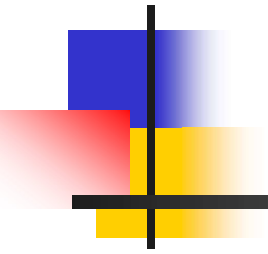


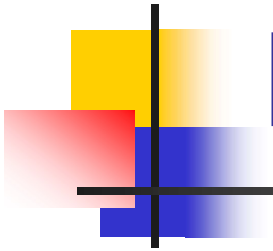
Planning Fundamentals

Mrs. Priya R. L

Overview of Planning Process

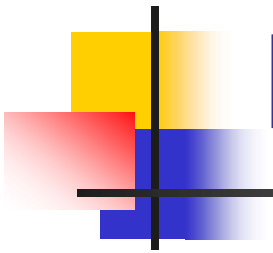
- **Business need** – RFP is needed
- **Project Manager** – Identified
- **Project Charter** – created that briefly gives statement of work, expected end items/ results, required resources.
- The purpose of **project charter** is to enable project Manager , senior management , functional manager to reach agreement about scope of project and resources they will commit to it.
- Plan – What has to be done? How it has to be done? When and in what order, for how much and by when? Project Team need to address these questions.

Project Planning Overview

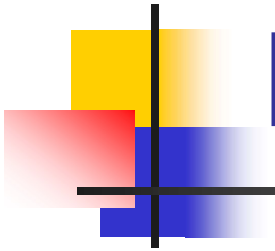


- Project objectives, requirement & scope- desired results, time, cost, performance targets
- Specific work activities – tasks, jobs to achieve objective are broken down, defined & listed(What?)
- Project Organization is created specifying department, subcontractors, managers responsible for work activities (who?)

Project Planning Overview



- A schedule is prepared showing timing of work, activities, deadlines and milestones
  (when, in what order?)
- Budget & Resource plan is prepared showing amount & timing of resources & expenditures for work activities & related items
  (How much and When?)
- A forecast is prepared of time, cost & performance. Projections for the completion of project(How much time is needed, what will it cost & when will project be finished)



Project Master Plan

- Purpose is to guide project manager and team throughout project life cycle
- To tell them what resources are needed, when & how much they will cost?
- To enable them to measure progress, determine when they are falling behind and know what to do to catch up.
- Common failure scheduling and cost overrun can be avoided.
- Project planning begins during formulation of project proposal.
- Summary plan in proposal is for Customer
- Master plan is for Team members

Contents of Master Plans

- Management Summary
- Management and organization section
- Technical section

Contents of Master Plans

- Management Summary
  - Description of project for top management
  - Includes brief description of project, objectives, overall requirement, constraints, problem areas, master schedule showing major events and milestones.

Contents of Master Plans

- Management & Organization Section
  - Overview of organization and personnel requirement for project. It includes
    - Project Management & Organization – details how project will be managed & identifies key personnel & authority relationships
    - Manpower – estimates of work force requirement in terms of skills, expertise & strategies for locating & recruiting qualified people.
    - Training & Development – summary of executive development.

Contents of Master Plans

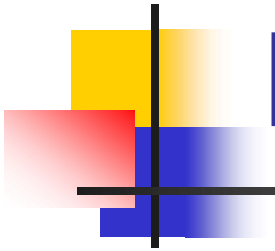
- Technical Section – overview of major project activities, timing and cost.
  - Statement of Work and Scope Of Work – Generalized description of major project activities & tasks, results/ end items.
  - Work Breakdown – list of work packages and description of each.
  - Responsibility assignments – list of personnel and responsibility for work packages and other areas of project.
  - Project Schedules – Generalized project & tasks schedule showing major events, milestones & points of critical action – Gnatt charts, PERT/CPM diagrams etc.

Contents of Master Plans

- Technical Section
  - Budget & financial support – estimates & timing of capital and development expenses for labor, materials and facilities
  - Testing – listing of things to be tested, including procedures, timing, person responsible
  - Change control plan – Procedures for review & decision about requirement for changes to any aspect of project plan
  - Quality Plan – Measures of monitoring quality and accepting results for individual work tasks, components , end items.
  - Work review plan (included in quality plan)- Procedures for periodic review of work, what is to be reviewed? By whom, when and according to what standards?

Contents of Master Plans

- Technical Section
  - Documentation – List of documents to be produced & how they will be organized and maintained
  - Implementation- Guidelines showing how customer will cover/ adopt the results of project
  - Economic Justification- summary of alternatives in meeting project objectives showing tradeoffs between costs and schedules.
  - Area of uncertainty and risk – Contingency plans for areas of greatest uncertainty in terms of potential work failure/ missed milestones.



Learning from past projects

- During development of project plan, reference should be made to earlier, similar projects (including plans, procedures, successes and failures).

Tools for Project Planning

- Work Breakdown structure and work packages – It is used to define the project work and break it down into specific tasks.
- Responsibility Matrix – Used to define project organization, key individuals, and their responsibilities.
- Events and milestones – used to identify critical points and major occurrences on the project schedule.
- Gantt charts – used to display the project master schedule and detailed task schedules.
- Additional planning tools such as networks, critical paths, PERT/CPM, cost estimating, budgeting and forecasted are also required.

Scope Definition

- An overall goal statement
- A list of project objectives
- A list of deliverables
- A list of exclusions from scope
- A list of stakeholders, roles, & responsibilities
- A list of assumptions and constraints

Work Breakdown Structure

- What makes up my entire project (Scope)?
  - What is the agreed upon work scope and what is additional work?
- What are my start and completion dates (Schedule)?
- How much is the project going to cost (Cost)?

