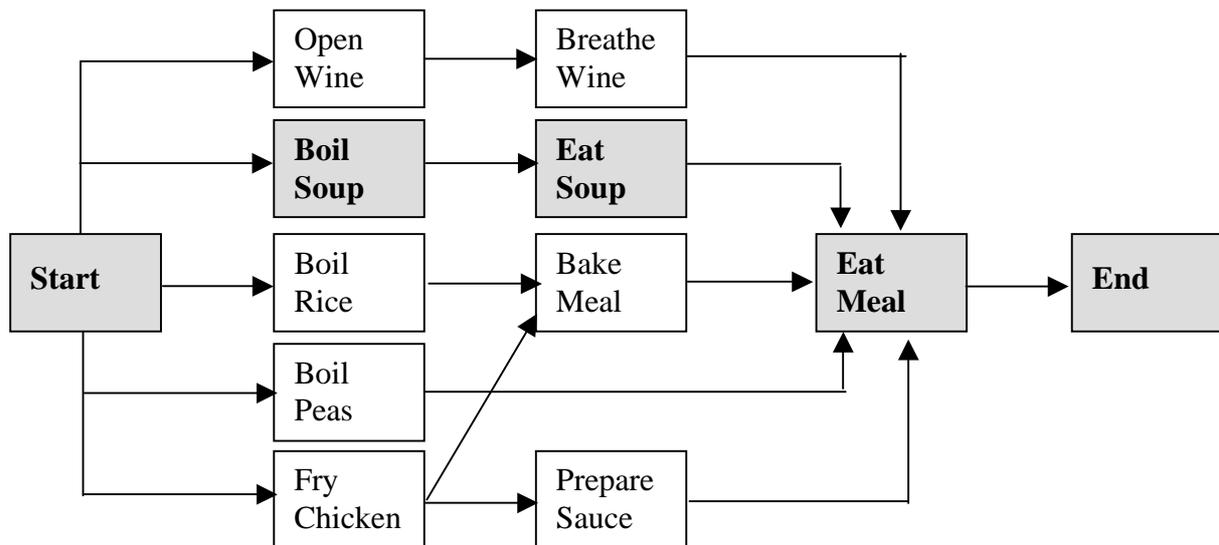
The total float is therefore the difference between the latest and earliest start for each task

The easiest way to find the float is use the Gantt chart and, starting with the latest tasks first, “slide” each task to the right as far as it will go without further delaying the new start of its first (earliest) successor. (Remember that this process might already have shifted successors.) This indicates that float is cumulative (hence the title “total float”), since a task may have its own float (the amount of time it can be delayed before it affects any other task – called “free float”), but also all of the free floats from its successors and their successors. The shifted positions of the non-critical tasks relate to their “latest” starts and finishes.

Since critical tasks cannot be moved at all – they are locked in position, trapped by the duration of the project they helped to define – they have no total nor free float. Thus the critical path method determines both extremes for the schedule. A Gantt chart, showing both earliest and latest start, is shown on the following page. The shaded bars show the “latest” schedule.

The late starts and finishes can also be worked out on the table, using a separate set of columns (late start and late finish), starting from the bottom of the table and working upwards. For this, we would need a list of the successors, since latest finishes depends upon the latest starts of their successors. These are just the inverse of predecessors and can easily be identified. Alternatively, a PERT chart (see the next page) shows successors clearly.

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Summary of the Method

- Find the earliest start for each task. For the very first task, this is just zero. For all others, it is the latest of the earliest finishes of all of its predecessors. Earliest finishes are found by adding durations to their earliest starts.
- Find the critical tasks. The latest finishing task in the list is always critical. Driving predecessors for critical tasks are themselves critical. Starting from the end, thread your way back through the Gantt chart, choosing the driving predecessor links to determine the critical tasks.
- “Shift” each task as late as it can go (subject only to the latest start of its successor. Starting from the latest finishing task in the list (the one which defines the project end), . Successors are easy to see on a Gantt chart showing predecessor links. The amount of shift available for each task is its total float. **Remember that critical tasks have no float.**

Why Identifying the Critical Tasks is Important

Since critical tasks dictate the project schedule, they indicate where the priorities lie for the project manager. Critical tasks should also receive priority when dealing with resource overloads. When a resource is assigned to more than one task occurring simultaneously, it is the non-criticals which should give way.

