

PM *(Project Management)*

*International Campus – Kish
Sharif University of Technology*

Session#10



Course Description

▪ *Instructor*

- *Omid Fatahi Valilai, Ph.D. Industrial Engineering Department, Sharif University of Technology*
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- *Web site: <http://sharif.edu/~fvalilai>*

▪ *Class time*

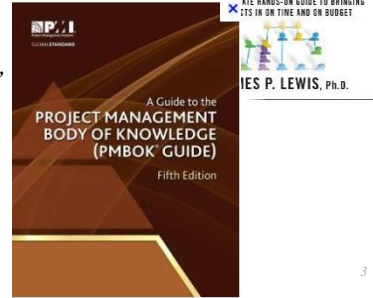
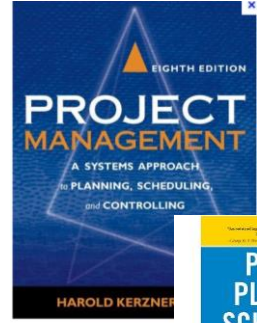
- *Thursday* *09:30~12:30-13:00~16:00- 16:30~19:30*

▪ *Course evaluation*

- *Mid-term* *(30%)*
- *Final exam* *(40%)*
- *Quiz* *(10%)*
- *Exercise* *(20%)*

Course Description (Continued ...)

- **Mid-term session:**
 - 23rd, Aban 1392
- **Reference:**
 - Kerzner, H., “Project Management—A Systems Approach to Planning, Scheduling, and Controlling, Eighth Edition”, 2003, John Wiley & Sons, Inc.
 - Lewis, James P.; “Project planning, scheduling, and Control a hands-on guide to bringing projects in on time and on budget”, 2001, McGraw-Hill
 - Project Management Institute; “A Guide to the Project; Management Body of Knowledge”, 5th edition, 2013, Project Management Institute, Inc.



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Course Description (Continued...)

Course Calendar:

| | | 1,2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|--------|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| | | W1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Mo | Tu | We | Th | Fr | Sa | Su | Mo | Tu | We | Th | Fr | Sa | Su | Mo | Tu | We | Th | Fr | Sa | Su | Mo | Tu | We | Th | Fr | Sa | Su | Mo | Tu |
| مهر | 9 Sep | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| مهر | 10 Oct | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| | | 3,4,5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | W2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| آبان | 10 Oct | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| آبان | 11 Nov | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| | | 6,7,8 | | | | | | | | | | | | | | 9,10,11 | | | | | | | | | | | | | | | |
| | | W3 | | | | | | | | | | | | | | W4 | | | | | | | | | | | | | | | |
| آذر | 11 Nov | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| آذر | 12 Dec | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| | | 12,13,14 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | W5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| دی | 12 Dec | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| دی | 13 Jan | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |

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Course Description (Continued..)

- *Contents:*
 - *Chapter 1 - Overview*
 - *Chapter 2 - Project Management Growth—Concepts and Definitions*
 - *Chapter 3 - Organizational Structures*
 - *Chapter 4 - Organizing and Staffing the Project Office and Team*
 - *Chapter 5 - Management Functions*
 - *Chapter 6 - Time Management and Stress*
 - *Chapter 7 - Conflicts*
 - *Chapter 8 - Special Topics*
 - *Chapter 9 - The Variables for Success*
 - *Chapter 10 - Working with Executives*
 - *Chapter 11 - Planning*

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Course Description (Continued..)

- *Contents:*
 - *Chapter 12 - Network Scheduling*
 - *Chapter 13 - Project Graphics*
 - *Chapter 14 - Pricing and Estimating*
 - *Chapter 15 - Cost Control*
 - *Chapter 16 - Trade-off Analysis in a Project Environment*
 - *Chapter 17 - Risk Management*
 - *Chapter 18 - Learning Curves*
 - *Chapter 19 - Modern Developments in Project Management*
 - *Chapter 20 - Quality Management*
 - *Chapter 21 - Contracts and Procurement*
 - *Chapter 22 - Critical Chain Project Management*

