

Computers & Project Management CMI

Week 6: Topic: Preparing the Computer Schedule

Overview: We'll be looking at how you prepare and load / build the project schedule.

Objectives:

- Look at a procedure for implementing a new PM software
- Gain an understanding of the data required to set-up a project schedule including:
 - Project data (project code, sponsor, project name / title etc.)
 - Calendar information (working days, hours of work, holidays, multi-national etc.)
 - Resource data (resource names, pools, charge rates etc.)
 - Activity records (task descriptions, task lists, sub-tasks, sequencing, tasks, start dates, end dates, precedence etc. etc.)
- To gain an understanding of basic schedule time analysis
- To learn about some of the common data entry errors on project schedules

Introduction

A software selection process was covered in Week 3. We looked at how files for a project could be stored using a suggested “document repository” approach. We also looked at how MS Office applications other than MS Project can be used to assist in the project management process.

This week's focus is on the basic set-up of computer schedules for projects. There are certain common characteristics across all project schedules or plans. The method of entry varies from application to application and from system to system but the need for core data exists for all.

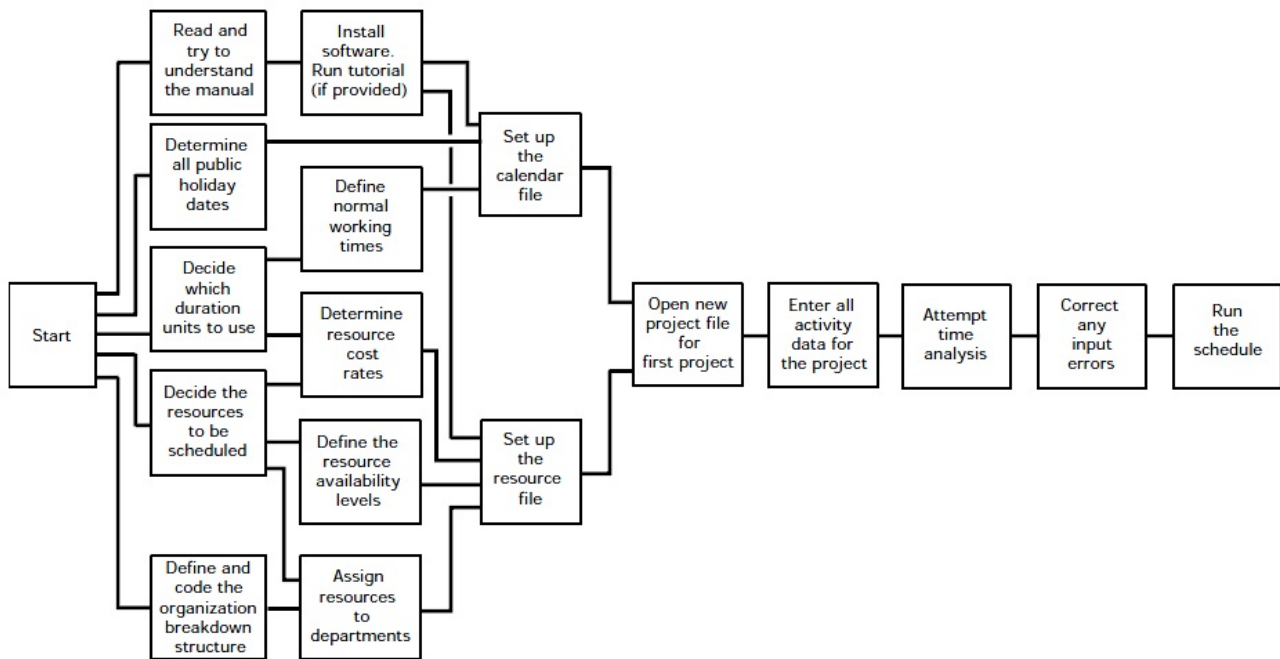
- Project data (describe the project)
- Calendar information (when are resources available)
- Resource data (what resources are available)
- Activity records (when will the resources do / complete the scheduled tasks)

Time Analysis, common data entry errors and the means to identify and avoid them will also be examined.

Implementing a new PM software application:

These are the steps that are typically required when attempting to use new software for the first time for project planning and resource scheduling:

- Install and Setup of software
- Prepare data (project, calendar, resource & activity)
- Open a new project file for first project
- Enter all Activity data for the project – all tasks to be completed, in sequence
- Attempt time analysis – resource levelling, simulations etc.
- Correct any input errors
- Run / execute the schedule



Lock's suggested procedure for implementing new PM software.

