INTRODUCTION TO PROJECT MANAGEMENT

Prepared for Carleton University

Sep 28 and Oct 1, 2018

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Training material adapted utilizing Bombardier Q-Series Basic Project Management Training developed by Lidia Jovanovic, PMP and Milica Micic, PMP
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1. INTRODUCTION TO PROJECT MANAGEMENT
1.1 PROJECT MANAGEMENT DEFINITION
1.1 Project Management Definition – Learning Goals

At the end of this module you will understand:

- What is Project Management
- What is the role of Project Manager
- What are 10 Project Management knowledge areas
- What are the Project Management process groups
1.1 Project Management Definition

- What is a Project?

*Project is a temporary endeavour undertaken to create a unique product, service or result. (PMI)*
1.1 Project Management Definition

- Do We Need Project Management?
- Why?
1.1 Project Management Definition

- What is Project Management?

*Project management is the application of knowledge, skills, tools and techniques to project activities to meet project requirements (PMI)*
1.1 Project Management Definition

- What is Project Management?

Project management is the application of knowledge, skills, tools and techniques to project activities to meet project requirements (PMI)
1.1 Project Management Definition

10 Areas of Knowledge (must be addressed to manage any project)
1.1 Project Management Definition

- What is Project Management?

PM Skills
- Technical knowledge
- Project atmosphere
- Communication
  - Influence
  - Leadership
  - Motivation
  - Negotiation
- Problem Solving

Project management is the application of knowledge, skills, tools and techniques to project activities to meet project requirements (PMI)
1.1 Project Management Definition

- What is Project Management?

PM Processes
5 process groups

Project management is the application of knowledge, skills, tools and techniques to project activities to meet project requirements (PMI)
1.1 Project Management Definition

5 Project Management Process Groups

- Initiating Processes
- Planning Processes
- Executing Processes
- Monitoring & Controlling Processes
- Closing Processes
1.1 Project Management Definition

- What is Project Management?

Project management is the application of knowledge, skills, tools and techniques to project activities to meet project requirements (PMI)
1.1 Project Management Definition

- What is Project Management?
1.1 Project Management Definition

- Do We Need Project Managers?
- Why?
1.1 Project Management Definition

- Some of Project Manager’s responsibilities:
  - Identify project **requirements**
  - Determine the best order of activities and create **schedule**
  - Define what is in and what is out of project **scope**
  - Collect impacts and request adequate project **budget**
  - Identify all **stakeholders** and build good relationships with them
  - Ensure adequate **communication** between stakeholders
  - **Motivate** and focus the team on objectives
  - **Integration** of all project activities
  - Project status **reporting**
  - Document **opportunities** for improvement
  - **Deliver** the project

*Project Manager is a person assigned by the performing organization to achieve the project objectives (PMI)*
1.1 Project Management Definition

A good Project Manager ...

- Is a good communicator
- Can manage and adapt to change
- Has team building and negotiation skills
- Possesses the necessary technical expertise
- Puts the customer first

*These skills are good to have even for the people on the technical path.*
1.1 Project Management Definition

“PMI appears to believe that the essential goal and aim of project management is to eliminate chance and accidents... While it is a good idea to tame what can usefully and practically be tamed, most of the project world lives where the wild things are... You have to sail the turbulent seas toward a destination that often shifts.”

from Creative Project Management by Michael S. Dobson and Ted Leemann (2010)
1.1 Project Management Definition
1.1.1 Project Management Need

- Sampoong Department Store (삼풍백화점; 三豊百貨店)
1.1 Project Management Definition
1.1.1 Project Management Need

- Sampoong Department Store (삼풍백화점; 三豊百貨店) collapse

![Before collapse](image1.jpg)

![After collapse](image2.jpg)
Our latest *Pulse of the Profession* research suggests a positive change in the way organizations are managing projects and programs. For the first time in five years, more projects are meeting original goals and business intent and being completed within budget. There has also been a significant decline in dollars lost: Organizations are wasting an average of $97 million for every $1 billion invested, due to poor project performance—that’s a 20 percent decline from one year ago.*

1.1 Project Management Definition

1.1.3 Project Management Institute

- Not-for-profit organization
- 2.9 million professionals
- Nearly every country
- Eight globally recognized certifications
- Standards for project, program and portfolio management
- Local Chapters located in over 80 countries
- PMI research program: research projects, symposiums and surveys
- 1,600 Registered Education Providers (R.E.P.s)
- Nearly 100 degree programs in institutions worldwide.

For more info go to https://www.pmi.org/about/learn-about-pmi
1.1 Project Management Definition
1.1.3 Project Management Institute

- PMI ®– PMP ® Certification
- Project Management Professional
- Min 3-5 years of PM experience
- Globally recognized
- 833,025 certification holders as of March 2018

For more info go to https://www.pmi.org/about/learn-about-pmi

All PMI Members, or non-members who hold a PMI certificate, must abide by PMI Code of Ethics and Professional Conduct. This document covers four values vital for PM profession: Responsibility, Respect, Fairness and Honesty.
1.2 PROJECT INITIATION
1.2 Project Initiation

5 Project Management Process Groups

- Initiating Processes
- Planning Processes
- Executing Processes
- Monitoring & Controlling Processes
- Closing Processes
1.2 Project Initiation – Learning Goals

At the end of this module you will understand:

- What are project constraints
- What are project initiation main goals
- What are typical key roles on a project
1.2 Project Initiation
1.2.1 Typical Project Constraints and Triple Constraint

![Diagram showing the triple constraint](image_url)
1.2 Project Initiation

1.2.1 Typical Project Constraints and Triple Constraint

Strategic decisions made are based on the estimated Cost. If estimates are too low or too high, the right decision for the company / customer may not be made.

Being over or under budget creates a financial impact to the company and shareholders.

Deviation from the original Scope in order to satisfy schedule and cost could impact customer satisfaction

Late to Schedule, incurs Cost.