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Chapter 11 - Planning

▪ Introduction

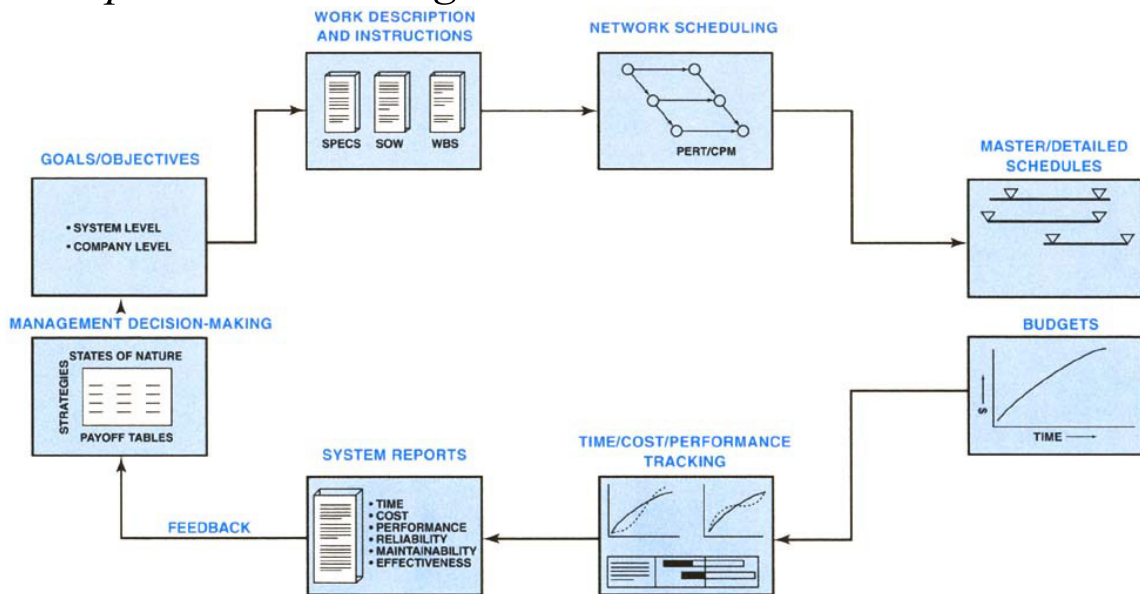
- *The most important responsibilities of a project manager are planning, integrating, and executing plans*
- *Planning, in general, can best be described as the function of selecting the enterprise objectives and establishing the policies, procedures, and programs necessary for achieving them.*
- *Planning in a project environment may be described as establishing a predetermined course of action within a forecasted environment.*

Chapter 11 - Planning

▪ Introduction

- *One of the objectives of project planning is to completely define all work required (possibly through the development of a documented project plan) so that it will be readily identifiable to each project participant.*
- *This is a necessity in a project environment because:*
 - *If the task is well understood prior to being performed, much of the work can be preplanned.*
 - *If the task is not understood, then during the actual task execution more knowledge is gained that, in turn, leads to changes in resource allocations, schedules, and priorities.*
 - *The more uncertain the task, the greater the amount of information that must be processed in order to ensure effective performance.*

Chapter 11 - Planning



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Chapter 11 - Planning

▪ General planning

▪ There are nine major components of the planning phase:

- *Objective: a goal, target, or quota to be achieved by a certain time*
- *Program: the strategy to be followed and major actions to be taken in order to achieve or exceed objectives*
- *Schedule: a plan showing when individual or group activities or accomplishments will be started and/or completed*
- *Budget: planned expenditures required to achieve or exceed objectives*
- *Forecast: a projection of what will happen by a certain time*
- *Organization: design of the number and kinds of positions, along with corresponding duties and responsibilities, required to achieve or exceed objectives*
- *Policy: a general guide for decision-making and individual actions*
- *Procedure: a detailed method for carrying out a policy*
- *Standard: a level of individual or group performance defined as adequate or acceptable*

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Chapter 11 - Planning

- *General planning*
 - *Planning varies at each level of the organization. At the individual level, planning is required so that cognitive simulation can be established before irrevocable actions are taken.*
 - *At the working group or functional level, planning must include:*
 - *Agreement on purpose*
 - *Assignment and acceptance of individual responsibilities*
 - *Coordination of work activities*
 - *Increased commitment to group goals*
 - *Lateral communications*

