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ENGINEERING MANAGEMENT

(GE 404)

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LECTURE #3

Project Life Cycle and Time Management Process

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Objectives of the Present lecture

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- *To provide an overview of the Project life cycle*
- *To discuss Work Breakdown Structure (WBS)*
- *To give an overview of Time Management Process*

Project Management and Project Participants

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- **Project management** is the discipline of managing a series of tasks within a given amount of time and within a budget
- Project participants consist of all the individuals entities who either:
 - *Work on the project directly*, such as team members, consultants, contractors, and the sub-contractors
 - *Influence the project directly*, such as the internal project stakeholders (including functional managers and executives), the project sponsor, and the customer/client
- Usually, the project participants are all listed in the project management hierarchy of the project.

Project Management Hierarchy

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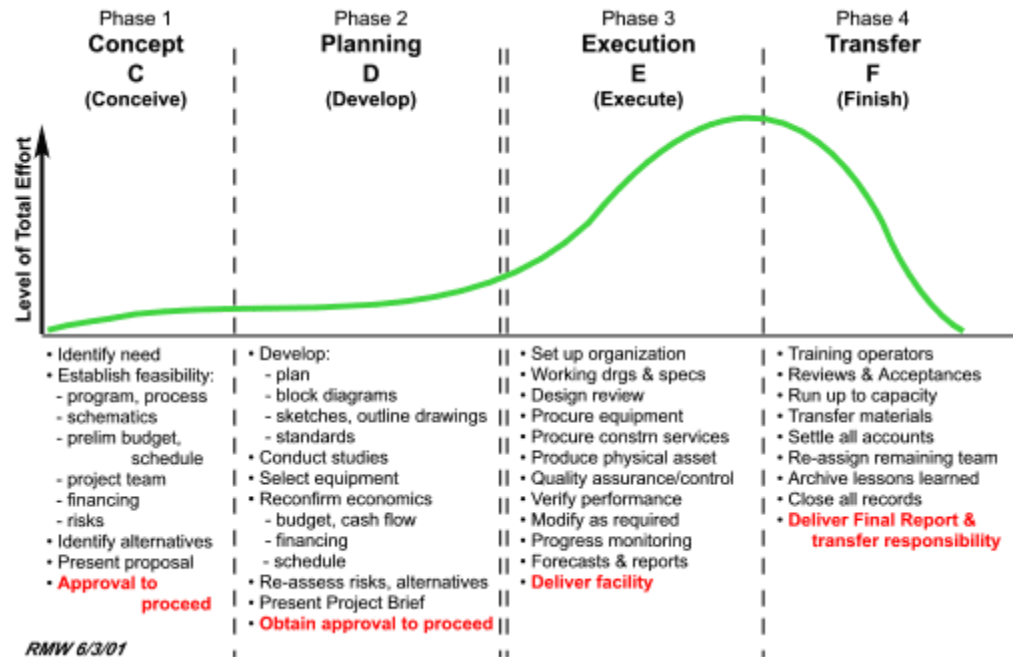
- A project management hierarchy is the **hierarchy of roles in a project** (based on leadership).
- By looking at the project management hierarchy, one can understand **who reports to who** and **who has authority (implied or explicit) over who** in the project.
- For example, here's the project management hierarchy in an web project:
Project Owner
Project Sponsor
 Project Manager
 Team Leader
 Database Architect
 Programmer
 Designer
 HTML Developer
- In the above example, we understand that the HTML Developer reports to the team leader, who in turn reports to the project manager, and who finally reports to the project sponsor and the project owner.
- There is no standard/generic project management hierarchy, but PM hierarchies for the same industry are very similar.

