Project Controls EXPO

Introduction to Planning & Scheduling

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About the Author

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Anil Godhawale is Director of ProjCon Consultants and Founder of ProjectControlsOnline.com. Anil has over 14 years of international field and home office experience in Project Planning & Scheduling, Cost Engineering, EVA, Risk and Delay Claims Analysis with project values ranging from $10M to $1.5B. Anil has a strong Project Controls background & has worked in all phases of projects in various sectors that includes Petroleum & Chemicals, LNG regasification & liquefaction facilities, CCU's (Carbon Capture Units), Power Projects and Pipelines.

Anil is also very active with industry professional associations as fellow at ACostE, UK and member of AACEi, USA since last decade. He also contributed to CIOB, UK as member of TDWG to develop guidelines for accreditation in Time Management. Anil also holds distinguished Project Controls Certifications CCE & PSP from AACEI, USA and is a registered member (IEng) of Engineering Council UK. Find out more about Anil and his contribution to industry by visiting www.linkedin.com/in/godhawale

Question...

What is the difference between planning and scheduling?

What is Planning...

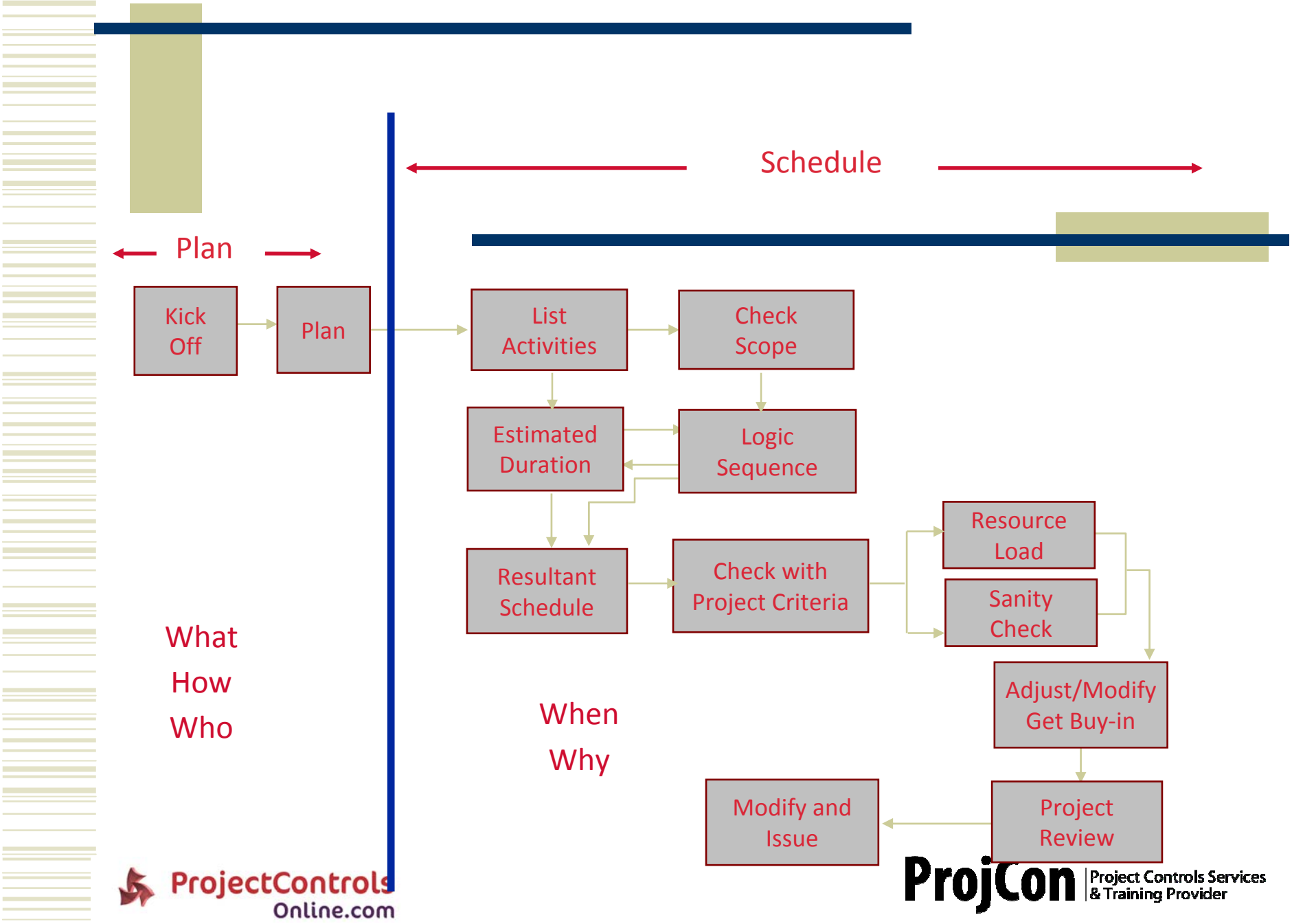
- Making decisions with the objective of influencing the future:
  - What tasks will be performed?
  - How tasks will be performed?
  - Who will perform the tasks?