Schedule delays can impact other projects and day-to-day business

© Happy Customers ©
1.2 Project Initiation
1.2.1 Carleton Capstone Projects - Cost Management - Project Budgeting

Department of Mechanical and Aerospace Engineering

<table>
<thead>
<tr>
<th>No</th>
<th>Capstone Project</th>
<th>Budget [$]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<tr>
<td>2</td>
<td>B</td>
<td>$2,000</td>
</tr>
<tr>
<td>3</td>
<td>...</td>
<td>...</td>
</tr>
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</table>

<table>
<thead>
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</tr>
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<td>4</td>
<td>Sponsors</td>
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<td></td>
<td>TOTAL</td>
<td>$8,000</td>
</tr>
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</table>

NOTE: BUDGET DISTRIBUTION USED IN THE EXAMPLE IS FICTIONAL.
1.2 Project Initiation

1.2.2 Project Initiation Main Goals

• What is the purpose of the project?

• What is the product, service or result that we are trying to achieve?

• What is the project success criteria?

*The Challenge of initiation process is to gain the agreement and approval of all stakeholders prior to proceeding to planning.*
1.2 Project Initiation
1.2.3 Understanding the Key Roles on a Project
1.2 Project Initiation
1.2.3 Understanding the Key Roles on a Project

Project Organization Chart – Example
Project Organization Chart does not replace the department organization chart.
1.2 Project Initiation
Exercise #1 EXAMPLE – Create Project Organization Chart

Executive Sponsor
- Aerospace Comp. Leader

Program Manager
- Customer Engineer

Project Manager
- Eng. Specialist
- Flight Test Team

Design Focal
- Methods Engineer
- InService Engineer
- Maintenance Engineer
- Designer(s): Interior Wiring

Stakeholders
- Operations
- Service Center
- Contracts
- Supply Chain
- Legal Services
- TCCA
- Media
- Supplier A
- Union(s)

Clients
- Airline
- Aircraft Crew
- Passengers

Project Team
- Buyers
1.2 Project Initiation

Exercise #1 – Create Project Organization Chart

Create a Project Organization Chart for following project: Define project team and internal and external stakeholders.

High-Performance Rotary Wing (HPRW) Project

Project Description:

Evaluate and improve the racing quadcopter assigned to the team at the start of the fall semester. Both Red and Blue HPRW teams were each given the Eachine Wizard X220s. For the fall semester, both teams will be working together to get a common benchmark platform, which will be used to improve the drone. Once the quadcopter is benchmarked, along with lead supervisor supervision, the teams will be able to make measurable alterations to the drone to improve the desired criteria. At the end of the Winter term, the Red and Blue HPRW teams will compare the alterations made to the quadcopters by racing them in a predetermined course. Using the wind tunnel testing results and outcome of the race will determine which team made the more effective adjustments.
1.2 Exercise #1: Project Organization Chart

**HINTS:**
A – Government
B – Science Fairs
C – Machine Shops
D – Chair – Faculty of Eng. & Design
E – Media
F – Lead Supervisor

- **Executive Sponsor:**
  - D

- **Professor and Chair Dept. of Mech. and Aero. Engineering:**
  - F

- **Project Manager:**
  - *Team A*
    - Propulsion
    - Aerodynamics
    - Flight Control & Data Acquisition
    - Flight Testing
    - Structures and Mechanical Systems
  
  - *Team B*
    - Propulsion
    - Aerodynamics
    - Flight Control & Data Acquisition
    - Flight Testing
    - Structures and Mechanical Systems

- **Racing Competition:**
  - B

- **Clients:**
  - A
  - C

- **Suppliers (Hardware & Software):**
  - C

- **Sponsors:**
  - A

- **Competing Universities:**
  - A

- **Competition Organizers:**
  - A

- **Student Eng Society:**
  - A

- **Corporations:**
  - E

- **Stakeholders:**
  - A

*Note: In this example we have team A and B, but is usually not the case.*

***Enter the appropriate letter in the space provided.***

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1.2 Exercise #1: Project Organization Chart – Possible Solution

**Stakeholders**
- Suppliers (Hardware & Software)
- Machine Shops
- Sponsors
- Competing Universities
- Competition Organizers
- Student Eng Society
- Government
- Corporations
- Media

**Executive Sponsor**
- Chair – Faculty of Eng. & Design

**Lead Supervisor**
- Professor and Chair Dept. of Mech. and Aero. Engineering

**Project Manager**

**Teams**
- **Team A**
  - Propulsion
  - Aerodynamics
  - Flight Control & Data Acquisition
  - Flight Testing
  - Structures and Mechanical Systems

- **Team B**
  - Propulsion
  - Aerodynamics
  - Flight Control & Data Acquisition
  - Flight Testing
  - Structures and Mechanical Systems

**Clients**
- Racing Competition
- Science Fairs

*Note: In this example we have team A and B, but is usually not the case.*

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1.3 PROJECT PLANNING
1.3 Project Planning

5 Project Management Process Groups

- Initiating Processes
- Planning Processes
- Executing Processes
- Monitoring & Controlling Processes
- Closing Processes
1.3 Project Planning – Learning Goals

At the end of this module you will understand:

- What is the Work Breakdown Structure (WBS)
- How do we estimate activity duration
- How do we sequence activities
- What is the critical path
- How does Microsoft Project work
1.3 Project Planning
1.3.1 Work Breakdown Structure (WBS)

To avoid micro-management, the project manager should focus on milestones, deliverable completion on time / at cost, and let the owner of the deliverable do their job. The owner is the expert.
1.3 Project Planning
1.3.1 WBS - Few Definitions

- **DELIVERABLE**: According to PMI, a deliverable is “any unique and verifiable product, result or capability to perform a service that must be produced to complete a process, phase or a project.” Deliverable is usually represented as a noun.
- **Examples**: contract, test cards, flight permit, drawing, workbook, test plan etc.

- **TASKS** represent the activities required to produce the deliverables. It is possible that more than one task is required to complete one deliverable. Tasks are usually represented as a verb-noun phrase.
- **Examples**: create a webpage, negotiate contract, complete test cards, obtain flight permit, create drawings, release drawings, approve test plan etc.