Chapter 11 - Planning

- *General planning*
 - *Planning varies at each level of the organization. At the individual level, planning is required so that cognitive simulation can be established before irrevocable actions are taken.*
 - *At the organizational or project level, planning must include:*
 - *Recognition and resolution of group conflict on goals*
 - *Assignment and acceptance of group responsibilities*
 - *Increased motivation and commitment to organizational goals*
 - *Vertical and lateral communications*
 - *Coordination of activities between groups*

Chapter 11 - Planning

- *Understanding participants' roles*
 - *Companies that have histories of successful plans also have employees who fully understand their roles in the planning process. Good up-front planning may not eliminate the need for changes, but may reduce the number of changes required. The responsibilities of the major players are as follows:*
- *Project manager will define:*
 - *Goals and objectives*
 - *Major milestones*
 - *Requirements*
 - *Ground rules and assumptions*
 - *Time, cost, and performance constraints*
 - *Operating procedures*
 - *Administrative policy*
 - *Reporting requirements*

Chapter 11 - Planning

- *Understanding participants' roles*
 - *Companies that have histories of successful plans also have employees who fully understand their roles in the planning process. Good up-front planning may not eliminate the need for changes, but may reduce the number of changes required. The responsibilities of the major players are as follows:*
- *Line manager will define:*
 - *Detailed task descriptions to implement objectives, requirements, and milestones*
 - *Detailed schedules and manpower allocations to support budget and schedule*
 - *Identification of areas of risk, uncertainty, and conflict*
- *Senior management (project sponsor) will:*
 - *Act as the negotiator for disagreements between project and line management*
 - *Provide clarification of critical issues*
 - *Provide communication link with customer's senior management*

Chapter 11 - Planning

- *The statement of work*
 - *The statement of work (SOW) is a narrative description of the work required for the project.*
 - *The complexity of the SOW is determined by the desires of top management, the customer, and/or the user groups.*
 - *For projects internal to the company, the SOW is prepared by the project office with input from the user groups because the project office is usually composed of personnel with writing skills.*
 - *For projects external to the organization, as in competitive bidding, the contractor may have to prepare the SOW for the customer because the customer may not have people trained in SOW preparation. In this case, as before, the contractor would submit the SOW to the customer for approval. It is also quite common for the project manager to rewrite a customer's SOW so that the contractor's line managers can price out the effort.*

Chapter 11 - Planning

- *The statement of work*
 - *SOW preparation manuals also contain guides for editors and writers:*
 - *Every SOW that exceeds two pages in length should have a table of contents conforming to the CWBS coding structure. There should rarely be items in the SOW that are not shown on the CWBS; however, it is not absolutely necessary to restrict items to those cited in the CWBS.*
 - *Clear and precise task descriptions are essential.*
 - *A good SOW states precisely the product or service desired. The clarity of the SOW will affect administration of the contract, since it defines the scope of work to be performed. Any work that falls outside that scope will involve new procurement with probable increased costs.*
 - *The most important thing to keep in mind when writing a SOW is the most likely effect the written work will have upon the reader.*

Chapter 11 - Planning

- *Milestone schedules*
 - *Project milestone schedules contain such information as:*
 - *Project start date*
 - *Project end date*
 - *Other major milestones*
 - *Data items (deliverables or reports)*

Chapter 11 - Planning

- *Milestone schedules*
 - *The steps required to prepare a report, after the initial discovery work or collection of information, include:*
 - *Organizing the report*
 - *Writing*
 - *Typing*
 - *Proofing*
 - *Editing*
 - *Retrying*
 - *Graphic arts*
 - *Submittal for approvals*
 - *Reproduction and distribution*

Chapter 11 - Planning

- *Work breakdown structure*
 - *The successful accomplishment of both contract and corporate objectives requires a plan that defines all effort to be expended, assigns responsibility to a specially identified organizational element, and establishes schedules and budgets for the accomplishment of the work.*
 - *In planning a project, the project manager must structure the work into small elements that are:*
 - *Manageable, in that specific authority and responsibility can be assigned*
 - *Independent, or with minimum interfacing with and dependence on other ongoing elements*
 - *Integratable so that the total package can be seen*
 - *Measurable in terms of progress*