What is Scheduling....

- Determination of timing of events in the Project:
  - When tasks will be performed
  - In what sequence the tasks will be performed?
  - Reflection of plan

Food for thought..

If PLANNING is an Art form based on Experience and knowledge then, SCHEDULING is a Systematic exercise in using applied Logic.


Schedule
Plan
Kick Off
Plan
List Activities
Check Scope
Estimated Duration
Logic Sequence
Resultant Schedule
Check with Project Criteria
Resource Load
Sanity Check
Adjust/Modify Get Buy-in
Project Review
Modify and Issue
What
How
Who
When
Why
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Project Controls Principles

Planning

Level of Detail Essential for Planning

- Sufficient to communicate the method of work execution.
- Do not duplicate level of detail contained in supporting documents.
- Expanded level of detail in potential problem areas.

Planning - Top down or bottom up?

- Top-down is the most logical way of thinking about a project and is usually the best approach to new endeavours. It provides an early high-level plan, including initial costs and timings, which can be used in the project's definition and benefit case.
- Bottom-up planning makes sense where we already have a good example of a successful similar project plan to base the new project on. A majority of projects will be similar to something that has been done before and it makes sense to use that as a starting point (assuming it was of good quality). As well as saving time in the planning process, this allows us to learn lessons from the previous experiences. In particular, estimates can often be extrapolated from the previous projects.

Components/Elements of Plan

- Scope of Work ..... Work Breakdown Structure
- Method of Execution ..... Project Execution Plan
- Project Budget ..... Usage of Resources
- Time Objectives ..... Project Milestones

Requirements for building a Plan

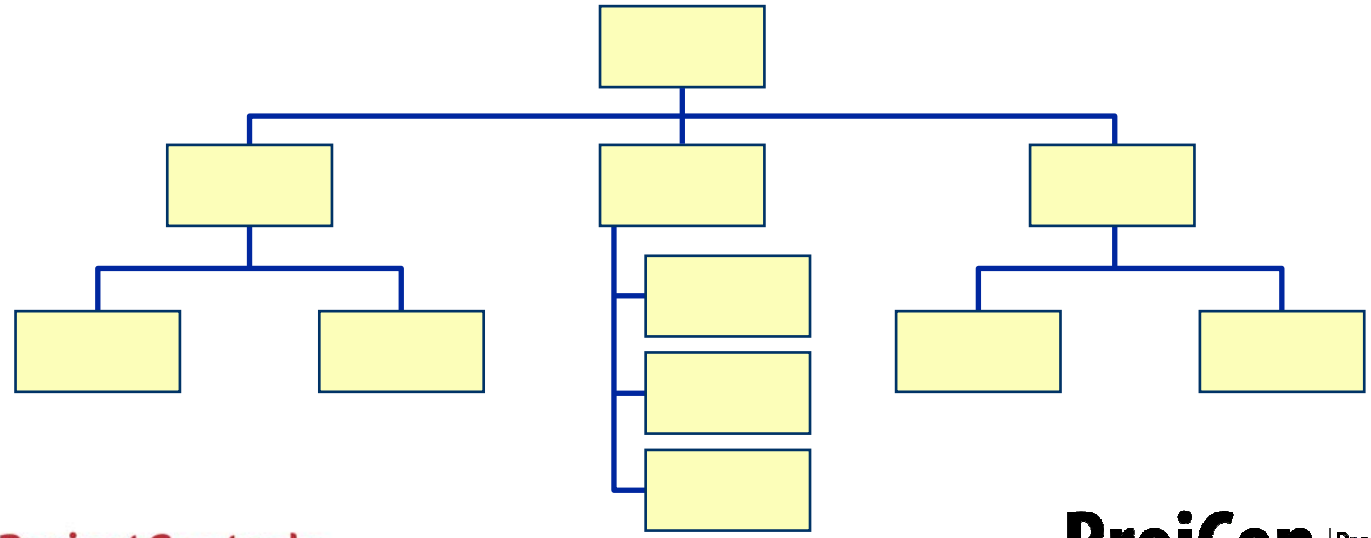
- Scope Definition
- Execution strategy
- Identifying / Defining the activities & milestones necessary
- Be Creative
- Be Flexible
- Level of detail
- Discipline integration