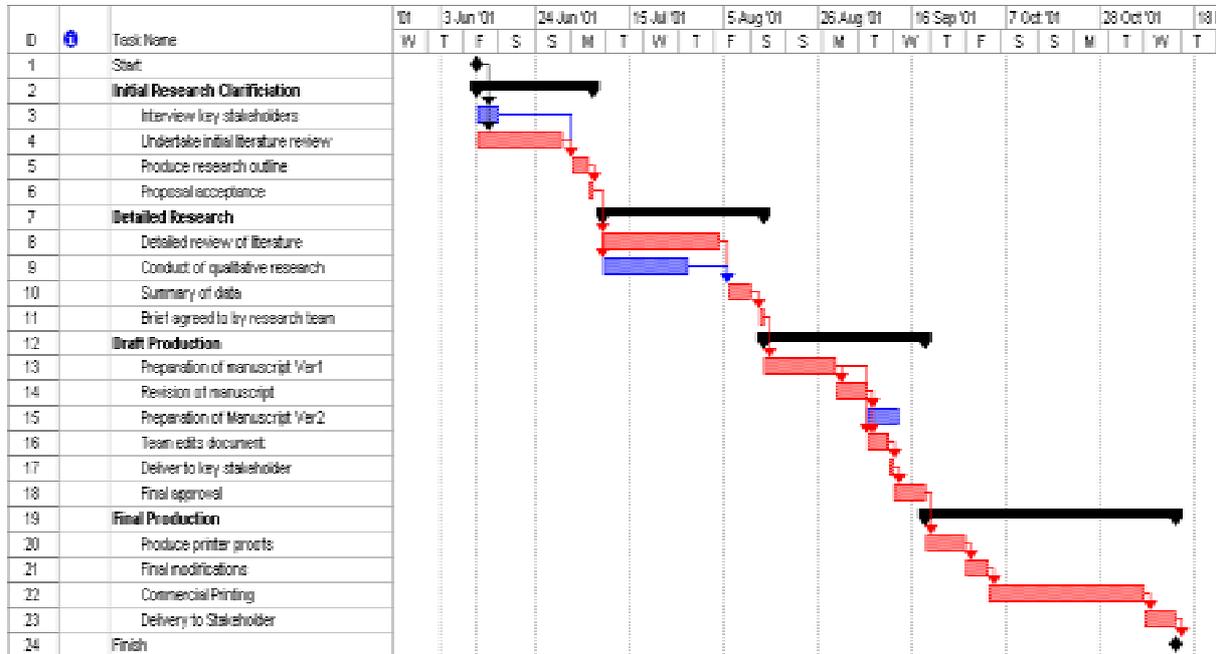
When estimating durations for tasks, accuracy is paramount on the critical tasks since any error made there immediately contributes to errors on the project duration. Errors made on non-critical tasks, provided they lie within the float available, do not have an impact on the project schedule. Thus, in cases where there is insufficient time to refine estimates on all tasks, the criticals again provide prioritization with regard to where to begin.

When a project has been scheduled, but the project manager is requested to shave further time off its duration, additional resources will be required. Since the critical path is the longest through the schedule (check the PERT chart above), it is these that must be shortened. However, be aware that, if the critical path is reduced by an amount less than the float available on another path, the tasks on that path become critical.

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The *Food for Thought* example is a bit complicated which is why it is so much better to use software. With software you simply list the duration and predecessor relationship and the critical path is worked out for you. The above exercise is however useful for understanding the process.

A schedule for the *Simple University Research Project*, introduced previously, is represented below. We used MS-Project to work out the Gantt chart.



Step Three: Allocate resources and costs

The third step in project planning is to develop the detailed resource allocation schedule and subsequent costing associated with it. Many projects at University stop short of allocating resources and costs. While this is understandable in some instances, not using a full project management information system limits your capacity to make effective decisions.

As we mentioned earlier, resources include people, materials, machines, equipment, vehicles, and office space. In fact any asset that is required for the project can be considered a resource. The most common resource in teaching and learning projects is people. Resources incur a cost and therefore must be managed. You not only need to know when the resource is available but also how much they will cost.

This is best achieved through producing a resource and cost schedule. As we continually advise, we believe that project management software is a useful way to keep track of resources and costs. However, a simple spreadsheet in Microsoft EXCEL.

A resource schedule is nothing more than attaching resources to task dates. These can then be displayed in a table or as a histogram. Underneath this is the cost schedule, which to be of value, can be displayed in a number ways. These can include:

- costs over tasks;
- costs over resources; and
- costs over time.

Now let's consider our research project again. Firstly we need to manage the project team (resources). In the diagram below is a simple list of project resources (i.e team members).