Over the years, it was determined that project managers needed a tool to help capture and control their project scope. This led to the development of a Work Breakdown Structure (WBS).

On the following pages we will define and discuss a WBS.

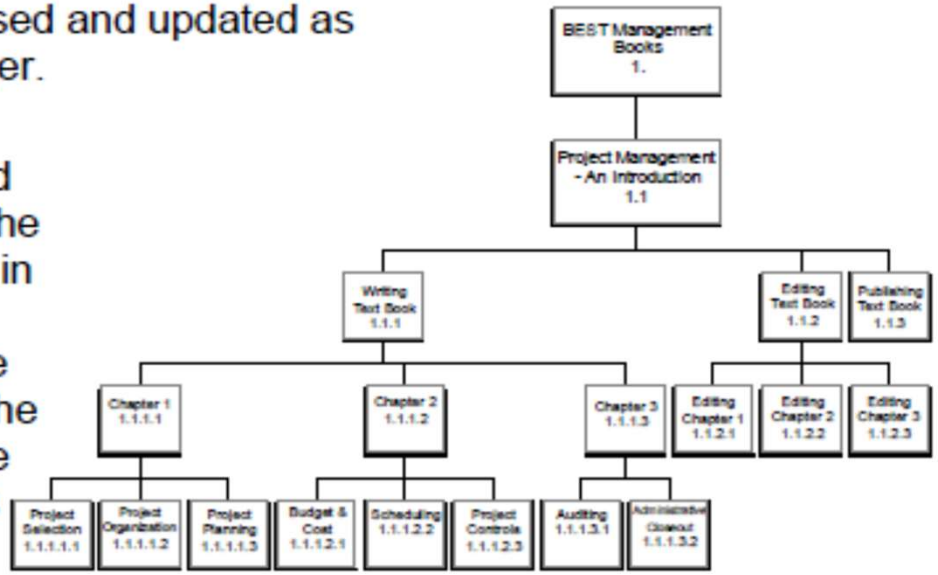
Work Breakdown Structure

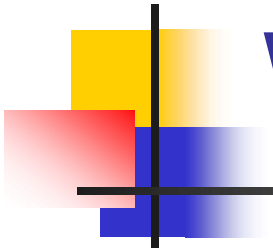
- The process of dividing project into sub elements is called as Work Breakdown structure.

What is a Work Breakdown Structure?

The Work Breakdown Structure (WBS) is a tool that defines a project and groups the project's discrete work elements in a way that helps organize and define the total work scope of the project. A WBS element may be a product, data, a service, or any combination. WBS also provides the necessary framework for detailed cost estimating and control along with providing guidance for schedule development and control. Additionally the WBS is a dynamic tool and can be revised and updated as needed by the project manager.

Each descending level of the WBS represents an increased level of detailed definition of the project work. As you can see in this WBS for developing the BEST Management Book, the work is broken down into all the discrete elements of work, the total sum of which represents all the work and products necessary to produce the book.





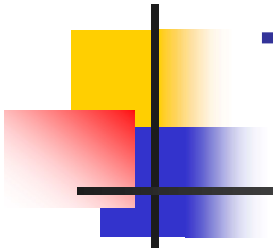
Work Breakdown Structure

- Work
  - A WBS considers the work that needs to be performed
- Breakdown
  - Work is broken down (decomposed) into small pieces (activities)
  - Activities are eventually broken down into tasks
  - A task is something that takes less than a week to complete
  - Activities are normally assigned to individuals
- Structure
  - Each unit of work is broken down into a number of components
  - The result is a hierarchical structure
  - The lowest layers are tasks
    - e.g. A function that generates a polynomial collision-handling hash function is completed
  - The middle layers could be milestones
    - e.g. "Getting started" tutorial is completed
  - The highest layers are normally deliverables
    - e.g. Source code distribution, with configuration and makefiles, is completed

Why is a Work Breakdown Structure needed?

- Provides a framework for organizing and managing the approved project scope
- Helps ensure you have defined all the work that makes up the project
- Provides a framework for planning and controlling cost and schedule information
- It's better to be deliberate about planning than rely on luck!

Additionally, when you work for a company or organization that has many projects being performed simultaneously, each of the projects is competing for the limited resources available. The WBS enables you to review project details and distinguish one project's needs from others within the company or organization. Why is distinguishing one project from another important? It enables you to identify resource requirements and allocate resources more effectively.



Terminology

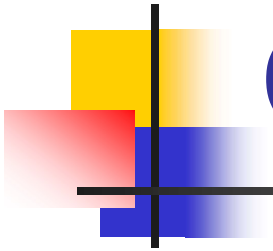
- Activity:
  - Some behavior that needs to be done
  - Produces some outcome (e.g. a deliverable)
  - Is often decomposed into other activities or tasks
- Task:
  - An activity that is not decomposed
  - Is at the lowest level of the WBS
  - Also called a *work package*

Work Breakdown Structure

- For tasks to be well defined it must have following properties:
  - Clear comprehensive statement of work
  - Resource Requirements – labor, skills, equipment, facilities and materials for task are identified.
  - Time – required to perform task is estimated
  - Cost- cost for required resources management
  - Responsibility – parties responsible for performing task
  - Outcomes – the deliverables are identified
  - Inputs – Preconditions necessary to begin task are identified
  - Quality Assurance – Entry, process and exit conditions to which task must conform are identified.
  - Other – additional information

Work Packages

- Well defined tasks are called as work packages
- Inputs : Preconditions, Predecessors, Resources , Requirements/ specifications.
- Tasks - statement of work, time, cost, responsibility, quality assurance
- Outcomes – deliverables , results



Creating a WBS: Top-down

- The top-down approach:
  - Start with the project's overall goal
  - Decompose the goal into deliverables
  - Decompose the deliverables into modules

    …
  - When you are finished you have tasks
    - Tasks should be a few days work or less
- This is an iterative technique to creating a WBS
  - WBS iterations might produce only a part of the next level while requirements are still being worked out
  - However, it should produce some tasks, so that work can begin

Preparing a WBS

In preparing a WBS there are a number of steps that need to be taken to make sure the WBS developed will help manage your project. Below and on the following pages we will discuss these steps.