Project Life Cycle

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The project life cycle consists of four phases:

- **Phase 1: Initiation/Concept**
- **Phase 2: Planning**
- **Phase 3: Execution** (including monitoring and controlling)
- **Phase 4: Transfer/Closure**



Two Common Views of Project Life Cycle (the second one even include Monitor & Control as a stage)

Initiation Phase

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- The Initiation phase begins by defining the
 - Scope, purpose, objectives, resources, deliverables, timescales and structure of the project.
- The next step is to develop a *Business Case*, including several possible solutions and a cost/benefit analysis for each.
- A *Feasibility Study* should then be carried out to ensure that the chosen solution is feasible and has an acceptable level of risk.
- The next step is to define the *Terms of Reference*, followed by the appointment of the *Project team*.
- The final step is to carry out *Phase Review* before seeking approval to proceed.

Planning Phase

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- Planning is the process of thinking systematically about the future in order to decide what our goals are, and how we are going to achieve them.
- Thus planning involves making preparations, and deciding the best course of action for a project.
- The first step of the Planning phase is the creation of a detailed *Project Plan* which the project manager will refer throughout the project to monitor and control time, cost and quality.
- The project manager will then create the following plans:
 - **Resource Plan:** to identify the staffing, equipment and materials needed
 - **Financial Plan:** to quantify the financial expenditure required
 - **Quality Plan:** to set quality targets and specify Quality Control methods
 - **Risk Plan:** to identify risks and plan actions needed to minimise them
 - **Acceptance Plan:** to specify criteria for accepting deliverables
- Finally, a Phase Review is carried out to approve the start of the Project Execution phase.

Execution Phase

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- During the Project Execution phase the project team produces the deliverables while the project manager monitors and controls the project delivery by undertaking:
 - **Time Management:** tracking and recording time spent on tasks against the Project Plan
 - **Cost Management:** identifying and recording costs against the project budget
 - **Quality Management:** reviewing the quality of the deliverables and management processes
 - **Change Management:** reviewing and implementing requests for changes to the project
 - **Risk Management:** assessing the level of project risk and taking action to minimize it
 - **Issue Management:** identifying and resolving project issues
 - **Acceptance Management:** identifying the completion of deliverables and gaining the customers acceptance
 - **Communications Management:** keeping stakeholders informed of project progress, risks and issues

Closure Phase

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- Once the customer has accepted the deliverables and a Phase Review has been carried out to determine whether the project objectives have been achieved, the project is ready for **Closure**.
- A **Project Closure Report** should list all of the actions required.
- When this has been approved, the listed actions are completed to release project resources, hand over deliverables, and inform all stakeholders that the project is now closed.

Evaluation

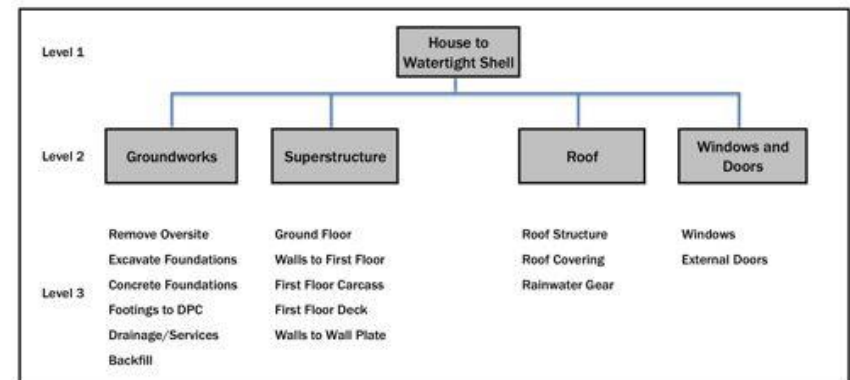
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- Shortly after the project has been closed, an **Evaluation** (also known as a **Post-Implementation Review**) should be carried out to determine the project's overall success and find out whether the benefits stated in the original Business Case were actually realised.
- Any lessons learned should be documented for future projects.