Chapter 11 - Planning

- *Work breakdown structure*
 - *A WBS is a product-oriented family tree subdivision of the hardware, services, and data required to produce the end product.*
 - *The WBS is structured in accordance with the way the work will be performed and reflects the way in which project costs and data will be summarized and eventually reported.*
 - *Preparation of the WBS also considers other areas that require structured data, such as scheduling, configuration management, contract funding, and technical performance parameters.*

Chapter 11 - Planning

- *Work breakdown structure*
 - *The WBS is the single most important element because it provides a common framework from which:*
 - *The total program can be described as a summation of subdivided elements.*
 - *Planning can be performed.*
 - *Costs and budgets can be established.*
 - *Time, cost, and performance can be tracked.*
 - *Objectives can be linked to company resources in a logical manner.*
 - *Schedules and status-reporting procedures can be established.*
 - *Network construction and control planning can be initiated.*
 - *The responsibility assignments for each element can be established.*

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Chapter 11 - Planning

- *Work breakdown structure*
 - *The work breakdown structure acts as a vehicle for breaking the work down into smaller elements, thus providing a greater probability that every major and minor activity will be accounted for.*
 - *Although a variety of work breakdown structures exist, the most common is the six-level indented structure shown below:*

| | <i>Level</i> | <i>Description</i> |
|--------------------------|--------------|--------------------|
| Managerial levels | { 1 | Total program |
| | { 2 | Project |
| | { 3 | Task |
| Technical levels | { 4 | Subtask |
| | { 5 | Work package |
| | { 6 | Level of effort |

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Chapter 11 - Planning

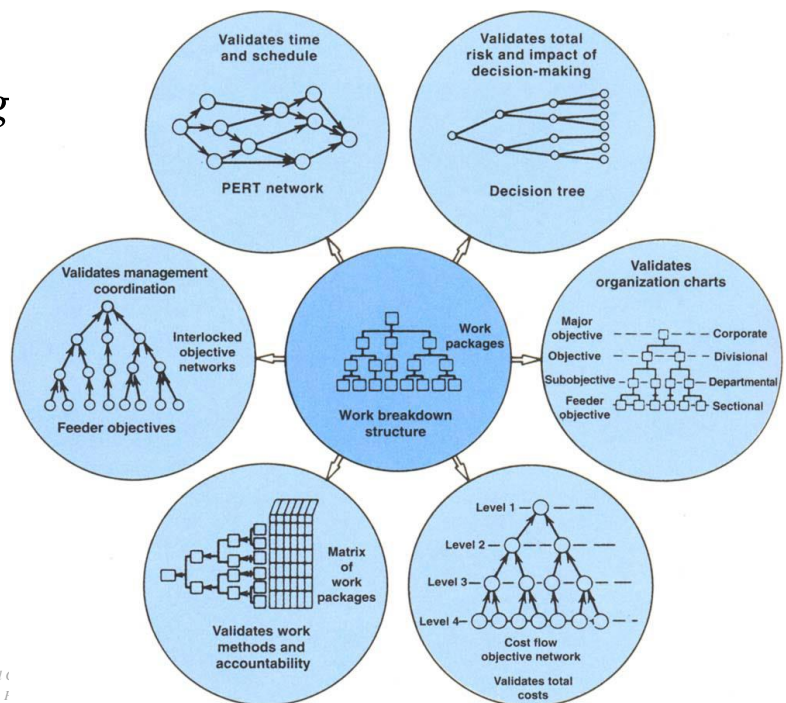
- *Work breakdown structure*
 - *The work breakdown structure can be used to provide the basis for:*
 - *The responsibility matrix*
 - *Network scheduling*
 - *Costing*
 - *Risk analysis*
 - *Organizational structure*
 - *Coordination of objectives*
 - *Control (including contract administration)*

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Chapter 11 - Planning

- *Work breakdown structure*



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Chapter 11 - Planning

- *Work breakdown structure*
 - *The upper three levels of the WBS are normally specified by the customer (if part of an RFP/RFQ) as the summary levels for reporting purposes.*
 - *The lower levels are generated by the contractor for in-house control. Each level serves a vital purpose:*
 - *Level 1 is generally used for the authorization and release of all work, budgets are prepared at level 2, and schedules are prepared at level 3.*