1. Identify final project products necessary for achieving project success. The WBS should assist the project manager in developing a clear vision of the end product. You need to answer the following question:
   - What must be delivered to achieve project success?
     - You may need to review the project scope documents for guidance.

2. Identify the major deliverables necessary for project success.
   - These are items that by themselves do not satisfy the project need but combined make up a successful project
   - Examples: a design completion, generator delivery, or acceptance test completion

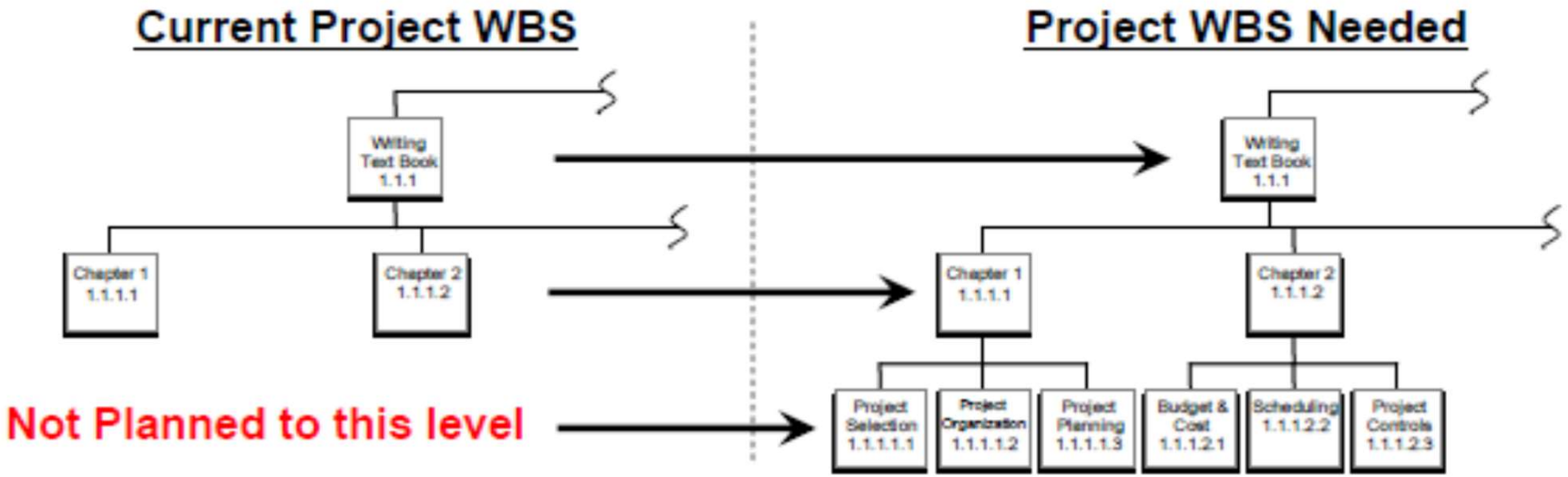
Preparing a WBS

3. Incorporate additional levels of detail until management requirements for managing and controlling the project are met.
   - Remember that each project is different, thus each WBS will be different
   - WBS's from previous projects can be used as templates, but remember that the management philosophy and the level of details may be different from project to project
   - Understand your controlling and reporting requirements
     - Projects have different requirements; make sure you take these into consideration when developing low level details

4. Review and refine the WBS until the stakeholders agree with the level of project planning and reporting.
   - Remember that no matter how detailed a WBS is, there are planning and reporting restrictions a WBS creates. On the following pages, we will look at examples of these restrictions.

Preparing a WBS

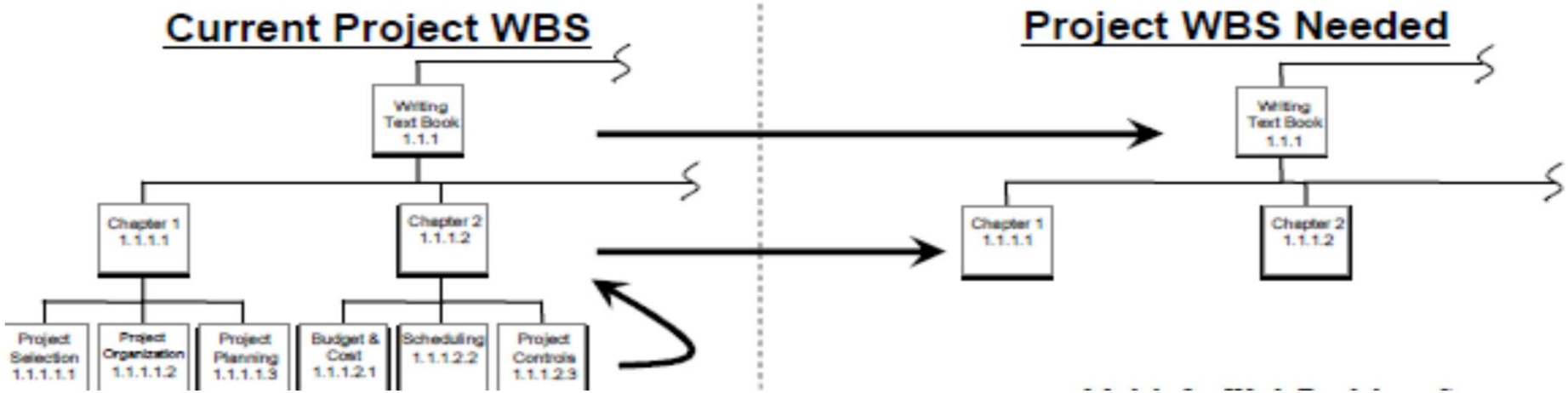
Let's use the BEST Management Books' WBS we looked at earlier. Assume that the WBS was only planned down to the chapters level (see graph below, left), but after the first month of work, the stakeholder wants reporting at the subchapter level (see graph below, right). Without restructuring the WBS and changing the other supporting systems, like cost tracking and reporting, it is impossible for the project manager to meet the stakeholder's request.