Work Breakdown Structure (WBS)

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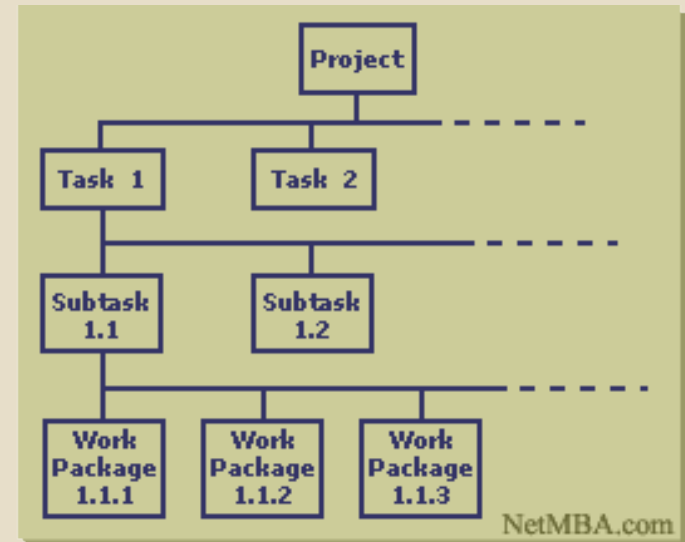
1. The Project Management Body of Knowledge (PMBOK) defines the work breakdown structure as *A deliverable oriented hierarchical decomposition of the work to be executed by the project team.*
2. The work breakdown structure visually defines the scope into manageable chunks that a project team can understand.
3. Figure shows a sample WBS with three levels defined.



WBS (Contd.)

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- A work breakdown structure starts with the project as the top level deliverable and is further decomposed into sub-deliverables
- The top level thus represents the **final deliverable** or project
- The sub-deliverables are further decomposed to the specific work packages required to produce the sub-deliverable.
- The work package represents the list of tasks or "to-dos" to produce the specific unit of work.



Definition of Activity and Event

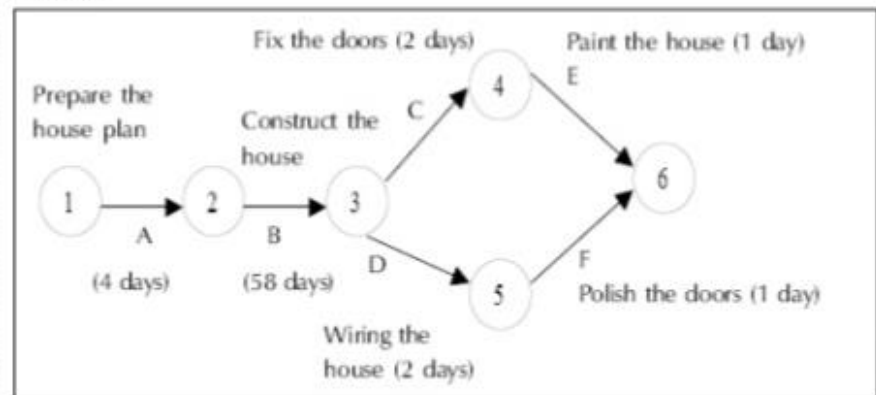
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- *Activity* is a single work step (element) that has a recognizable beginning and end and requires time and resource for its accomplishment.
- An *Event* marks the point in time when an activity completes.

Sequence of Activities for House construction project (Network diagram)

Name of the activity	Starting and finishing event	Description of activity	Predecessor	Time duration (days)
A	(1,2)	Prepare the house plan	--	4
B	(2,3)	Construct the house	A	58
C	(3,4)	Fix the door / windows	B	2
D	(3,5)	Wiring the house	B	2
E	(4,6)	Paint the house	C	1
F	(5,6)	Polish the doors / windows	D	1

Solution:



Note: Activity is often used as an alternative term for task.