Chapter 11 - Planning

- *Work breakdown structure*
 - *Certain characteristics can now be generalized for these levels:*
 - *The top three levels of the WBS reflect integrated efforts and should not be related to one specific department. Effort required by departments or sections should be defined in subtasks and work packages.*
 - *The summation of all elements in one level must be the sum of all work in the next lower level.*
 - *Each element of work should be assigned to one and only one level of efforts.*
 - *The level at which the project is managed is generally called the work package level. Actually, the work package can exist at any level below level one.*
 - *The WBS must be accompanied by a description of the scope of effort required, or else only those individuals who issue the WBS will have a complete understanding of what work has to be accomplished.*
 - *It is often the best policy for the project manager, regardless of his technical expertise, to allow all of the line managers to assess the risks in the SOW. After all, the line managers are usually the recognized experts in the organization.*

Chapter 11 - Planning

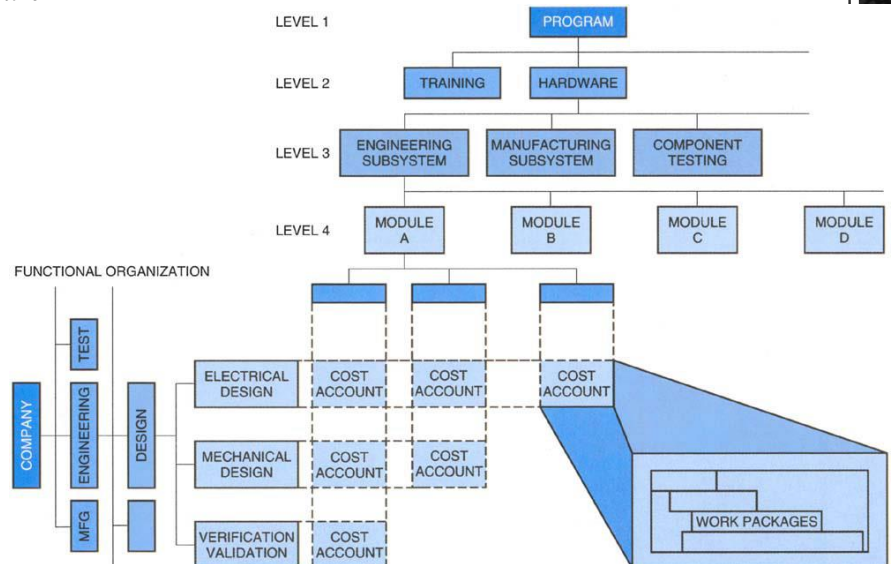
- *Work breakdown structure*
 - *The work package is the critical level for managing a work breakdown structure.*
 - *However, it is possible that the actual management of the work packages is supervised and performed by the line managers with status reporting provided to the project manager at higher levels of the WBS.*
 - *Work packages are natural subdivisions of cost accounts and constitute the basic building blocks used by the contractor in planning, controlling, and measuring contract performance*

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Chapter 11 - Planning

- *Work breakdown structure*



Chapter 11 - Planning

- *Work breakdown structure*
 - *In setting up the work breakdown structure, tasks should:*
 - *Have clearly defined start and end dates*
 - *Be usable as a communications tool in which results can be compared with expectations*
 - *Be estimated on a "total" time duration, not when the task must start or end*
 - *Be structured so that a minimum of project office control and documentation (i.e., forms) is necessary.*

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Chapter 11 - Planning

- *Work breakdown structure*

Table 11-2: WORK BREAKDOWN STRUCTURE FOR NEW PLANT CONSTRUCTION AND START-UP

| | |
|----------------------------------------------|----------|
| Program: New Plant Construction and Start-up | 01-00-00 |
| Project 1: Analytical Study | 01-01-00 |
| Task 1: Marketing/Production Study | 01-01-01 |
| Task 2: Cost Effectiveness Analysis | 01-01-02 |
| Project 2: Design and Layout | 01-02-00 |
| Task 1: Product Processing Sketches | 01-02-01 |
| Task 2: Product Processing Blueprints | 01-02-02 |
| Project 3: Installation | 01-03-00 |
| Task 1: Fabrication | 01-03-01 |
| Task 2: Setup | 01-03-02 |
| Task 3: Testing and Run | 01-03-03 |
| Project 4: Program Support | 01-04-00 |
| Task 1: Management | 01-04-01 |
| Task 2: Purchasing Raw Materials | 01-04-02 |