Preparing a WBS

Now let's reverse the situation. Assume WBS was planned down to the subchapter level (see graph below, left), but after the first month of work, the stakeholder wants reporting at the chapter level (see graph below, right). Is there any restructuring needed to the WBS? The answer is "No". Since you planned the work at a level below what is now the stakeholder's requirement, you can "roll-up" and meet the stakeholder's request.

Do you still see a problem with the project WBS? Let's take a look.



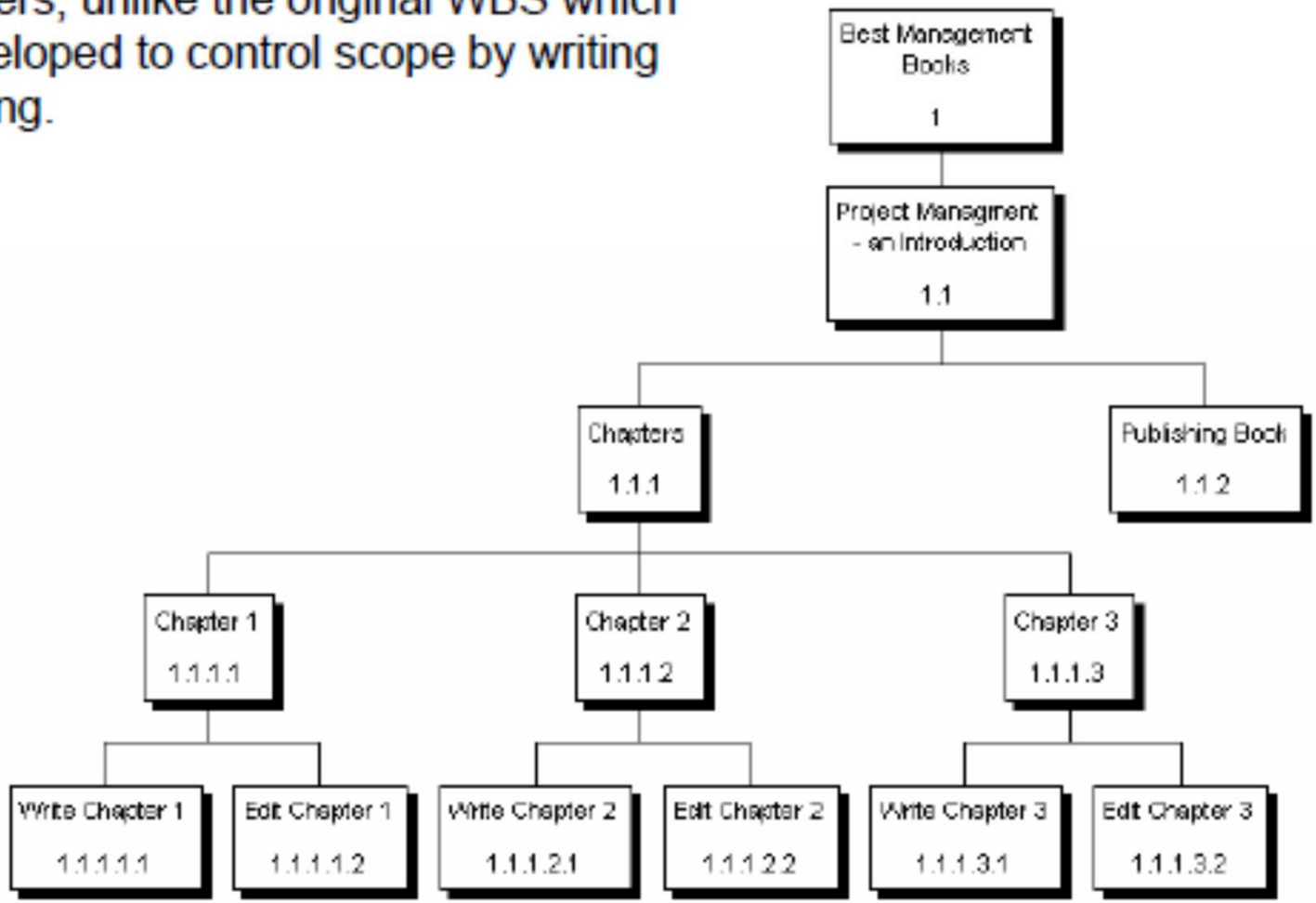
Preparing a WBS

Other items to consider when developing a WBS are:

- Reporting requirements
- Size of project
- Resource executing the work (contractors vs. in-house)
- Complexity of the project

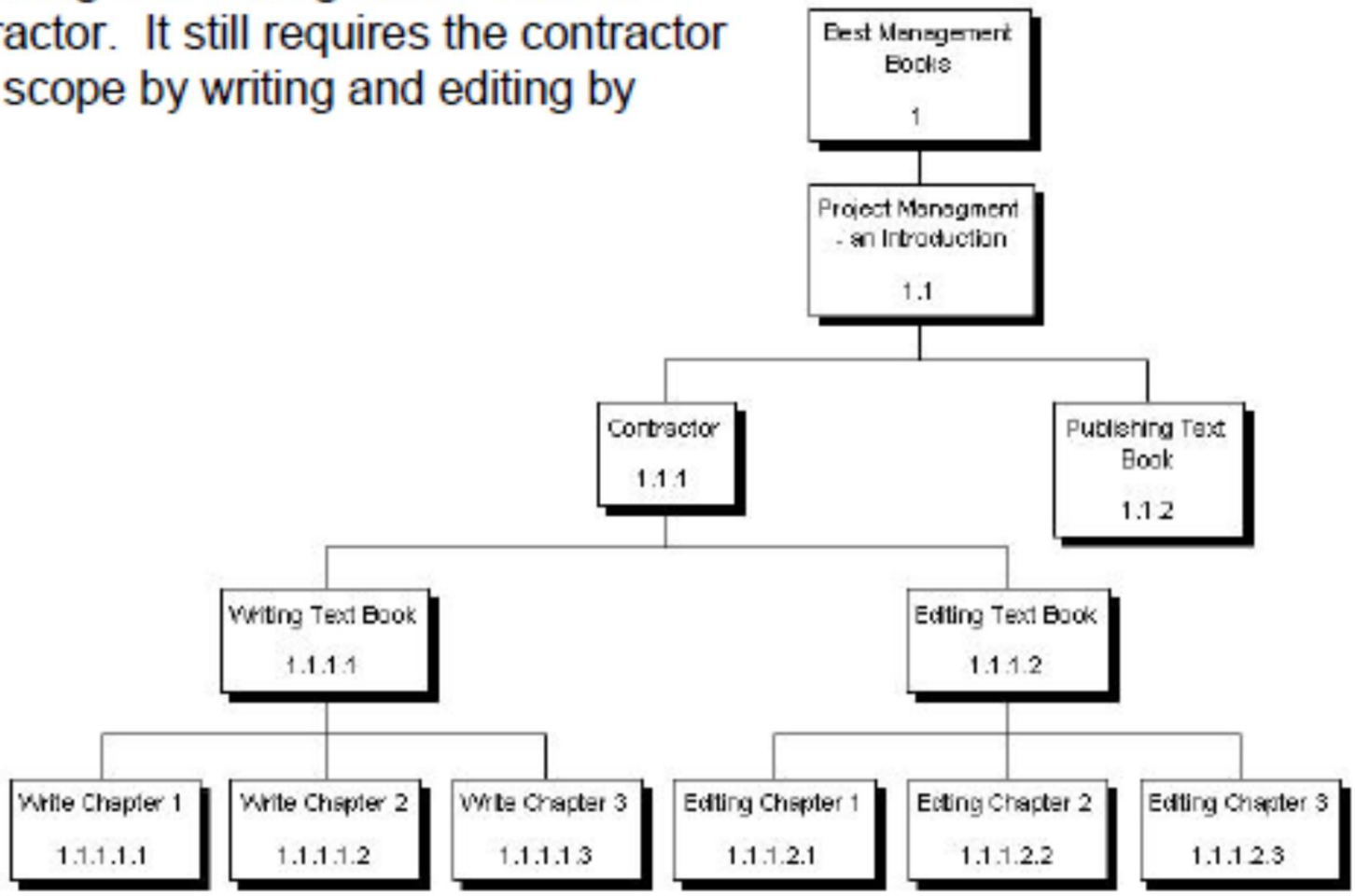
Preparing a WBS

This WBS structure is designed to control scope by chapters, unlike the original WBS which was developed to control scope by writing and editing.



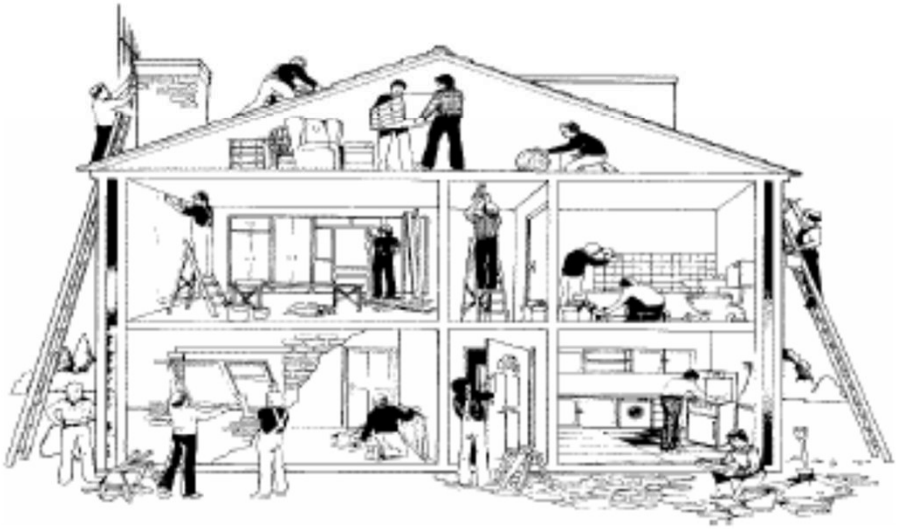
Preparing a WBS

This WBS structure is taking into consideration that the writing and editing will be executed by a contractor. It still requires the contractor to control scope by writing and editing by chapter.



