Master LSCM

Course 2022-2023

Subject:

Project Management Lab

Practice 1:
Planning a Project with Microsoft Project.

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Introduction

In this practice the planning of a project (Project Plan) is performed using Microsoft Project. The project involves automating a small industrial plant through a SCADA system; control architecture consisting of one or more monitoring stations (typically PCs), one or more PLCs, as local control units, and field instrumentation required (sensors and actuators). We assume that the feasibility study has already been done and approved.

Method

Note: The names of menus, options, tabs, etc., are in *italics*. In **bold** are marked the significant stages or relevant information in the planning process. Before starting work we will ensure that the redistribution of resources is assigned to MANUAL (tab: *Resource (Recursos)*, option: *Leveling options (Redistribuir recursos)*).

1. General Information of the project

Now we will set the **start date (fecha de inicio)** of the project.
In the *Project (Proyecto)* menu select *Project Information* > the *Date of beginning* , on **Monday November 23, 2022**

By default, Microsoft Project works with a **standard calendar (calendario estándar)** defining a working day of 8 hours per day, Monday through Friday, from 10:00 to 13:00 and from 15:00 to 20:00. Although this calendar may be modified, in this project we will use the standard calendar and, simply, we will define the **holidays** that we have in the project period. To do this, in the *Project (Proyecto)* tab select *Change work calendar (Cambiar calendario laboral)* and assign from 25th of December to 1st of January and 17th of Januray as **Non-working days**, selecting the *Exceptions (Excepciones)* tab and adding three exceptions, one for each non-working day.

2. Defining resources for the project

Microsoft Project distinguishes two main **categories of resources**:

- **Work (Trabajo):** people and teams that perform project work.
- **Materials (Materiales).**

As labor resources, this project will have:

- 1 Project Controller (PC), half-time in the project.
- 1 Project Manager (PM),half-time in the project

- 2 System Analyst (SA), full-time in the project.
- 2 Technicians in Automation (TA), full-time in the project.
- 2 Operators (O), full-time in the project.

To enter these resources, in the *View (Ver)* menu select *Resource Sheet (Hoja de recursos)*, and we introduce the following information:

Resource name (Nombre del recurso)	Max. Units (Capacidad máxima)	Std. rate (Tasa estándar)	Accrue at (Acumular)
PC	50%	80 € / h.	Prorated
PM	50%	60 € / h	Prorated
SA	200%	50 € / h.	Prorated
TA	200%	40 € / h.	Prorated
O	200%	25 € / h.	Prorated

As material resources, we need only cable, which the supplier delivers us in rolls. To introduce this resource, in the same previous view we add to the table the following information:

Resource name (Nombre del recurso)	Material label (Etiqueta de material)	Std. rate (Tasa estándar)	Accrue at (Acumular)
Cable	Rolls	50 €	prorated

3. Create the list of tasks

Now we will introduce the **tasks** or project activities, establish their **precedence relationships** and assign **resources**.

Task Activitie	Task names (Nombre de tarea)	Duration (Duración)
Task 1	Automation Concept Development	20 days
Task 2	Hardware Development & Implementation	20 days
Task 3	Software Development & Implementation	20 days

As **precedence** relationships, we will define:

- Task 2 cannot begin until the Task 1 has been completed (End-to-start dependency).
- Task 3 should start after 5 days from the start of Task 2 (Start-to-start dependency). In the *Predecessors (Predecesoras)* tab we will indicate: Task Name (*Nombre de tarea*:): Task 2

    - *Type (Tipo)*: Start-to-start (CC: *Comienzo a Comienzo*)
    - *Pos*: 5d
- Start UP should start after task-3
- System Documentation should start after Start Up

Now assign resources to tasks. To do this, we will access (for each task) to the *Task information (Información de la tarea)* form, and in the *Resources (Recursos)* tab we will assign:

- For Task 1:
    - Nombre del recurso *(Resource Name)*: PC; Unidades *(Units)*: 50%
    - Nombre del recurso *(Resource Name)*: PM; Unit:50%
- For Task 2:
    - Nombre del recurso *(Resource Name)*: O; Unidades *(Units)*: 100%
    - Nombre del recurso *(Resource Name)*: TA; Unidades *(Units)*: 100%
    - Nombre del recurso *(Resource Name)*: Cable; Unidades *(Units)*: 6 Rolls
- For Task 3:
    - Nombre del recurso *(Resource Name)*: SA; Unidades *(Units)*: 200%
    - Nombre del recurso *(Resource Name)*: TA; Unidades *(Units)*: 100%
    - Nombre del recurso *(Resource Name)*: O; Units: 100%

In the following step we will create a WBS (Working Breakdown Structure) that includes the following phases:

- Automation Concept Development
    - Preliminary analysis and data taking: PC(50%),PM(50%)
- Hardware Development & Implementation
    - Hardware development: Cable(5 rolls), Operators(100%)
    - Hardware installation : Technician in Automation(100%)
- Software Development & Implementation
    - Software development: System Analyst(200%), Operators(100%)
    - Software installation : System Analyst(100%),Technician in Automation(100%)
- Start up
- System documentation (a final task)

Now, the planning is completed.

4. Information about the planning

Now, we can examine the information shown in the view. For example, we can inspect the logic of relations of precedence between tasks, the resource allocations, etc.