- **MILESTONE** is a significant event on the project.
- **Examples**: webpage launched, contract signed, project completed, flight test completed, drawings released, aircraft delivered, etc.
1.3 Project Planning

Exercise #2 – Create Work Breakdown Structure (WBS)

Create a WBS for following project:

High-Performance Rotary Wing (HPRW) Project

OR

Create a WBS for following your own Capstone Project

NOTE: This is a group exercise.
1.3.1 Work Breakdown Structure (WBS)

Exercise #2 - EXAMPLE: WBS for Bombardier Aircraft Configuration Project

1-WHAT?

New Aircraft Configuration

PROJECT LAUNCH
- Complete CRM
- Complete DCP
- Obtain Soft Material Definition
- Obtain Paint Scheme Definition
- Obtain Translation Requirements
- Complete CRWS’s

PRELIMINARY DEFINITION
- Complete Interface Control Drawings for Interiors
- Complete Wiring Schematics
- Complete Electrical Load Analysis
- Complete Preliminary Test Requirements
- Complete PDR

DETAIL DEFINITION
- Update Interface Control Drawings for Interiors
- Complete Source Control Drawings
- Complete Wiring Diagrams
- Complete CATIA 3D Modeling
- Complete Preliminary Certification Plan
- Complete PDR

PRODUCT DEFINIT. RELEASE
- Finalize 3D Design
- Complete Installation Drawings
- Finalize Certification Plan
- Complete Tooling Build
- Produce Components
- Complete First Article Inspection
- Complete CDR

PRODUCT CERTIFICATION
- Complete Component Level Testing
- Complete Aircraft Build
- Complete First Article Installation Build
- Complete Aircraft Level Testing (Projects)
- Complete SOC’s
- Complete All FTP, Ground and Flight Testing

PROGRAM COMPLETION
- Obtain Aircraft Certification of Airworthiness
- Prepare Aircraft for Delivery
- Deliver Aircraft to the Customer
- Enter the Aircraft into Service

ALTERNATE ACRONYMS:
- CRM - Customer Requirement Matrix
- DCP – Design Change Proposal
- CRWS – Change Request Work Statement
- SOC – Statement of Compliance
- FTP – Functional Test Procedure

ACRONYMS:
- CRM - Customer Requirement Matrix
- DCP – Design Change Proposal
- CRWS – Change Request Work Statement
- SOC – Statement of Compliance
- FTP – Functional Test Procedure

2-HOW?

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Prepare WorkBooks
1.3.1 Exercise #2: WBS for Carleton HPRW Project

***HINTS:

A - Complete Flight Data Analysis
B - Complete Machine Shop Training
C – Install New Airframe
D - Select Flight Test Location

E – Obtain Flight Permit
F - Approve Drawings for New Airframe
G – Prepare Final Report
H - Complete Propeller Solid Model

**ACRONYMS:**

SFOC – Special Flight Operations Certificate
CAR – Canadian Aviation Regulation
CFD - Computational Fluid Dynamics

***Enter the appropriate letter in the space provided.***
1.3.1 Work Breakdown Structure (WBS)
Exercise #2: WBS for Carleton HPRW Project – Possible Solution

1-WHAT?

High-Performance Rotary Wing (HPRW) Project

TRAINING & THEORY
- Complete (C.)
- WHMIS Training (T.)
- C. Work Health & Safety Awareness
- C. Battery Safety T.
- C. Wind Tunnel Operations T.
- C. Machine Shop T.
- C. Pilot T.
- Research Materials

MODELING & EVALUATION
- Complete (C.)
  - CATIA Drone Modeling
  - C. Propeller Solid Model
  - C. CofG Analysis
  - C. Testing Circuit Design
  - Complete Test Procedure
  - C. Wind Tunnel Testing
  - C. Avionics Evaluation

FLIGHT TEST PREPARATIONS
- Review TC UAV regulations and CARs
  - Develop List of Possible Flight Locations
  - Select Flight Test Location
  - Complete SFOC Application
  - Obtain Liability Insurance Certificate
  - Obtain Flight Permit

BASELINE TEST & ANALYSIS
- Develop Checklists
- Identify
- Benchmarking Criteria
- Develop Flight Test Plans
- Complete Test Cards
- Complete Flight Testing
- Complete Flight Data Analysis
- Complete CFD Propeller Modeling
  - Prepare Fall Report
  - Submit Fall Report

DESIGN CHANGES
- Complete Aerodynamics & Propulsion Design Changes
- Optimize Solid & CFD Model
- Create Drawings for New Airframe
- Approve Drawings for New Airframe
- Complete Avionics Modifications / Improvements
  - Manufacture New Airframe
  - Install New Airframe
  - Order & Receive new Avionics Parts
  - Install Avionics Modifications
  - Complete Drone Build
  - Obtain Liability Insurance Certificate
  - Obtain Flight Permit

BUILD & TEST PREPARATIONS

DRONE RACE & REPORT
- Complete Preliminary Flight Test
- Perform Final Adjustments
- Complete Race
  - Analyze Flight Data
  - Determine the Competition Winner
    - Prepare Final Report
    - Submit Final Report

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1.3 Project Planning
1.3.2 Activity Duration Estimating

- **Duration** is the actual amount of time spent working on the activity, including elapsed time.
- **Effort (work)** is the number of work days or work hours required to complete the task.

**Example:** For 5 days, each day we test one specimen for 2 hours, but it takes 20 hours to condition the specimen in a chamber.

- Duration is 5 days.
- Effort (work) is 10 hours.
- Elapsed time is time specimen spends in a conditioning chamber.