Questions the Scheduler Asks

- What tasks will be performed? (Scope)
- How will the tasks be performed? (Execution Plan)
- What is the sequence in which the tasks will be performed? (Execution Plan & Resources)
- Who will perform the tasks? (Resources & Execution Plan)
- Where is the equipment list, is there any exotic material used? (Scope & Execution Plan)
- How many s/c's do we plan to use? (Execution Plan & Resources)
- What Permits are required and who is responsible for them? (Scope & Execution Plan)
- Where is the Project to be executed? (Scope, Execution Plan & Resources)

Planning Term: WBS

A WBS (Work Breakdown Structure) is the top down logical structuring of project work that defines and displays all of the work to be performed in accomplishing the project objectives.



Importance of WBS

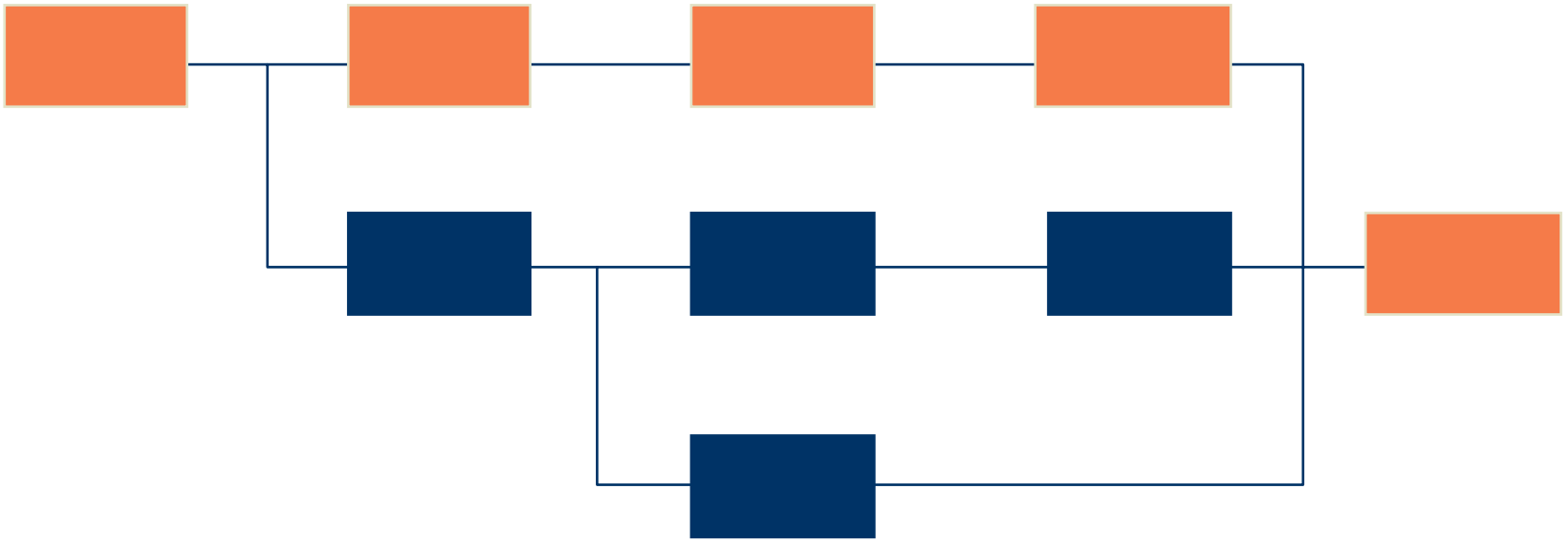
- Avoids omission of key project activities through a systematic planning process.
- Removes the complexity of the project by dividing it into manageable units.
- Provides a framework for...
  - Defining specific tasks within a project from which schedules can be developed
  - Linking activities with resources
  - Facilitating communication
  - Integrating project plans (schedule, resources, cost)