ID	Resource Name	Type	Material Label	Initials	Group	Max. Units	Std. Rate	Ovt. Rate	Cost/Use	Accrue At	Base Calendar	Cc
1	Bill	Work		B		1	\$28.00/hr	\$0.00/hr	\$0.00	Prorated	Standard	
2	Jenny	Work		J		1	\$28.00/hr	\$0.00/hr	\$0.00	Prorated	Standard	
3	Susie	Work		S		1	\$28.00/hr	\$0.00/hr	\$0.00	Prorated	Standard	
4	Project Manager	Work		P		1	\$40.00/hr	\$0.00/hr	\$0.00	Prorated	Standard	
5	Printer	Work		P		1	\$0.00/hr	\$0.00/hr	\$0.00	Prorated	Standard	

You can see we have our project team members listed and we have even allocated a cost (hourly rate). Whilst we recognise many teaching and learning projects do not allocate costs for people unless they are a hired contractor, it is a good habit to get into.

Another useful display is the actual hours to be worked and money spent. In the table below we have listed the project team members (only Bill appears on this page) and the particular tasks they are involved with. The next column provides a summary of all money planned to be spent on Bill for that particular task. For example, Bill does \$560.00 worth of work on *Interview Key Stakeholders* but none of it is done in the week displayed (which incidentally is the first week in September). On the right hand side we display the hours of work Bill is planned to undertake in a particular week. So, for that week in September, it is planned for Bill to spend eight hours per day on the revision of the manuscript at a cost of \$224.00 per day. Note also that underneath the *Work* line is the *Actual Work* line. So when you are conducting the project you can compare the work you intended against the actual work that occurred.

ID	Resource Name	Cost	Details	Week				
				M	T	W	T	F
1	Bill	\$10,416.00	Work	8h	8h	8h	8h	8h
			Act. Wk					
			Cost	\$224.00	\$224.00	\$224.00	\$224.00	\$224.00
	<i>Interview key stakeholders</i>	\$560.00	Work					
			Act. Wk					
			Cost					
	<i>Undertake initial literature review</i>	\$1,680.00	Work					
			Act. Wk					
			Cost					
	<i>Produce research outline</i>	\$448.00	Work					
			Act. Wk					
			Cost					
	<i>Detailed review of literature</i>	\$2,240.00	Work					
			Act. Wk					
			Cost					
	<i>Brief agreed to by research team</i>	\$112.00	Work					
			Act. Wk					
			Cost					
	<i>Preparation of manuscript Ver1</i>	\$2,688.00	Work					
			Act. Wk					
			Cost					
	<i>Revision of manuscript</i>	\$1,120.00	Work	8h	8h	8h		
			Act. Wk					
			Cost	\$224.00	\$224.00	\$224.00		
	<i>Preparation of Manuscript Ver2</i>	\$560.00	Work				4h	4h
			Act. Wk					
			Cost				\$112.00	\$112.00
	<i>Team edits document</i>	\$336.00	Work				4h	4h
			Act. Wk					
			Cost				\$112.00	\$112.00
	<i>Final modifications</i>	\$672.00	Work					
			Act. Wk					
			Cost					

Your Project Management Information System



Remember, the first step is to breakdown the work (i.e. the WBS). Then using the critical path method produce a schedule and allocate resources and costs. The schedule combined with a clear table of what your people are doing and what it will cost you, is your project management information system. This system should have enough information to enable you to effectively manage your project.



Exercise Five

You may now wish to create a project management information system for a project which you are involved. To do this, you must collect a WBS, Gantt Chart, Resource Allocation and Resource Usage.

4.5 Accurate Estimation of Project and Task Duration

Before we move on to how we can tie all this information together and actually conduct the project we need to discuss how we actually determine how long (the duration) a task or project will take. Too often in project planning the duration of a project is a guess or it is based on when the project must be completed, rather than a logical estimate. Yet a logical estimate is always so much better than a simple guess. An entire plan can be rendered useless if it is estimated that a task will take two days and it ends up taking four weeks. The accurate estimation of task duration is critical to the project planning process. The more accurate that we can be in our estimation, the more useful and effective the project plan will be.

How do we know how long a task will take? What sort of system can we use to work out the duration of a particular task? When these questions are posed to workshop participants, they often come up with the following suggestions:

- Use the knowledge of others who have performed similar tasks or managed similar projects before. This may be your own experience or the experience of others.
- Base the estimate on a best and worse guess scenario.
- Conduct a rehearsal or trial (this is quite common in the case of software development).
- Look at the resources allocated to that task.
- Look at the risk associated with the task.