In the following, we will answer some questions related to the planning:

1. **What is the date of completion of the project? What is the duration (effective time in days)?**

Date of completion: 24/02/2023
Duration (days): 62

2. **What activities consitute the critical path of the project? Which activity has the largest delay margin (slack)?**

In order to answer these questions we personalize the view of the Gantt Chart. On the diagram view we click the right mouse button and enter the *Assistant to Gantt charts (Asistente para Diagramas de Gantt)*. We choose:

- What kind of information do you want to display in the Gantt chart? → Personalized Gantt chart *(Diagrama de Gantt personalizado)*.
- What other bars you want to include in the Gantt chart? → Total delay margin (Margen de demora total)
- What information of the tasks do you want to show together with the Gantt bars? → Resources

With the personalized view we can now answer the questions:

Critical path of the project: Tasks-3(System Development and Implementation) ,start up and system documentation are critical

Activity with the largest delay margin (slack): Hardware Installation

Its' total slack: 10

3. **What is the total cost of the project? Which activity is the most expensive?**

To answer this question, first you have to establish a resume about the project with the help of the Gantt chart. In order to do this, we go to menu *Project (Proyecto)* and choose *Format (Formato)* and on the right side of the menu ribbon we check the point *Project summary task (Mostrar tarea de resumen del proyecto).*

Now in the menu *View* (*Ver*) we select *Table: Cost* (Tabla: Costo) to answer the question:

Total cost of the project: 29,900 €
Most expensive activity and its cost: Preliminary analysis and Data with cost of 11,200 €
Most expensive task and its cost: Software development and Implementation, with a cost of 13,200 €

4. What is the cost associated with each resource of the project?

In order to answer this we go to the menu *Show (Ver)* and select View of *the Resource sheet (Hoja de recursos)*. Furthermore, we select the *Table: Cost (Tabla: Costo)* which we can also find in the menu *View (Ver).*

PC	Total Cost: 6,400 €
PM	Total Cost : 4,800 €
SA	Total Cost: 8,000 €
TA	Total Cost: 6,400 €
O	Total Cost: 4,000 €
Cable	Total Cost: 300 €

5. Solving the problem of resource over allocation

In the tables of resources that we have examined we saw that some resources were shown in red color. This shows us that the resources are over allocated (the sum of the total capacity allocated to the various tasks exceeds the maximum capacity defined). Microsoft Project warns of the problem so that the project manager can solve the problem regarding the chosen criteria.

In order to exactly localize the over allocation problems we use a combined view of the *Gantt chart (Diagram de Gantt)* and the *Resource diagram (Diagrama de recursos)*. To do this, we go back to the view of the *Gantt Chart (Diagrama de Gantt)* with *Table: Entry (Tabla: Entrada)*. Now, in the menu *View (Ver)* we choose *Split view (Dividir)/Details* and for the bottom window we select the view of the *Resource Graph (Gráfico de recursos).*

This way, choosing an activity in the upper view, we can see in the bottom view all the resources that are involved in the activity and how they distribute their dedication to the project (globally, not only for the chosen activity) or over time.

Now we can answer the questions:

5. **Which are the over allocated resources? What days are they over allocated? What is the percentage of over allocation?**

There are overallocation in Operators (O) .
For O, 4th to 10th of January are days with overallocation.
% of overallocation for Operators are 100% more (it means one FTE will be requested for these activities)

Basically, there are two ways of solving the over allocation problems of the resources:

- Manual solution, made by the user.
- Automatical solution, made by Microsoft Project.

6. **Propose two exact different ways of solving the problem, without extending (if possible) the total duration of the project.**

a) Increasing the resources
b) Delaying the time with the same resources, at least done using automatic assignment

Choose one of the two proposed methods and check the results (see if the problem of over allocation could be solved).

In case of the problem of over allocation of the Operators(O), we apply the automatic solution of the problem using Microsoft Project. For that we go to the menu *Resource (Recurso)* and select *Leveling options (Redistribuir recursos)* and apply *Redistribute now (Redistribuir ahora).*

Now we can see how the planning of the project has changed:

7. **Did the total duration change?**

No

As we can see the total duration of some activities has changed:

8. **Which activities have changed? What are the new durations?**

Hardware Development & Implementation all activities have suffered a delay for 5 days. It was about to finish at 25/01/23, but after levelling all it's finishing at 01/02/23

9. **Why do you think Microsoft Project has changed some of the durations (what is the objective of these changes)?**

To avoid overallocation and avoiding so an extra impact on cost

In the menu *View (Ver)* select *Task Usage (Uso de tareas)*. Using this view, we can see what exactly Microsoft Project has done in order to solve the problem of over allocation of Operators.

10. **Briefly explain it:**

In this final planning, To solve the overallocation for Operators Project Management software allocates a daley in Hardware development and distributes working hours for Operators parallelly in Hardware Development and Software Development.

11. **Did the critical path change? Which tasks are now representing the critical path?**

☐ Yes ☒ No

Finally, we safe our final project plan under the name **Baseline.** A baseline contains all the relevant information of the panning of the project: tasks, resources, assignments, etc. Microsoft Project allows to safe 11 baselines (subsequent updates of planning) for every

project. This allows, in the implementation phase of the project, compare it with the (most current) planning and, if necessary, take appropriate remedial measures.

In order to save the planning as a baseline, first we safe the file of the project with the option *Safe* in the menu *Archive (Guardar* in menú *Archive).* Now, we go to the menu *Project (Proyecto)* and choose *Set Baseline (Establecer línea de base).*We set the baseline for the entire project, using the default values and click on *OK.*