Key Terms : Network Diagram

Network Diagram :

A graphic display of schedule activities and predecessors which aid project planning by showing the logical relationships of activities, one to another. It forces the user to define and plan the work in detail from start to finish. Permits early identification of potential problems. Reveals how much the responsible supervisor understands about the project and discloses how much the scheduler understands about the process.

Network Diagram. Contd..



Project Controls Principles

Scheduling

Importance of Schedule

- Depicts the Scope of work
- Improves the probability for the project team to meet its goals.
- Establishes overall schedule parameters.
- Aids in determining staffing requirements.
- Resource loading basis.
- Identifies long lead items.
- Act as Communication tool
- Identifies Phases of Project i.e., E, P, C

Scheduling Terms

Activity :

The Basic element into which a project is subdivided for scheduling a network.

- Has a definable start and finish
- Consumes time (Exclusion is milestones and hammocks)
- Is assignable
- Consumes resources
- Is measurable
- Is defined by a Work Package for Engineering
- Is a Physical Task for Construction

Scheduling Terms

Work Package :

A group or number of Engineering Deliverables that will enable Procurement or Construction to accomplish a meaningful task.

- i.e. All of the Data Sheets & Specifications required for a Purchase Order.
- i.e. All of the Drawings & Details necessary to Locate, Excavate, Form and Pour a Foundation

Scheduling Terms

Milestone :

Is a GOAL to be achieved.

- Can be either a Start or Finish Achievement
- Is a single point in Time
- Has no duration
- Has no resources
- Has a specific and unique Definition
- It is either YES or NO

Scheduling Terms

Predecessor & Successor:

- **Predecessor** :

  An activity that must occur before another activity.

  A predecessor activity controls the start or finish date of its successor (s). An activity can have multiple predecessors, each with a different relationship to it.

- **Successor** :

  An activity that must occur after the start or finish of predecessor activity.

  An activity can have multiple successors, each with a different relationship to it.

Scheduling Terms

Relationships (Logic):

There are four types of Relationships:

Finish to Start - FS - A relationship in which the predecessor activity must Finish before its successor activity can Start.

Start to Start - SS - A relationship in which the Start of the predecessor activity controls the Start of a successor activity.

Finish to Finish - FF - A relationship in which the Finish of a successor activity depends on the Finish of its predecessor activity.

Start to Finish - SF - A relationship in which the Start of the predecessor activity controls the Finish of a successor activity

Scheduling Terms

Lag :

An offset or delay from an activity to its successor. Lag can be positive or negative.

Total Float:

The amount of time the start or finish of an activity can be delayed without affecting the project finish date. Please note TF can also drive toward an intermediate milestone, not just project completion so if there is a delay in intermediate milestone, it does not mean project is delayed.

Free Float:

The amount of time than that the early start/finish of an activity can be delayed without delaying the early start/finish of a successor activity.

Scheduling Terms

Critical Path:

- One or more continuous chains of zero or negative float activities running from the start event to the finish event in the schedule. This does not mean project can never be ahead of schedule and show positive TF.

-The sequence of activities that must be completed on schedule for the entire project to be completed on schedule. Theoretically, this is the longest duration path through the work-plan. If an activity on the critical path is delayed by one day, then entire project will be delayed by one day (unless another activity on the critical path can be accelerated by one day). Please note critical path may not be the longest path, if the schedule contains more than one or two start constraints. In such scenario, least float can be considered.