Building a WBS

Armed with the basics of the WBS, it is time to examine them in more detail and to begin to understand how to build one. To do this, let's look at building a WBS for the construction of a single family home. First, take a moment to familiarize yourself with some background information about the construction company, which appears on the next page.



WBS: Structure

The ACME Housing Corporation, which you own, has been contracted to build its first house. You want to be able to manage your projects effectively and efficiently, so you charge your project managers to develop an appropriate WBS. You decide to manage the project by the individual tasks necessary to complete the house.

You hope that this is the first of many houses that ACME will build, so you start the WBS with ACME in the highest position, or Level 1. Accordingly, Level 1 is given a WBS code of 1. You assign the WBS code of 1 to the highest level because all future projects (houses) will be summarized at Level 1.

NOTE: For ease of explanation, our example will assume the following:

- Design is complete
- All permits issued
- All Material ordered
- Inspection happens

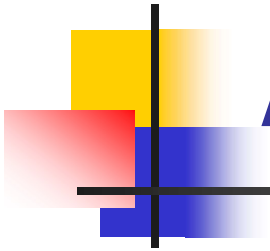
Level 1 →

WBS: Structure

The graphical structure of the WBS is an easy way to identify the project components and relationships of those components; however, the WBS can be displayed in another format as well: the Tree format. Both formats are acceptable. The graphical format is at times easier to understand, but can take up considerable space in a report. The tree is not as easy to understand but is more easily incorporated into a report format.

Note the WBS codes and the structure of the Levels in the Tree format mirror the graphical format. The content has not changed; only the way the content is presented has changed.

1 ACME Housing Corporation
- 1.1 New Home Construction
  - 1.1.1 Concrete
    - 1.1.1.1 Pour Foundation
    - 1.1.1.2 Install Patio
    - 1.1.1.3 Pour Stairway
  - 1.1.2 Framing
    - 1.1.2.1 Frame Exterior Walls
    - 1.1.2.2 Frame Interior Walls
    - 1.1.2.3 Install Roofing Trusses
  - 1.1.3 Plumbing
    - 1.1.3.1 Install Water Lines
    - 1.1.3.2 Install Gas Lines
    - 1.1.3.3 Install B/K Fixtures
  - 1.1.4 Electrical
    - 1.1.4.1 Install Wiring
    - 1.1.4.2 Install Outlets/Switches
    - 1.1.4.3 Install Fixtures
  - 1.1.5 Interior
    - 1.1.5.1 Install Drywall
    - 1.1.5.2 Install Carpets
    - 1.1.5.3 Install Painting
  - 1.1.6 Roofing
    - 1.1.6.1 Install Felt
    - 1.1.6.2 Install Shingles
    - 1.1.6.3 Install Vents



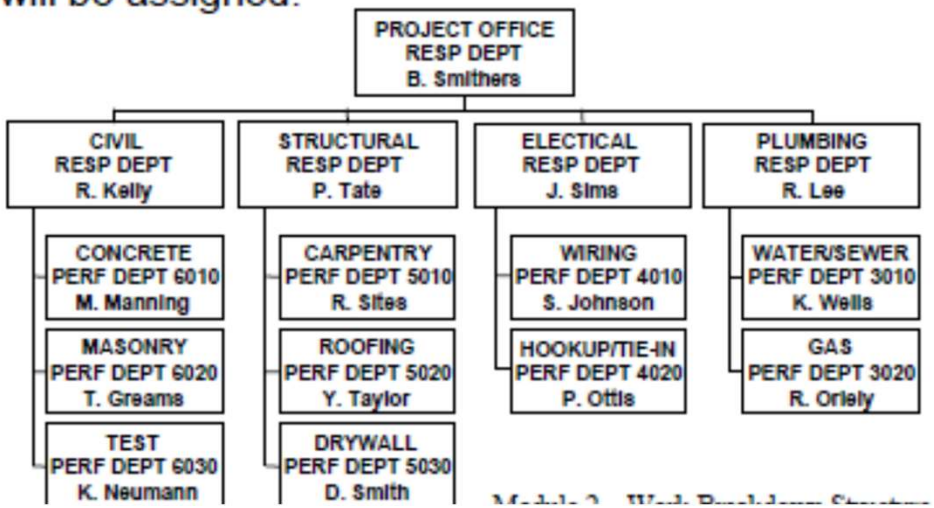
Advantages of a WBS

- The WBS:
  - Gives you a somewhat complete list of tasks
    - Later, this can be a checklist to show how much is still to be done, and how much is done
  - Allows you to easily assign work to team members
  - Requires you to solidify things that are still vague, even after requirements analysis
    - Generating a WBS enables you to methodically decompose the work, exposing new risks and resource requirements

Organization Breakdown Structure (OBS)