New Software Setup

Before we look at building a project schedule there are a few basic things to remember when you start using any new software system:

- Attend a training course from a recognised software trainer for the application software you're going to use.
- If you're going to be an end user, get a copy of the user manual that gets delivered with the application.
- Don't rule out spending a few extra Euro buying books by other authors and publishers.
- Use the help text and on-line tutorials that usually install with the applications.
- Use the templates that software vendors usually bundle with the application software – these are often useful as a basis for developing your organisations own templates as they can often be based on:
 - Industry best practice
 - Software vendors experience
 - Making the most out of the features in the software application
- You can learn a lot about scheduling techniques and how to manage a project schedule from books, websites and other publications that deal with system-independent and system-dependent scheduling.
- Ensure you have sent your techies on technical support training courses.
- Make certain that you receive / source information on how to configure the application in a way that is aligned to how your organisation needs it to operate.
- Consider developing basic, pre-loaded project templates for the different project types that you want your project teams to engage in. For example, you might want templates for:
 - Compliance projects
 - New product development projects
 - Business process change projects
 - Etc.

Once you understand how you want your projects to be run, you basically pre-load these templates with a mandatory set of tasks that all projects in a project category must adhere to. You may allow projects to add to or enhance the template but you would not (procedurally at any rate) allow them to omit any of the template based tasks.

Prepare data

Project data

Project data means the bundle of data that sets up the project file and contains the main details about the project. It is generally descriptive in nature and should generally remain static from the outset of the project until the end.

Project data items include:

- Project name
- Project number
- Project manager name
- Project sponsor
- May include stakeholders and / or work-stream leads etc.

These are items that might also be reflected in the naming convention and folder structure of any document repository and in the ‘sign-off’ tables of project documentation (see Week 3 notes for more details).

Calendar information

This is the information that will facilitate the generation of a calendar or time line for the project. Please note: the second semester includes an entire course on ‘Resource Scheduling’.

Some basic information needs to be established at the outset:

- Working day and week – define the working week, including weekend working and shift work, days of operation
- Holidays – include or exclude public or bank holidays as appropriate.
- Annual leave – or personal holidays should be included for those working on the project.
- Working hours – how long each resource can be scheduled for in a normal working day for that resource type (e.g. a crane may be worked 24hrs/day whereas a bricklayer will be set up for an 8 hour day).

The ‘date format’ to be used on a project is often important, e.g. 01/03/12 means March 1st 2012 to a European but means 3rd January 2012 to an American. It is recommended that an alpha-numeric option is taken, e.g. 01Mar12 to avoid confusion across borders.

As different project team members may work to different patterns it may be necessary to set up a number of overlapping calendars.

Start Date

All projects require a start point or ‘datum point’ that marks the beginning of the project. The start date for the first task or activity is generally used as the project start date.

Resource data

Resource data includes a description of the resource; generally this includes the job title for the human resource and a unique identifier for that resource. Non-human resources need to also be described, e.g. a Building site team needs a tower crane.

The organisation structure and resource listing should reflect the availability and role of the human resources involved. For instance, if a 3rd party provider has been contracted to deliver a specific part of the project, they should appear in the org structure (perhaps within a work-stream). Common examples include programmers, analysis, DBA's etc.

It is also likely that a project manager will not be in a position to schedule resources above a certain managerial level and may need to ensure that senior managers PA's confirm their availability (at least on a provisional basis).

Mandatory Resource Data

The following are recommended for all resources:

- Resource Code – an identifier code, e.g. CDev1 for senior C software developer.
- Resource Name – name as it will appear on reports. It is a matter of preference as to whether or not actual individuals names here.
- Normal availability – the number of resource units normally available to the program for allocation to simultaneous project activities and the period for which the resources will be available (start date & finish date). These available levels may vary during the project.

Sensible planning will take the resources promised and apply a %, such as 75%. This allows for some slippage due to unforeseen events or over optimistic advice. This is part of contingency allocation and will generally be refined as the project task time estimates are firmed up on.

Additional and optional resource data that could also be included:

- Calendar – any special calendar (e.g. alternate shift / night shift calendar) that applies to the resource.
- Cost rate – always a good idea to include cost per schedule unit per resource e.g. per day, per hour, per measured unit (Tons, Cubic Metre, etc.)

Lock also suggests the addition of:

- Threshold resources – additional resources that could be called upon in the event that the existing resources will not be sufficient to meet the project schedule. The most frequently used 'threshold resource' is overtime for existing resources. Temporary staff would also be defined as 'threshold resources'.
- Threshold cost rate – the cost rate for any threshold resource used.