Time Management Process

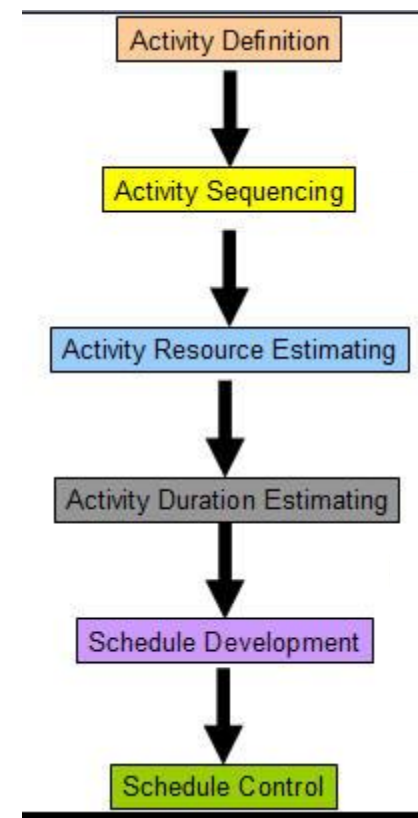
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- Time is the most valuable resource in a project.
- Every delivery that you are supposed to make is time-bound. Therefore, without proper time management, a project can head towards a disaster.
- Scheduling is the easiest way of managing project time.
- In this approach, the activities of the project are estimated and the durations are determined based on the resource utilization for each activity.
- Cost always plays a vital role in time management. This is due to the fact that schedule over-runs are quite expensive.

Steps of the Time Management Process

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- Time management is a key responsibility of a project manager. Following are the main steps in the project time management process:
 1. Defining Activities
 2. Sequencing Activities
 3. Resource Estimating for Activities
 4. Duration and Effort Estimation
 5. Development of the Schedule
 6. Schedule Control



Defining Activities

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- First of all, the high-level requirements are broken down into high-level tasks or deliverables.
- Then the high-level tasks/deliverables are broken down into activities and presented in the form of WBS (Work Breakdown Structure).

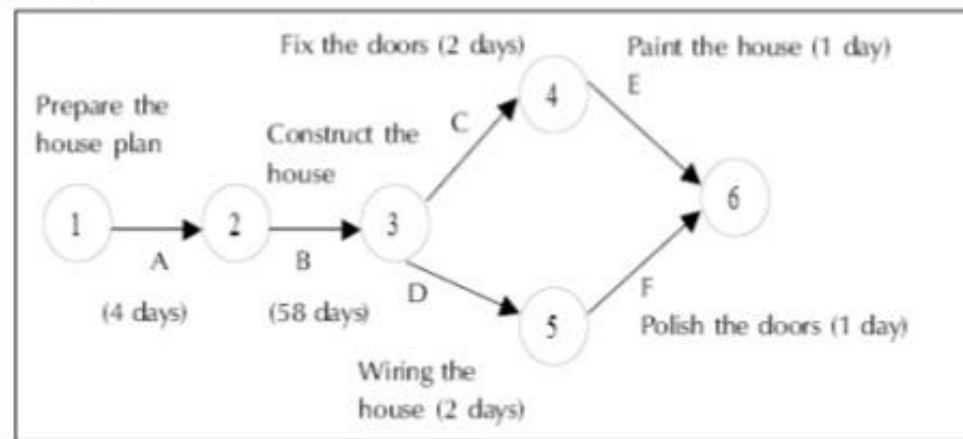
Sequencing Activities

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- The activities identified in the previous step should be sequenced based on the execution order.
- When sequencing, the activity interdependencies should be considered.