<table>
<thead>
<tr>
<th>DAY 1</th>
<th>DAY 2</th>
<th>DAY 3</th>
<th>DAY 4</th>
<th>DAY 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 hours</td>
<td>2 hours</td>
<td>2 hours</td>
<td>2 hours</td>
<td>2 hours</td>
</tr>
</tbody>
</table>

= DURATION

= WORK
1.3 Project Planning

1.3.3 Dependencies - Activity Sequencing

Start Modeling and Analysis
A: Complete CATIA Drone Modeling – 10d
B: Complete Propeller Solid Model – 5d
C: Complete Testing Circuit Design – 5d
D: Complete Test Procedure – 2d
E: Complete CofG Analysis – 2d
F: Complete Wind Tunnel Testing – 5d
G: Complete Avionics Evaluation – 5d
End Modeling and Analysis

WORKING IN PARALLEL

Start Test Preparations
H: Review TC UAV Regulations & CAR’s – 10d
I: Develop List of Possible Flight Locations – 3d
J: Select Flight Test Location – 1d
K: Obtain Liability Insurance Certificate – 10d
L: Complete SFOC Application – 5d
M: Obtain Flight Permit – 15 d
End Test Preparations

Network Diagram (also referred to as a PERT chart) is a schematic display of the logical relationships among project activities.
1.3 Project Planning
1.3.4 Microsoft Project Gantt Chart Example

**Critical Path** represents the shortest time in which a project can be completed. If one or more activities on this path take longer than planned, the project will slip.

<table>
<thead>
<tr>
<th>Task Name</th>
<th>Duration</th>
<th>Start</th>
<th>Finish</th>
<th>Predecessors</th>
</tr>
</thead>
<tbody>
<tr>
<td>START*******</td>
<td>0 days</td>
<td>Sep 28 '18</td>
<td>Sep 28 '18</td>
<td></td>
</tr>
<tr>
<td>MODELING, WIND TUNNEL TESTING AND EVALUATION</td>
<td>22 days</td>
<td>Oct 01 '18</td>
<td>Oct 30 '18</td>
<td></td>
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<tr>
<td>Start Modeling and Analysis</td>
<td>0 days</td>
<td>Oct 01 '18</td>
<td>Oct 01 '18</td>
<td>9</td>
</tr>
<tr>
<td>Complete CATIA Drone Model</td>
<td>10 days</td>
<td>Oct 01 '18</td>
<td>Oct 12 '18</td>
<td>11</td>
</tr>
<tr>
<td>Complete Propeller Solid Model</td>
<td>5 days</td>
<td>Oct 01 '18</td>
<td>Oct 05 '18</td>
<td>11</td>
</tr>
<tr>
<td>Complete Testing Circuit Design</td>
<td>5 days</td>
<td>Oct 01 '18</td>
<td>Oct 05 '18</td>
<td>11</td>
</tr>
<tr>
<td>Complete Test Procedure</td>
<td>2 days</td>
<td>Oct 08 '18</td>
<td>Oct 09 '18</td>
<td>14</td>
</tr>
<tr>
<td>Complete CoG Analysis</td>
<td>2 days</td>
<td>Oct 15 '18</td>
<td>Oct 16 '18</td>
<td>12,13</td>
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<tr>
<td>Complete Wind Tunnel Testing</td>
<td>5 days</td>
<td>Oct 17 '18</td>
<td>Oct 23 '18</td>
<td>12,13,16,15</td>
</tr>
<tr>
<td>Complete Avionics Evaluation</td>
<td>5 days</td>
<td>Oct 24 '18</td>
<td>Oct 30 '18</td>
<td>17,14</td>
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<td>Oct 30 '18</td>
<td>18</td>
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<tr>
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<td>Oct 01 '18</td>
<td>9</td>
</tr>
<tr>
<td>Review TC UAV Regulations, CAR's for restrictions</td>
<td>10 days</td>
<td>Oct 01 '18</td>
<td>Oct 01 '18</td>
<td>9</td>
</tr>
<tr>
<td>Develop List of Possible Flight Locations</td>
<td>3 days</td>
<td>Oct 01 '18</td>
<td>Oct 03 '18</td>
<td>21</td>
</tr>
<tr>
<td>Select Flight Test Location</td>
<td>1 day</td>
<td>Oct 04 '18</td>
<td>Oct 04 '18</td>
<td>23</td>
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<tr>
<td>Obtain Liability Insurance Certificate</td>
<td>10 days</td>
<td>Oct 15 '18</td>
<td>Oct 26 '18</td>
<td>22,23,24</td>
</tr>
<tr>
<td>Complete SFOC Application</td>
<td>5 days</td>
<td>Oct 15 '18</td>
<td>Oct 19 '18</td>
<td>22</td>
</tr>
<tr>
<td>Obtain Flight Permit</td>
<td>15 days</td>
<td>Oct 22 '18</td>
<td>Nov 09 '18</td>
<td>26</td>
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<tr>
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<td>0 days</td>
<td>Nov 09 '18</td>
<td>Nov 09 '18</td>
<td>26,25,27</td>
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<tr>
<td>END*******</td>
<td>1 day?</td>
<td>Nov 12 '18</td>
<td>Nov 12 '18</td>
<td>28</td>
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</table>
1.3 Project Planning
1.3.5 Microsoft Project Calendar

1. SET UP THE PROJECT CALENDAR

There are different calendars that could be assigned to overall project, a task or a resource. Holidays and vacations are entered prior to resource assignment, so MS Project can calculate properly.

2. SELECT THE PROJECT CALENDAR

Block the non-working time for the whole project for proper scheduling.
1.3 Project Planning
1.3.6 Microsoft Project Resource Sheet

3. POPULATE RESOURCE SHEET

4. ADJUST THE RESOURCE OR THE TASK CALENDAR

Block the non-working time for the individual resources for proper scheduling.
## 1.3 Project Planning
### 1.3.6 Resources Sheet Example

<table>
<thead>
<tr>
<th></th>
<th>Resource Name</th>
<th>Type</th>
<th>Material Label</th>
<th>Initials</th>
<th>Group</th>
<th>Max. Units</th>
<th>Std. Rate</th>
<th>Ovr. Rate</th>
<th>Cost/Use</th>
<th>Accrue At</th>
<th>Base Calendar</th>
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<tbody>
<tr>
<td>1</td>
<td>Angelo Susi</td>
<td>Work</td>
<td>AS</td>
<td></td>
<td>Systems Chief</td>
<td>30%</td>
<td>$0.00/h</td>
<td>$0.00/h</td>
<td>$0.00</td>
<td>Prorated</td>
<td>Bombardier Cal</td>
</tr>
<tr>
<td>2</td>
<td>Christina Yung</td>
<td>Work</td>
<td>CY</td>
<td></td>
<td>Airworthiness</td>
<td>30%</td>
<td>$0.00/h</td>
<td>$0.00/h</td>
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</tr>
</tbody>
</table>