Priority Rules

All projects are subject to the relationship of the triple constraints i.e. time, cost and scope (sometimes referred to as quality). Lock recommends that there are prioritisation rules for project schedules. The key question is should a schedule be time limited or resource limited. Prioritisation of resources is also a consideration.

There will be more detail provided on resource data and resource scheduling in a later topic.

Activity or Task records

Individual tasks or activities should be documented in the project schedule. This can be done using Gantt Charts or Work Breakdown structure functionality or by simple lists (as in MS Excel samples provided). Dependent tasks (precedence dependencies etc.) need to be linked as such in any project schedule.

Mandatory Activity Data

Individual tasks or activities need to have the following included:

- Activity ID number – unique identifier
- ID numbers for immediately preceding or immediately succeeding activities
- Any constraints or dependencies, e.g. does one task have to complete before another later in the project have to begin – tiling before the plumbing for example
- Estimated activity or task duration, using the base unit

Optional Activity Data

The following can also be added for individual activities:

- Activity Description
- Alternative duration estimates – generally referred to as “Optimistic” and “Pessimistic” estimates, used to facilitate PERT or risk analysis calculations.
- Editing & sorting codes – to facilitate reporting it is helpful to provide department or directorate codes for individual tasks. This allows a department manager to have a view on all tasks related to his or her area. Most applications are very flexible in this regard. Simple coding can be easily applied to lists in MS Excel also.
- Resource Data – code or identifier for the resource assigned to the task.
- Cost – estimated or budgeted cost for a particular activity can be applied here.
- Special constraints – it is often possible to set up mandatory links between activities, e.g. code & test, pour concrete & curing time.
- Split-able activities – many tasks can be started, halted and re-commenced at a later date. Lock suggests identifying these types of tasks as early as possible to allow more flexibility later on.
- Don’t forget that most applications support the use of user customisable fields. These can be used to allocate codes and calculations (calculated fields e.g. resource rate * 30% = your profit margin for particular resource) that have special or unique meaning in your PM context.

Open a New Project File

You can generally configure computer based scheduling applications to open with a preferred view – the default view is generally the Gantt Chart. If you prefer another view – many applications allow you to set this so that it loads on start-up e.g. you might start up with a view that shows workflow or work breakdown structures.

Enter Activity data

At the activity planning stage, the work is put into the scheduling tool and organized with predecessor/successor relationships, resources, effort, and duration.

Activity Sequencing

This is the process of identifying and documenting relationships between the project activities. Each task in the schedule, except the first and last, should have at least one predecessor and one successor.

Network diagrams are often used for this process, using a technique such as Precedence Diagramming Method (PDM). Relationships between activities are then identified such as Finish to Start (FS), Finish to Finish (FF), Start to Start (SS) and Start to Finish (SF).

Using this technique it is also possible to identify the critical path and float or slack for each activity.

Target Dates

Often referred to as scheduled dates or milestones, these are the dates in the schedule that need to be highlighted. Most applications also allow the user to impose restrictions or “constraints” on when tasks can be scheduled. Some common examples include:

- An early (‘not before’) date – a good example is a ‘vacate’ date for a construction site.
Start No Earlier Than (SNET) or Finish No Earlier Than (FNET) in MS Project
- A late date – the last possible start date or end date for a particular activity, often called a ‘drop dead date’.
Start No Later Than (SNLT) or Finish No Later Than (FNLT) in MS Project.
- A fixed date – has to happen on or between specific dates, e.g. resource required is in head office for 2 days during a month.
Must Finish On (MFO) or Must Start On (MSO) in MS Project.

These constraints can have different names depending on the software being used such as “Not Earlier Than”, “Not Later Than”, “Must Start Before” etc.

These allow the scheduler to generate relationships and dependencies between tasks in the schedule. For example, you don’t want to order cement before you’ve dug the foundations for your wall. Therefore, the “order cement” task will have a “Must Not Start Before” that is linked to the end date for the “dig foundations” task. This is known as a “Finish to Start” relationship.

Although the above can be imposed using a Project Management Software application this may not be possible, for example if using MS Office applications as discussed in last week 3. In such a case it is still sensible to flag the restricted or required dates in the relevant project documents, e.g. Project Diary.

Time Analysis

Once any basic data errors have been corrected, the software can carry out time analysis on the project. This involves forward and backward passes through the network to determine the amount of float, and the earliest possible and latest permissible times for the start and finish of every activity. Some software such as MS Project will carry out calculations automatically as the network data are entered.