Name of the activity	Starting and finishing event	Description of activity	Predecessor	Time duration (days)
A	(1,2)	Prepare the house plan	--	4
B	(2,3)	Construct the house	A	58
C	(3,4)	Fix the door / windows	B	2
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Solution:



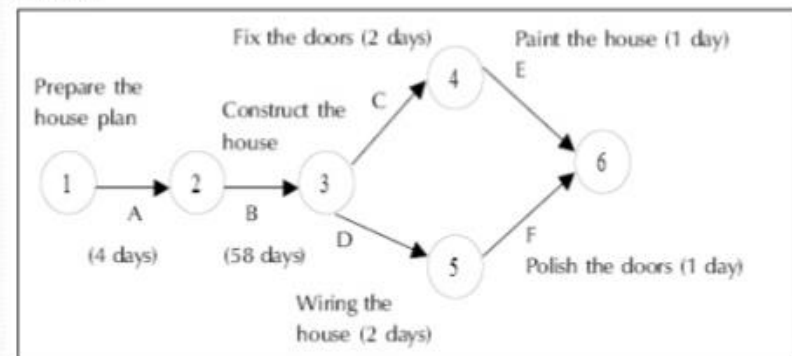
Resource Estimating for Activities

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- The estimation of amount and the types of resources required for activities is done in this step.

Name of the activity	Starting and finishing event	Description of activity	Predecessor	Time duration (days)
A	(1,2)	Prepare the house plan	--	4
B	(2,3)	Construct the house	A	58
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Solution:



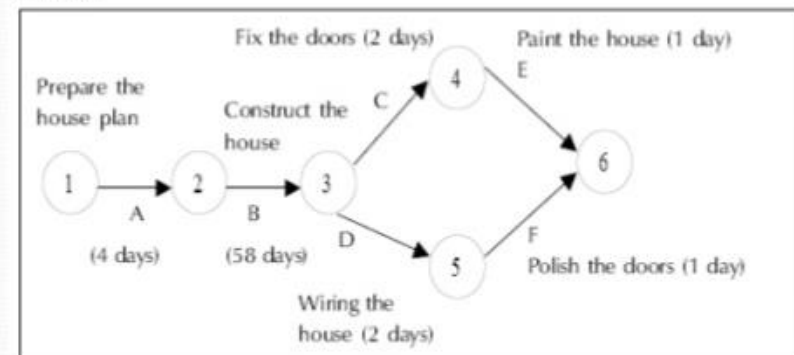
Duration and Effort Estimation

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- This is one of the key steps in the project planning process. Since estimates are all about the time (duration), this step should be completed with a higher accuracy.
- Once the activity estimates are completed, critical path of the project should be identified in order to determine the total project duration. This is one of the key inputs for the project time management.

Name of the activity	Starting and finishing event	Description of activity	Predecessor	Time duration (days)
A	(1,2)	Prepare the house plan	--	4
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Solution:



Development of the Schedule

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- Activity sequence, duration of each activity and the resource requirements/allocation for each activity are the most important factors.
- In case if you perform this step manually, you may end up wasting a lot of valuable project planning time. There are many software packages, such as Microsoft Project, that will assist you to develop reliable and accurate project schedule.
- As part of the schedule, you will develop a Gantt chart in order to visually monitor the activities and the milestones.