Rational Estimation

The suggestions above all make good sense. The technique we are proposing for determining the duration of a project task is termed Rational Estimation. Rational estimation is a method of estimating the time a task should take. Estimation of duration is a common source of error in the project management process. If the project manager, together with the project team, do not makes a serious attempt at identifying the times various tasks will take, controlling the project, its resources and its deliverables will be impossible.

There are six rules associated with rational estimation.

- Rule 1 Nothing beats experience (either yours or someone else's).
- Rule 2 Be realistic.
- Rule 3 Estimate in terms of effort rather than duration.
- Rule 4 Establish a benchmark to work out a final duration.
- Rule 5 Look at the people involved in the project – experience, availability.
- Rule 6 Use your common sense.

A Working Example

Now let's apply these rules to a workplace example. Let's say you have responsibility to produce a workbook for a unit in your faculty. Rule 1 says nothing beats experience; Rule 2 states that you need to be realistic and Rule 3 states that you need to estimate in terms of effort. So, let's begin by estimating that the job will take you 10 days of effort (remember effort equals resource by duration). Now that is how long it will take if you were to do it with no other commitments.



There is a big difference between effort and duration. Effort is the amount of work by resources. In other words, if there were five writers working on a workbook for two days, the duration of the project would be two days but the effort would be ten workdays.

A common problem in Universities is that the project manager estimates that they can complete the project in 10 days. However, this estimate is actually 10 days of effort and not 10 days of time. In our example above while you have been tasked with producing the manual, you have other responsibilities therefore cannot spend 10 days straight only on this task.

It is now necessary to look at the resource implications. Firstly, let's say for the sake of the exercise that you are too busy to work on the project so you decide to appoint someone else to produce the workbook. Your 10 days is now the benchmark effort. You may appoint someone who lacks your expertise and you need to add a loading of 50% to the original effort. So now you have an effort required of 15 days. Next, you need to take into account contingencies such as availability. Let's assume with availability it's now up to 30 days. Then risk, time of year and so on all contribute to a final estimate of effort of 45 days. This is a long way from the original estimate of ten days. It is far better to accurately estimate a task duration than guess and render your plan meaningless.

A Final Word on Estimation

Estimates should be made as objectively as possible and should be realistic. The people making the estimate should consider the task in isolation and try to determine how long it will take to complete it without considering any outside influences. It is often tempting to present a spectacular estimate when one feels that one's professional reputation is attached to it.

Once you have made your estimation, there are three other tricks to ensuring that your rational estimations continue to meet your needs.

1. **Document Your Estimates.** Always document your estimates and how you arrived at them. What factors did you take into consideration in making your estimate? What assumptions did you make? This will make it easier to revisit your estimate later on when the project changes and to revise your estimate as a result or to apply the estimates to similar projects later on.
2. **Refine Your Estimates.** Having made your initial estimates, it is important that you continually review them. Things change regularly and new information becomes available which may affect the estimates you have already made. The project manager is responsible for refining and updating the estimates on a regular basis, until it is 100 per cent accurate – when the task has been completed!
3. **Track Your Estimates.** To help you improve your estimation skills, it is suggested that you graph your original estimate and any subsequent revised estimates against time. You should also include notes in relation to why the estimates were revised. This will allow you to track how well you are estimating and hopefully assist you in improving this skill.

It is important to note that a good estimate is not necessarily one that ends up being close to the actual result. Rather a good estimate is one which is refined a number of times and to such an extent that it quickly converges on the actual value. Therefore estimates must be reviewed and updated on a regular basis, in light of any new information which has arisen.

4.6 Module Summary

- The project plan converts the outcomes of what we want in a project to a concrete reality by providing us with the specific actions that are required, the timeframe in which the actions need to occur, who will do them, how much they will cost, what is needed to complete them and to what level of quality.
- The detailed work breakdown (WBS) forms the basis to develop a project schedule using the critical path method (CPM) and an allocation of resources and costs. This schedule can be represented as either a Gantt or Program Evaluation Review Technique (PERT) chart.
- The Gantt and PERT charts are ways of depicting the project plan in a clear and unambiguous pictorial representation.
- Never guess when it comes to estimating task duration. Be rational and realistic in your estimations.
- All the planning techniques outlined above can be undertaken by hand. However, we recommend the use of project management software to develop a more flexible and effective project plan.
- Ask the question – Do I have a detailed enough plan to maintain control of the project?