Microsoft Project and *Primavera* both present a table of time analysis results on the left hand side of the same display as a Gantt chart. An example of a full tabular report is shown below with the data required to perform time analysis. Reports can be customised to include other relevant data e.g. cost data, resource requirements, critical status etc.

ID	Task name	Duration	Early start	Early finish	Late start	Late finish	Free slack	Total slack
1	Project start	0 days	10 May '10	10 May '10	10 May '10	10 May '10	0 days	0 days
2	Dig trench and soakaway	2 days	10 May '10	11 May '10	02 Jun '10	03 Jun '10	0 days	17 days
3	Cut roof timbers	1 day	10 May '10	10 May '10	01 Jun '10	01 Jun '10	16 days	16 days
4	Make door frame	1 day	10 May '10	10 May '10	14 May '10	14 May '10	0 days	4 days
5	Dig foundations	4 days	10 May '10	13 May '10	10 May '10	13 May '10	0 days	0 days
6	Make doors	3 days	10 May '10	12 May '10	01 Jun '10	03 Jun '10	0 days	16 days
7	Position door frame	1 day	11 May '10	11 May '10	17 May '10	17 May '10	4 days	4 days
8	Concrete foundations	2 days	14 May '10	17 May '10	14 May '10	17 May '10	0 days	0 days
9	Prime doors	1 day	13 May '10	13 May '10	04 Jun '10	04 Jun '10	12 days	16 days
10	Build brick walls	10 days	18 May '10	31 May '10	18 May '10	31 May '10	0 days	0 days
11	Lay floor base	2 days	18 May '10	19 May '10	02 Jun '10	03 Jun '10	0 days	11 days
12	Fit RSI lintel	1 day	01 Jun '10	01 Jun '10	01 Jun '10	01 Jun '10	0 days	0 days

Time analysis report can be sufficient for planning and managing the project, using the earliest possible dates as the schedule targets.

However in any project where the project activities need people or other resources that are within the project manager's own organization, resource scheduling should always be considered.

Correct Data Entry Errors

Errors will always be made in data entry. Lock makes a few recommendations on locating such errors. Firstly, a sequential list of all activities by activity code providing the previous and succeeding task (as recommended in activity data) can show the user blatant errors.

Error diagnostics is available on many applications that can locate obvious errors in a project schedule. There are 2 categories of data error:

- Identifiable mistakes – an error diagnostic routine should locate these errors, e.g. invalid dates, duplicated activities, dangles, loops
- Unidentifiable mistakes – incorrect durations, incorrect names or resource data. Two things can help here – experience (I did that before – so I won't do it again) and the IT system (if it has been programmed to identify and / or report anomalies etc.)

Identifiable Mistakes

The following mistakes should cause the software to report an error:

- Invalid dates such as February 30th, a date selected that is a non-working day on the calendar, or a date before the Project Start date.
- Duplicate activities are generally not allowed to be entered as the same activity identification number cannot be allocated twice.
- Dangles are activities with no preceding or succeeding activities. These can often be identified by sight on Gantt Charts.
- Loops are caused by incorrect activity links; again these are generally caught at the point of entry.
- Any other issue that the software is designed to report. For example a task with a resource assigned and a duration of zero days.

Unidentifiable Mistakes

Mistakes that the software cannot detect and may lead to errors in the schedule include:

- An incorrect activity duration.
- An incorrect activity name.
- A resource incorrectly assigned or a name mistyped.
- A constraint incorrectly selected.
- Costs missing.

Two things can help here – experience (I did that before – so I won’t do it again) and the IT systems (if it has been programmed to identify and / or report anomalies etc.)

Next Topic

More information on resources resource scheduling and output reports.

Bibliography and Further Reading

- Project Management, 9th Edition – Denis Lock (Gower).
- Guide to the Project Management Body of Knowledge (PMBOK), 4th edition, PMI.
- Managing Successful Project with PRINCE2, OGC 2005.
- Brilliant Project Management – Barker & Cole (Prentice-Hall)

Websites

- www.prince-officialsite.com – PRINCE2 website
- www.pmi.org – Project Management Institute
- www.ipma.ch – International Project Management Association
- www.projectmanagement9.com – support materials for Lock
- ccfltraining.com/PM-Sequencing_Activities.pdf s - Activity Sequencing

Student preparation (informal):

To prepare yourself for the class, try having a look on the Internet for some of the sample files (links) above. These are easily located using Google searches such as “Project Scheduling”; “Project Scheduling Software”; “Activity Sequencing”; “Building a project schedule” etc.