**Resource Sheet View** – Define all resources required for a project. A resource does not have to be a person. It can also be a machine that you will be utilizing to do the work.
1.3 Project Planning
1.3.7 Resources Usage Example

Resource Usage View – If resource name gets red, it signals that it is booked over his/hers maximum available time. Check and perform resource leveling. Resource leveling is a technique that overlooks resource allocation and resolves possible conflict arising from over allocation. It is considered one of the key elements to resource/capacity management.
1.3. Project Planning
1.3.8 Carleton - Multi-Year Project Planning

ONGOING PROJECT TASKS: project management, meetings, website management, configuration management, design integration, technical papers, data management

- Since the WBS is a graphic, there is a practical limit to how much detailed information can be included in each element.
- We can solve this problem by using a short title and a numbering scheme on the graphic in the WBS and providing more detail regarding these WBS elements in the WBS dictionary.
1.4 PROJECT EXECUTION

MONITORING & CONTROLLING

Initiating Processes
Planning Processes
Executing Processes
Monitoring & Controlling Processes
Closing Processes
1.4 Project Execution, Monitoring and Controlling – Learning Goals

At the end of this module you will understand:

- What are some elements of Project Execution
- Why is Monitoring and Controlling important
- What is Communication Management
- What is Risk Management
- What are Negotiation and Conflict Resolution processes
1.4 Project Execution and Monitoring & Controlling

The Challenge of effective project management is to regularly monitor and measure progress and recognize when corrective actions are necessary.
1.4 Project Execution and Monitoring & Controlling

The Challenge of effective project management throughout the project execution is to coordinate the people and other resources well.
1.4 Project Execution and Monitoring & Controlling

- **Build the Team and Allocate Responsibilities**
  - Organize communication system
  - Identify all Stakeholders

- **Execution Kick-Off – Start positively**
  - Invite Sponsor and ask him to greet the team, present the project background and express his confidence in the team
  - Include the summary of project goal, any performance indicators and target figures
  - Summarize milestones and identify associated deliverables
  - Present any risks and opportunities identified so far
  - Present the list of stakeholders …
1.4 Project Execution and Monitoring & Controlling

Source:
https://www.thebalancecareers.com/list-of-soft-skills-2063770
1.4 Project Execution and Monitoring & Controlling

Build the Team

1. **Forming** – team members introduced
2. **Storming** - confirm roles and responsibilities
3. **Norming** - establish team ground rules and boundaries
4. **Performing** – teamwork to achieve goals
5. **Adjourning** – celebrate success, learn from mistakes and share the improved processes
1.4 Project Execution and Monitoring & Controlling

Leadership Style

1. **Dictatorial** – Making decisions alone, taking risks
2. **Analytical** – Gathering all the facts, observing and analyzing
3. **Opinion-Seeking** – Asking stakeholders for opinion on which to base the decisions
4. **Democratic** – Encouraging team participation and involvement in decision-making

- Respect cultural differences between stakeholders
- Look for ways to use conflict constructively
- Adapt your leadership style

Risk Management

Build the Team and Allocate Responsibilities

Launch the Project – Start positively

Identify all Stakeholders

Communicate key information
1.4 Project Execution and Monitoring & Controlling

- Build the Team and Allocate Responsibilities
- Launch the Project – Start positively
- Risk Management
- Organize communication system
- Identify all Stakeholders
- Negotiate effectively
- Look for ways to use conflict constructively
- Adapt your leadership style

Communication

Sep 28 & Oct 1, 2018 64
1.4 Project Execution and Monitoring & Controlling

1.4.1 Communication

- **Communication Types:**
  - Formal - Verbal
  - Informal - Written

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1.4 Project Execution and Monitoring & Controlling

1.4.1 Communication

FORMAL TONE

Dear Ms. Johnston:
Enclosed please find the information requested during our telephone communication on April 21st.
...

CONVERSATIONAL TONE

Good morning Susan:
Here is the information you requested during our phone conversation on Friday.
...

INFORMAL TONE

Hi Susan:
Hope all is well. Just sending along the information you asked for. As I said on Friday our team ....
1.4 Project Execution and Monitoring & Controlling
1.4.1 Communication

Exercise #3: Effective Business Communication

The summer student wants to ensure all Design Proposals are submitted for Engineering Change Board review in a timely fashion. The student just finished the draft of an e-mail he plans to send to Design Proposal authors and asked you to review it.

What will your feedback be? Will you ask him to improve the text, and how?
1.4.1 Exercise #3: Effective Business Communication

Good day all,

I would appreciate if Design Proposals requiring Engineering Change Board Review are sent two working days prior to the meeting (held on Thursday’s at 11am). Personally the latest (and I stress LATEST) I would want these is Wednesday by noon. I hope you understand I have to review these and submit to Management. Once I receive the Board Agenda I will forward it in an e-mail to you. If you send a Design Proposal for Board Review after this email is sent, chances are it will not be presented in the meeting and will be placed for the next Board Review.

I know this will be somewhat of a struggle, unfortunately in order to make this process effective, I am asking that Design Proposals are completed PROPERLY! For example, if signatures and hours are missing I will be rejecting them. This will create unnecessary delay in approval of your proposal and you may end up having to reschedule your milestones. And the situation will get even more complicated as for any milestone date changes, approval will be required. I think that all of this is unnecessary, and can be prevented by simply submitting your Design Proposal two days prior to our Engineering Change Board Meeting.