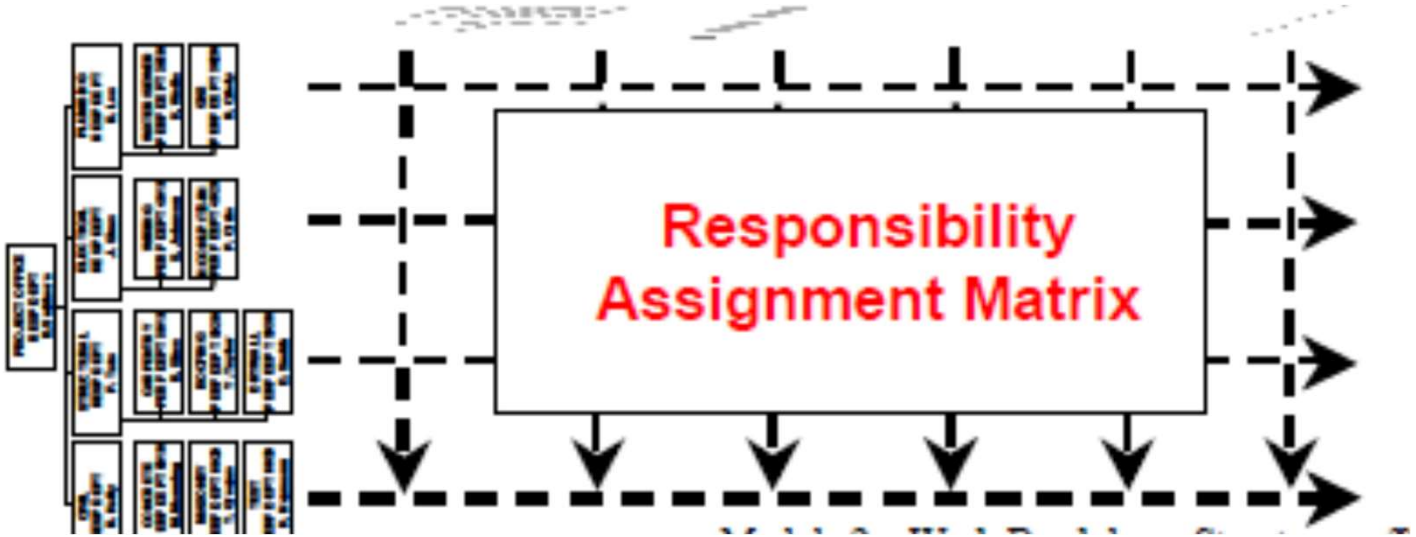
Now that our WBS is developed, the appropriate resources and responsibilities need to assigned. The first step in doing this is developing the Organizational Breakdown Structure (OBS) for the project. The OBS indicates the organizational relationships and is used as the framework for assigning work responsibilities. Below is an example of the OBS for the ACME house building project. The OBS is structured by Responsible Department and then by Performing Department at the lowest level. This Performing Department level is were the responsibility and resource needed to accomplish the project will be assigned.

With the relationships and responsibilities defined, the second and final step is to merge the WBS and OBS. Take a look on the next page.



Responsibility Assignment Matrix (RAM)

Merging the WBS and OBS, the project manager creates a Responsibility Assignment Matrix (RAM). The RAM displays the lowest level of both the WBS and the OBS. The integration identifies specific responsibility for specific project tasks. It is at this point that the project manager develops control accounts or work



Project Organization Structure and Responsibilities

- The intersection of WBS and the organizational structure is represented by a chart called as responsibility matrix/ responsibility chart.
- E.g. project engineer has the responsibility of “approval” for the work package of “ basic Design”

E.g. project engineer has the responsibility of "approval" for the work package of " basic Design"

Project Elements Of Work Packages

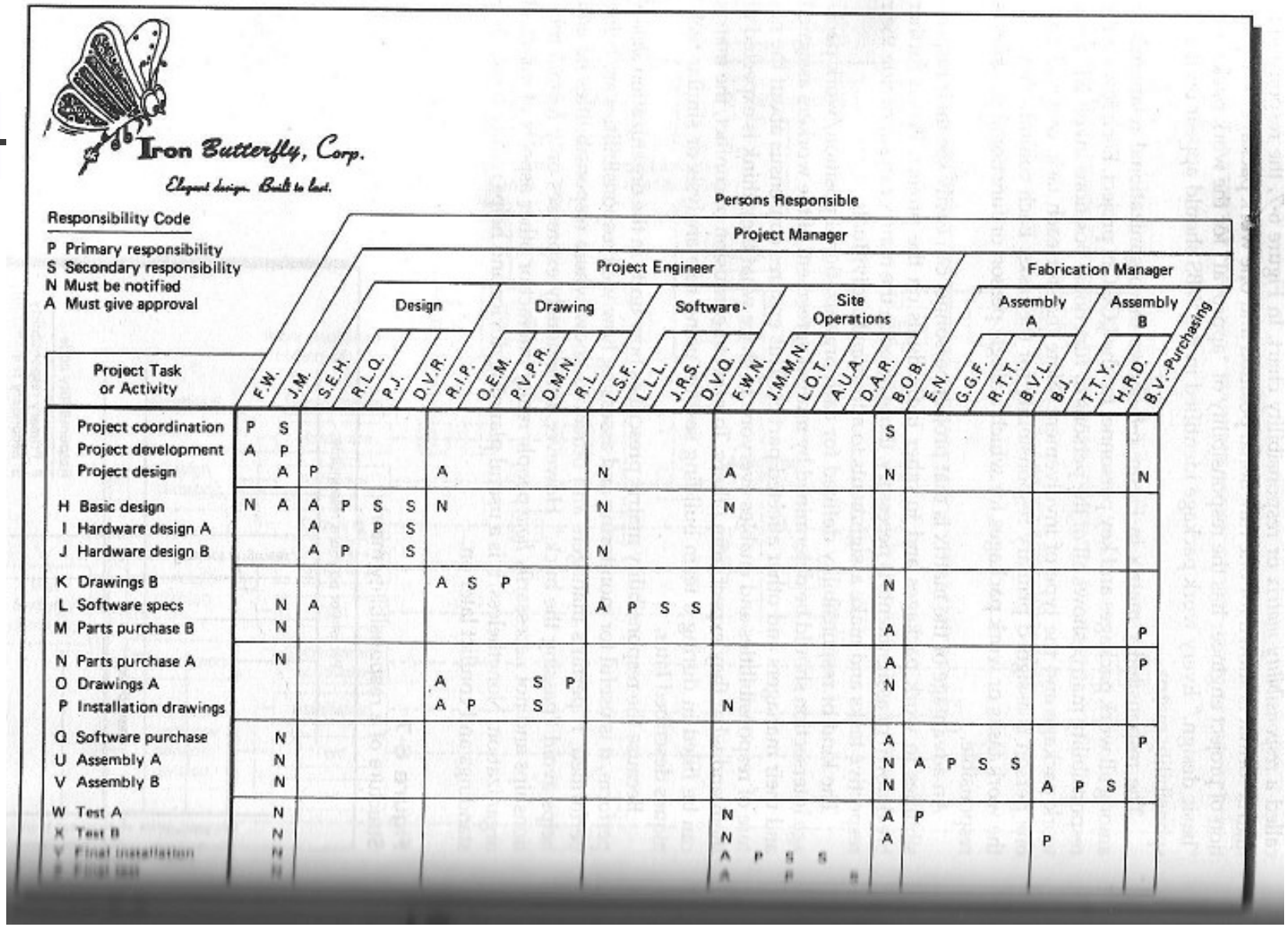
of a responsibility matrix.