An Example of a Construction Schedule

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Anderson Homes & Renos												
6.1 Month - Construction Schedule - With Site Work - Daily Job Log												
JOB Address:	116 Franklin Drive SE				Page 1 of 2		Main Flr:	868	JOB #:	101001		
Primary Contact:					Ext:	2 Storey:		1,080	Model:	Manchester		
Current Address:	Calgary, AB				Bus:	3 Storey:			Sale Type:	Pre-Sale		
Email Address:					Cell:	Tot SqFt:		1,948	House Type:	2-Storey		
Legal Address:	START DATE From Previous	Lot: 1	Block: 2	Plan: 3	Home:	Garage:		461	Spec:	Platinum Specifications 2010		
					Phase: 4	Base Dev SqFt:		734	Permit #:			
SCOPE OF WORK	PH - FX - EMAIL	START DATE	COMP DATE	COMPANY NAMES	SCOPE OF WORK	EST. DATE	PH - FX - EMAIL	START DATE	COMP DATE	COMPANY NAMES		
Job Start Date →	9-Sep-12	Prtl Permit Date		← FULL Building Permit Date	Overhead Garage Door	25-Oct-12				Ultra-Lite Overhead Doors Ltd.		
Initial Lot Inspection	9-Sep-12			Paint Water/Curb Stop & Send in Inspec FORM to	* Fireplace Install	25-Oct-12				Diamond Fireplace Distributors		
Survey / Stake	12-Sep-12			SexSmith Surveys Ltd.	Rough-In Plumbing	26-Oct-12				Canyon Plumbing & Heating.		
Excavation - Utilities 1st Call	17-Sep-12			Blue Ridge Excavating	_3 Pc R/I Base _Soaker _Jetted _Shwr Stall _Steam Shower _Wine Frge _SumpPump							
U.G. Plumbing Trench	18-Sep-12			Canyon Plumbing & Heating.	City-Footings & Pads & Plumb R/I	30-Oct-12				When Inspection Passes - Prep Basement With		
Pack Sewer Trench	18-Sep-12			Blue Ridge Excavating	Rough-In Heating	30-Oct-12				Alberta Mountain Air		
Soil Bearing	19-Sep-12			McIntosh Lalani Engineering Ltd	Interior Gas Line Install	2-Nov-12				Canyon Plumbing & Heating.		
Ladder Package	20-Sep-12			Totem Building Supplies Ltd.	_BBQ _Range _Dryer _Garage							
Footings - Form & Pour	21-Sep-12			J.T. Cribbing	Rough-In Electrical	5-Nov-12				L. McLellan (2003) Holdings		
*Footings - Elevation Check - If	24-Sep-12			SexSmith Surveys Ltd.	_Sound _Garb _110 Gas Range _H/F Interlock _EZ Heat Flr							
Foundation Walls - Form & Pour	27-Sep-12			_ 8' or _ 9'	R/I Phone / Cable	7-Nov-12				L. McLellan (2003) Holdings		

Schedule Control

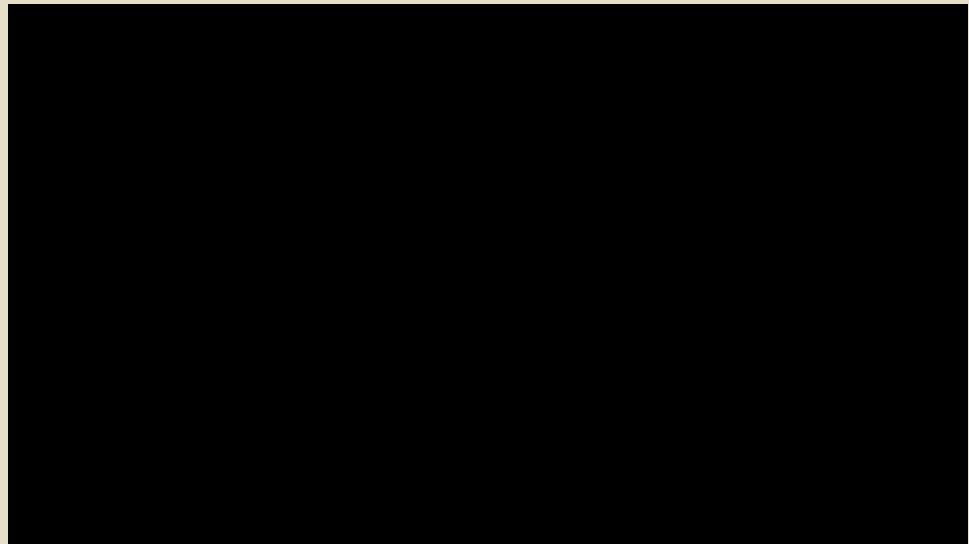
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- No project in the practical world can be executed without changes to the original schedule.
- Therefore, it is essential to update the project schedule with ongoing changes.

Work Breakdown Structure Video

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This video demonstrates
how to create WBS using
MindView software



Further Reading

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- Wysocki, R K, *Effective Project Management*, Wiley
- Heerkens, G R, *Project Management*, McGraw-Hill

Thank You

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Questions Please