Regards,
Student Xyz
1.4.1 Exercise #3: Effective Business Communication

Good day all,

I would appreciate if Design Proposals requiring Engineering Change Board Review are sent two working days prior to the meeting (held on Thursday’s at 11am). Personally the latest (and I stress LATEST) I would want these is Wednesday by noon. I hope you understand I have to review these and submit to Management. Once I receive the Board Agenda I will forward it in an e-mail to you. If you send a Design Proposal for Board Review after this email is sent, chances are it will not be presented in the meeting and will be placed for the next Board Review.

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Regards,
Student Xyz
1.4 Project Execution and Monitoring & Controlling

1.4.1 Communication

- Communication
1.4 Project Execution and Monitoring & Controlling

1.4.1 Communication

- Communication Model

Sender → Message → Receiver

Feedback

Noise
1.4 Project Execution and Monitoring & Controlling

1.4.1 Communication

- **Communication Channels:**
  - The more people involved in a project, the greater the number of communication channels
  - Number of communication channels grows quickly as people are added to the project

*The Challenge of effective project management is to ensure communication channels are open and that cooperation happens. Continuous Monitoring and Controlling is essential.*
1.4 Project Execution and Monitoring & Controlling

1.4.1 Communication

- **Project Manager’s role:**
  - Communication planning
  - Information distribution
  - Performance reporting
  - Managing stakeholders

---

The Challenge of effective project management is to ensure effective communication and prevent information overload.
1.4 Project Execution and Monitoring & Controlling

1.4.2 Risk Management
1.4 Project Execution and Monitoring & Controlling
1.4.2 Risk Management

- **What is Risk?**
  - An event with some degree of **uncertainty**
  - **Positive** risks are **opportunities**
  - **Negative** risks are **threats**
  - **Materialized** risk is an **issue**
  - **Risks are being assessed** to offset any negative impact on project and pursue any positive impact
  - **Risk Register** should identify the risks, assess their probabilities, impact and uncertainty

- **Objective:**
  - **To be proactive & anticipate** any events which may harm the program so that actions may be taken to decrease the risk impact if / when they materialize.

  - *Risk is an uncertain event or condition that, if it occurs, has a positive or negative effect on a project’s objectives (PMI, PMBOK Rev3)*

  - *Risk is an undesired situation or circumstance that has both a likelihood of occurring and a potentially negative consequence (AS9100)*
1.4 Project Execution and Monitoring & Controlling
1.4.2 Risk & Opportunity Management Strategy – Process

1. Identification
2. Analysis & Prioritization
3. Mitigation Plan Development
4. Mitigation Plan Implementation
5. Monitoring & Reporting
6. Closing

Identification Assessment Mitigation Closure

Identification
Assessment
Mitigation & Monitoring

1 2 3 4 5
Likelihood of Occurrence
Impact

Sep 28 & Oct 1, 2018
1.4 Project Execution and Monitoring & Controlling

1.4.2 Risk Management

- Some Risks that may occur during Project Execution Phase
  - Change in scope
  - Change in schedule
  - Unskilled labour
  - Material availability
  - Strike
  - Weather
  - Change in Regulatory Requirements …

Updated Risk Matrix and criteria

Risk Matrix

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Likelihood

- Sep 28 & Oct 1, 2018
1.4 Project Execution and Monitoring & Controlling

1.4.2 Risk Management

Exercise #4: Risk Assessment

While planning your project, you became aware that Machine Shop is very busy at the time you need your new components. You have also learned from other students that sometimes the components get delayed up to 1 week, and you know that would shift your schedule to the right (Drone Build would be delayed) and subsequently affect the end date of your project.

1) Perform risk assessment.
2) Define mitigation plan.
1.4 Project Execution and Monitoring & Controlling

1.4.2 Risk Management

Exercise #4: Risk Assessment

Complete 3D Printed Missing Component

Complete Drone Build

Obtain Flight Permit

PLAN 5 DAY LAG

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Exercise #4: Risk Assessment

- Complete Drone Build
- Obtain Flight Permit
- Complete Preliminary Flight Test
- Perform Final Adjustment
- Complete the Race
- Prepare / Submit Final Report

Risk Matrix:

- Cost Impact: X
- Schedule Impact: X
- Product Performance: X
- Quality/Cost Satisfaction: X
- Likelihood: X

PLAN 5 DAY LAG

Sep 28 & Oct 1, 2018
# 1.4 Project Execution and Monitoring & Controlling

## 1.4.2 Risk Management

### Exercise #4: Risk Assessment – Possible Mitigation Actions

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**MITIGATING ACTION**

- **Complete 3D Printed Missing Component**: 2 days, Mar 07 '19 - Mar 08 '19, 74FF-5 days

**NOTES**

- May require additional time due to unexpected issues.

---

### Another Exercise #4:

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**MITIGATING ACTION**

- **Complete Preliminary Flight Test**: 1 day, Mar 18 '19 - Mar 18 '19, 8SF+5 days, 86
# 1.4 Project Execution and Monitoring & Controlling

## 1.4.2 Risk Management

<table>
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</table>

- **Likelihood**: Identify risks sooner, rather than later.
- **Prioritize**: Focus more on high likelihood / high impact risks.

Sep 28 & Oct 1, 2018
1.4 Project Execution and Monitoring & Controlling
1.4.3 Negotiation and Conflict Resolution

Negotiation and Conflict Resolution

- Build the Team and Allocate Responsibilities
- Risk Management
- Respect cultural differences
- Identify all Stakeholders
- Organize communication system
- Launch the Project – Start positively
- Look for ways to use conflict constructively
- Negotiate effectively
- Adapt your Leadership style
1.4 Project Execution and Monitoring & Controlling
1.4.3 Negotiation and Conflict Resolution

Conflict is a process in which one party perceives that its interests are being opposed or negatively affected by another party.
A conflict that is being ignored or run away from acts like a catalyst for future project issues and unplanned roadblocks. This applies to both, personal and intergroup conflicts.

The Challenge of effective project management is to encourage healthy conflict and manage dysfunctional conflict.
1.4 Project Execution and Monitoring & Controlling
1.4.3 Negotiation and Conflict Resolution

Project Managers are constantly involved in negotiations, discussing scope, schedule, cost; discussing with project team members, upper management, Customers.