- Any activity on the critical path is called a Critical Activity.

Common Scheduling failures

1. Lack of buy-in by all project team members
2. Lack of PLANNING
3. Poorly defined activities
4. Inappropriate scheduling detail
5. Inadequate or inappropriate logic ties
6. Poor duration estimating
7. Lack of information
8. Failure to disseminate the proper information to all parties
9. Lack of Sufficient Funding
10. Lack of adequate consideration of resources, and work conditions

Hierarchy of Schedules

- Milestone Summary Schedule – Level 1
- Project Intermediate Schedules – Level 2
- Details – Level 3/4

Level 1 - Milestone Summary Schedule

- Level 1 is the first schedule produced to give a overall picture in summarized format.
- Independently produced; not electronic roll up
- Comprises a select mix of activities and WBS levels
- Used to depict overall plan for execution of the Project and highlight significant or critical events

Level 2 - Intermediate Schedule

- **Engineering**
  - Summarized by Discipline
  - Depicts overall timeframes
- **Procurement**
  - Highlights ‘long lead’ items
  - Critical items
  - ‘Bulk’ procurement
- **Construction/Installation/Cutover**
  - Summarized by discipline grouped by area
  - Depicts overall timeframes

Level 3 - EPC Schedule

ENGINEERING - Sorts by: WBS

- Discipline / Craft
- Facility/Area/Work and/or Grouped by Systems
- Depicts Facility/Area Relationships and Time frames
- Depicts system requirements

PROCUREMENT

- Identifies Demands by Facility/Area or Systems
- Identifies Major Equipment Delivery by Tag number

CONSTRUCTION/ STARTUP

- Facility/Area and/or Grouped by Systems
- Depicts Area Relationships and Time frames

Level 4 – Working Schedules

- ENGINEERING –
  Broken down by discipline and work activity (Drawing, Spec., Data Sheet, etc).

- PROCUREMENT –
  Identifies Equipment & bulk releases along with Vendor drawing deliverables by purchase order.

- CONSTRUCTION –
  Depicts Construction by Work Package/Area/Facility/ Craft/Crew. Establishes Construction Sequence

CPM (Critical Path Method) Scheduling

Definition of CPM :

The calculation of the earliest and latest start and finish dates of activities based on their durations and relationships to other activities.

CPM Calculation

- Early dates indicate the earliest start and finish dates when an activity can be performed if all preceding activities have been completed (Forward Pass).
- Late start and finish dates are the latest dates an activity can be performed without delaying the project (Backward Pass).
- A computer is suited to handle the numerous calculations of a forward pass and backward pass.

Overview of Total Float

- Total Float identifies the extent to which any activity can be delayed without negatively impacting downstream deadlines. Please note float could be positive as well.
- Negative Float : Amount of time that the start or finish of any activity exceeds the time allowed.
- NOTE: Total Float is determined during Critical Path Analysis (CPA) and it is not a “product” of CPA.

Float Types

- Total Float : Amount of time an activity can exceed its early finish date without affecting the project end date or other imposed dates.
- Free Float : Amount of time by which an activity can delay its early start or early finish date without affecting the early start or early finish date of any successor.

Float Responsibility

- Float is owned by the Project - According to FIDIC conditions of contract, the contractor develop the contract schedule but there is a liberty to the client to accept or reject it and ask the contractor to amend accordingly.
- Once the Baseline Schedule is accepted by the Owner, then it becomes contractually binding on both parties.
- The float on any activity is not there exclusively for the people on that activity to use. It is to be shared by all activities along the same path … before and after.
- Said differently, Float on an activity does not confer any right to delay an activity – to dip into the float.

Disadvantages of displaying total float

- End user may delay start of activity thinking there is slack time
- May cause false sense of security
- Once used as an activity -- it's gone … for all parties
- Assumes CPM is complete with correct logic

Disadvantages of NOT displaying total float

- End user may work on low priority items
- Too much emphasis on non-critical activities
- May consume resources on non-critical activities
- Precludes line supervisor's opportunity to efficiently manage the work

Questions & Additional info

Thanks for attending this session on Planning & Scheduling.

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You can also find all our modules in elearning (video) format at **www.ProjectControlsOnline.com**

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