Chapter 11 - Planning

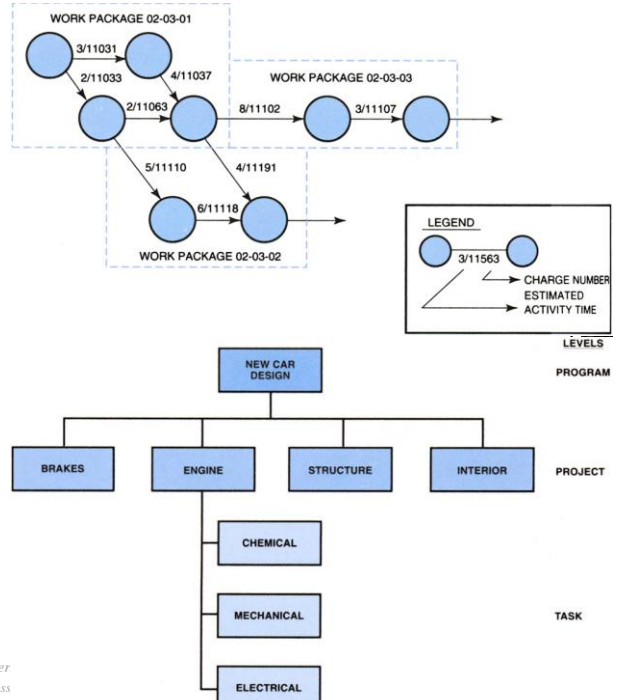
- *WBS decomposition problems*
 - *There is a common misconception that WBS decomposition is an easy task to perform.*
 - *In the development of the WBS, the top three levels or management levels are usually rollup levels.*
 - *Preparing templates at these levels is becoming common practice.*
 - *At levels 4–6 of the WBS, templates may not be appropriate.*
 - *One solution to the above problems is to create "hammock" activities, which encompass several activities where exact cost identification cannot or may not be accurately determined.*
 - *Some projects identify a "hammock" activity called management support (or project office), which includes overall project management, data items, management reserve, and possibly procurement. The advantage of this type of hammock activity is that the charge numbers are under the direct control of the project manager.*

Chapter 11 - Planning

- *WBS decomposition problems*
 - *The WBS can be subdivided into sub-objectives with finer divisions of effort as we go lower into the WBS.*
 - *By defining sub-objectives, we add greater understanding and, it is hoped, clarity of action for those individuals who will be required to complete the objectives.*
 - *Work breakdown structures can be used to structure work for reaching such objectives as lowering cost, reducing absenteeism, improving morale, and lowering scrap factors.*
 - *The lowest subdivision now becomes an end-item or sub-objective, not necessarily a work package as described here. However, since we are describing project management, for the remainder of the text we will consider the lowest level as the work package.*

Chapter 11 - Planning

- WBS decomposition problems
 - On simple projects, the WBS can be constructed as a "tree diagram" or according to the logic flow.
 - The second method is to create a logic flow and cluster certain elements to represent tasks and projects.



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Chapter 11 - Planning

- WBS decomposition problems

| | Method | | |
|-----------------|-----------|------------|--------------|
| Level | Flow | Life Cycle | Organization |
| Program | Program | Program | Program |
| Project | System | Life cycle | Division |
| Task | Subsystem | System | Department |
| Subtask | People | Subsystem | Section |
| Work package | People | People | People |
| Level of effort | People | People | People |

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Chapter 11 - Planning

- *The project charter*
 - *The original concept behind the project charter was to document the project manager's authority and responsibility, especially for projects implemented away from the home office.*
 - *Today, the project charter is more of an internal legal document identifying to the line managers and their personnel the project manager's authority and responsibility and the management-and/or customer-approved scope of the project.*
 - *Theoretically, the sponsor prepares the charter and affixes his/her signature, but in reality, the project manager may prepare it for the sponsor's signature. At a minimum, the charter should include:*
 - *Identification of the project manager and his/her authority to apply resources to the project*
 - *The business purpose that the project was undertaken to address, including all assumptions and constraints*
 - *Summary of the conditions defining the project*