Prior to negotiations, always do your “homework”. Both parties should be satisfied, so future business does not suffer.

**Budget**

- **Department A**
- **Department B**

**Distributive negotiations** – a single issue is being discussed. One person or group gains at the expense of the other. Involves “win-lose” strategy.

**Integrative negotiations** – more than one issue is being discussed. An agreement can be reached to satisfy both parties. Involves “win-win” strategy.
CUSTOMER – SUPPLIER NEGOTIATIONS

An Aerospace Company is negotiating a sale of the product with Supplier A. Various aspects will be negotiated.

You will earn points depending on the outcome. Remember, think of your priorities. You have done very well if you get 13 points.

You will be playing either a role of an Aerospace Company or Supplier A.
1.5 PROJECT CLOSING
1.5 Project Closing

5 Project Management Process Groups

- Initiating Processes
- Planning Processes
- Executing Processes
- Monitoring & Controlling Processes
- Closing Processes
1.5 Project Closing – Learning Goals

At the end of this module you will understand:

- Why is it important to hold a formal project close out meeting
- Why do we publish lessons learned
- How do we know the project was successful
1.5 Project Closing

... is performed upon:
- Successful completion or
- Project cancelation

Main output:
- Project product, service or result

Milestones:
- Close-Out Meeting
- Contract Closures
- Lessons Learned

*Project Closing is the process of finalizing all activities across all of the project process groups to formally close the project or phase.*
1.5. Project Closing

Project Success Criteria

Discussion: What constitutes Project Success?
1.5. Project Closing
1.5.1 Project Success Criteria

Discussion: What constitutes Project Success?
1.5. Project Closing
Exercise #6 – Compare Success of 3 Project

It is the end of the quarter and three projects of high significance were closed in the last few months. Your team has been asked to select the best project.

Please review the results shown below and discuss with your team which project was the most successful and why.

<table>
<thead>
<tr>
<th>Project #</th>
<th>Project Name</th>
<th>Estimated Hours</th>
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<td>149</td>
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<tr>
<td>34567</td>
<td>New Product Option</td>
<td>150</td>
<td>141</td>
<td>94.0%</td>
</tr>
<tr>
<td>56789</td>
<td>Installation Improvement</td>
<td>135</td>
<td>171</td>
<td>126.7%</td>
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</table>
1.5 Project Closure
1.5.2 Lessons Learned

Lessons Learned Value:

- Incorporation of lessons learned into process assets
- Improvement of existing processes
- Building on existing successes
- Turning mistakes into future successes
1.5 Project Closure

1.5.2 Lessons Learned

Lessons Learned Value:

- Incorporation of LL into process assets
- Improvement of existing processes
- Building on existing successes
- Turning mistakes into future successes

When?

- Project completed
- Project cancelled
- Project phase completed
- Project handover to a different team
1.5.2 Example - Team Lessons Learned Workshop

Accomplishments:
- Exceptional team work
- Active communication
- Cross-team learning experience
- Transfer of knowledge
- Change in project learning culture
- Creation of ‘learning to learn’ cycle

Initiative to:
- Incorporate lessons into process assets
- Enrich existing processes
- Turn mistakes into successes
1.5 Project Closure
1.5.2 Project Handover to Next Year Students

**ONGOING PROJECT TASKS:** project management, meetings, website management, configuration management, design integration, technical papers, data management

- **The importance of standardization and housekeeping.**

Sep 28 & Oct 1, 2018
1.5.2 Lessons Learned - What Went Wrong?

- The Sampoong Department Store (삼풍백화점; 三豊百貨店) collapse was a structural failure that occurred on June 29, 1995 in the Seocho-gu district of Seoul, South Korea. The collapse is the largest peacetime disaster in South Korean history – 502 people died and 937 were injured.

1986: Design 4-storey residential apartment building

1987: Started construction of the Sampoong Department Store

Concrete columns were φ60cm instead of φ80cm; had 8 instead of 16 steel reinforcement bars

1989: Work completed.

1990: Sampoong Department Store opened.

1993: Due to noise complaints, A/C unit moved to the other side of the building


Contractor hired advised the structure would not support another floor.

A/C unit vibration radiated through cracks

When installing fire shields around the escalators, columns cut further, reducing the strength.

New Contractor hired that completed the work.
2. SUMMARY AND RECOMMENDATIONS
You should now have a basic understanding of:

- What is project management
- What are the roles of project manager
- What are project management process groups
- What are project management knowledge areas
- What are typical constraints on the project
- What are typical key roles on a project
- The importance of Monitoring and Controlling
- Communication management
- Risk management
- Negotiation and conflict resolution processes
- Lessons learned
2. SUMMARY AND RECOMMENDATIONS

PROJECT INITIATION

NOTE: This could apply to the phase initiation, as you are accepting the project from the previous project team.

Select your PM

Define and Agree:
• What is the purpose of the project?
• What is the product, service or result that we are trying to achieve?
• What is the project success criteria?

Create Project Organization Chart
2. SUMMARY AND RECOMMENDATIONS

PROJECT PLANNING

NOTE: This could apply to the phase planning, as you have accepted the project from the previous project team.

Answer your two questions:

1. WHAT?
2. HOW?

- Estimate Duration and Dependencies for your tasks
- Identify Significant Milestones

Prepare WBS

Prepare Schedule

Make sure your project information folder is organized and create a table of contents. Same applies to CAD data management.

Sep 28 & Oct 1, 2018
Don’t forget to enter major project milestones: i.e. major design reviews, report submissions, etc.
2. SUMMARY AND RECOMMENDATIONS

PROJECT EXECUTION, MONITORING & CONTROLLING

Project Execution Kick-Off
- Invite Sponsor and ask him to great the team, present the project background and express his confidence in the team
- Include the summary of project goal, any performance indicators and target figures
- Summarize milestones and identify associated deliverables
- Present any Risks and Opportunities identified so far
- Present the list of Stakeholders …

Adopt leadership styles, as required…
Dictatorial / Analytical / Opinion-Seeking / Democratic

Prepare Communication Plan:
- How often would you meet regularly
- What are your major design reviews
- Define high level project visibility
- Define working level communication
- Have action item register
- Record and publish meeting minutes
- Communicate effectively → always seek feedback

Identify and manage your risks early:
- Create and maintain risk register: ID, Description, Impact, Likelihood, Mitigation Plan, Risk Owner, Status
- Focus on high impact / high likelihood risks

Negotiate effectively and resolve conflicts
- Encourage healthy conflicts and manage dysfunctional conflicts
- Come prepared for negotiations
### EXAMPLE – RISK REGISTER TEMPLATE

<table>
<thead>
<tr>
<th>No</th>
<th>Risk Health</th>
<th>Description</th>
<th>Likelihood</th>
<th>Impact</th>
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- Identify risks sooner, rather than later.
- Prioritize - Focus more on high likelihood / high impact risks.
**EXAMPLE – ACTION ITEM REGISTER TEMPLATE**

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</tr>
</tbody>
</table>

- Don’t forget to keep closed items. You can have a separate tab in excel spreadsheet. History.
- You can rotate who updates the register.
- Date your discussions / actions.
- Start your actions always with the verb.
2. SUMMARY AND RECOMMENDATIONS

PROJECT CLOSURE

NOTE: This could apply to the phase closing, as you are passing the project over to the next year project team.

Prepare for closeout meeting:
- Status the project scope, schedule and cost
- Have you met your purpose, produced your product and met your project success criteria?
- If you are handing over the project:
  - Prepare checklists for project handover
  - Inform where project information is stored

Conduct Lessons Learned meeting

What went well? What can be improved? What were the obstacles?
2. SUMMARY AND RECOMMENDATIONS

ENJOY THE PROJECT...

... AND NEVER FORGET
3. QUESTIONS
3. Questions
4. APPENDIX
4. Appendix

Some MS Project Hints - Planning

1. Set up the Project Calendar
4. Appendix
Some MS Project Hints - Planning

2. Set up the Project Information, choose project start date and Calendar
4. Appendix

Some MS Project Hints - Planning

3. In File / Options change tasks to Auto Scheduled and Fixed Duration
4. Appendix

Some MS Project Hints - Planning

4. Enter your Tasks from WBS. Use Intent Icons to move Subtasks.
4. Appendix
Some MS Project Hints - Planning

5. Set up Durations and Milestone Constraints.

Right click in this area and select “Show Split”
4. Appendix

**Some MS Project Hints - Planning**

6. Set up Durations and Milestone Constraints. Milestone has duration zero.

Work one task at the time adding the duration. Milestones have zero duration.
4. Appendix
Some MS Project Hints - Planning

7. Set up Durations and Milestone Constraints. Milestone has duration zero.

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4. Appendix
Some MS Project Hints - Planning

8. Set up Durations and Milestone Constraints. Milestone has duration zero.

<table>
<thead>
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<td>Sep 03 '18</td>
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</tr>
</tbody>
</table>

Double click on number corresponding to milestone. Go to Advanced Tab. Set up by which date you should complete this milestone.

Under Notes tab, you can add additional information related to a particular task. That could be your WBS Dictionary.
4. Appendix
Some MS Project Hints - Planning

9. Set up your Resource Sheet

The hints provided in the Appendix are basic. In this example we are not scheduling tasks based resource loading and work hours requested, we are estimating duration in days.

If this was not the case, the duration would not be entered (see steps 5 – 7). We would enter the number of hours required for the task. Based on number of hours required and percentage available, MS project would calculate the duration.

**Example:** 8 hour task done by 20% available resource would take 5 days, as each day resource would work on the task 1.6 hours.
4. Appendix
Some MS Project Hints - Planning

10. Example – if not using estimating by Duration

If estimating duration based on hours required to complete the task, in your split view:

- Change task type from Fixed Duration to Fixed Work
- Select resource
- Add work / effort required to complete the task
- Then click OK
4. Appendix
Some MS Project Hints - Planning

11. Assigned Resources

<table>
<thead>
<tr>
<th>Task Name</th>
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<th>Finish</th>
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<tr>
<td>Task 11</td>
<td>1 day</td>
<td>Sep 03 '18</td>
<td>Sep 03 '18</td>
<td>Bernd[20%]</td>
<td></td>
</tr>
<tr>
<td>Milestone</td>
<td>0 days</td>
<td>Nov 30 '18</td>
<td>Nov 30 '18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>End of the Project</td>
<td>0 days</td>
<td>Dec 07 '18</td>
<td>Dec 07 '18</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Resources are assigned, and all Red, as MS Project thinks all tasks are done at the same time. We need to set up task dependencies.
4. Appendix
Some MS Project Hints - Planning

12. Set up the dependencies: FS (finish-start), SS (start-start), FF (finish-finish). SF (start-finish) is not used that often.

Resources are no more red.
If you have extra time between the last task and the milestone for a chapter, you can add some lag on the tasks. Double-click on the dependency lines to adjust.

Double-click on 103 for Task 1 and go to Predecessors tab.
4. Appendix

Some MS Project Hints - Planning

13. Add lag.

Double-click on the dependency lines to add lag or double-click on the task line item number and go to Predecessor tab.
4. Appendix

Some MS Project Hints – Execution, Monit. & Controlling

14. Once you are happy with your schedule, save the baseline.
4. Appendix
Some MS Project Hints – Execution, Monit. & Controlling

14. Insert column “% Complete”, update weekly and monitor your schedule adherence.

If you have to reschedule tasks, you can re-baseline the schedule.

**Note:** In this simple example, the task dependences are FS and it continue like this. That is why there is no critical path, as there is only one path. In case that you have a critical path, the tasks on the critical path will turn red (see next slide). Pay special attention to those tasks, so they don’t get late.
4. Appendix

Some MS Project Hints – Execution, Monit. & Controlling

15. Example Showing Critical Path

Make sure you are in Tracking Gantt View (change in the drop-down beside Gantt Chart icon). In case that you have a critical path, the tasks on the critical path will turn red. Pay special attention to those tasks, so they don’t get late.