Project elements	Persons or positions responsible: Project engineer
Basic design	A

Responsibility code

P Primary responsibility
S Secondary responsibility
N Must be notified
A Must give approval

Sample Responsibility Matrix for LOGON Project



Iron Butterfly, Corp.

Elegant design. Built to last.

Responsibility Code

P Primary responsibility
S Secondary responsibility
N Must be notified
A Must give approval

Project Task or Activity	F.W.	J.M.	S.E.H.	R.L.Q.	P.J.	D.V.R.	R.I.P.	O.E.M.	P.V.P.R.	D.M.N.	R.L.	L.S.F.	L.L.L.	J.R.S.	D.V.Q.	F.W.N.	J.M.M.N.	L.O.T.	A.U.A.	D.A.R.	B.O.B.	E.N.	G.G.F.	R.T.T.	B.V.L.	B.J.	T.T.Y.	H.R.D.	B.V.-Purchasing
	Persons Responsible																												
	Project Manager																												
	Project Engineer																					Fabrication Manager							
	Design						Drawing					Software				Site Operations						Assembly A				Assembly B			
Project coordination	P	S																		S									
Project development	A	P																											
Project design		A	P				A					N				A				N									N
H Basic design	N	A	A	P	S	S	N					N				N													
I Hardware design A			A		P	S																							
J Hardware design B			A	P		S						N																	
K Drawings B							A	S	P											N									
L Software specs		N	A									A	P	S	S														
M Parts purchase B		N																		A									P
N Parts purchase A		N																		A									P
O Drawings A							A			S	P									N									
P Installation drawings							A	P		S						N													
Q Software purchase		N																		A									P
U Assembly A		N																		N	A	P	S	S					
V Assembly B		N																		N					A	P	S		
W Test A		N														N				A	P								
X Test B		N														N				A					P				
Y Final installation		N														A	P	S	S										
Z Final test		N														A		P		S									

Responsibility Matrix

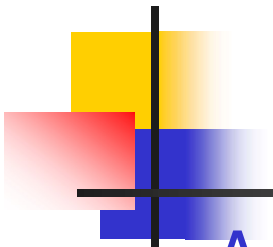
- Advantage:
  - Project personnel can easily see their responsibilities to work packages and to other individuals on the project

Summary

- The Work Breakdown Structure (WBS) is a tool that defines a project and groups the projects elements in a way that helps organize and define the total work scope of the project
- In preparing a WBS there are a number of steps that need to be taken including:
  - identifying the final project product
  - identifying the major deliverables
  - incorporating the appropriate levels of detail
  - obtaining stakeholder agreement
- WBS Dictionary is a narrative description of the lowest level for each WBS element
- Organizational Breakdown Structure (OBS) indicates the organizational relationships and is used as the framework for assigning work responsibilities
- Responsibility Assignment Matrix (RAM) merges the WBS and OBS to identify the specific responsibility for specific project tasks

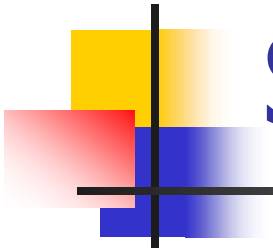
Project Management System

- PMS for each project includes
  - WBS & Work packages – to define all work to be done
  - An Organization Structure –to integrate people with functional areas with WBS and assign responsibilities
  - Project Schedules – to provide basis for work package resource allocation and work timing
  - Cost accounts – to provide basis for project cost aggregation and control
  - Budgets – to define expected cost for each cost account and work package.
  - PMS activities which utilize this information includes – collecting and storing project management information, means for reporting information, means for management direction, decisions and corrective action.



What is a schedule?

- A schedule is a description of start and end times for all the WBS tasks.
  - The schedule accommodates the plan
  - The schedule specifies all dates in terms of offsets from the start date
  - Ideally, the start date is a parameter which can be changed if the project start is delayed
- An important part of the schedule is the Gantt chart



Scheduling

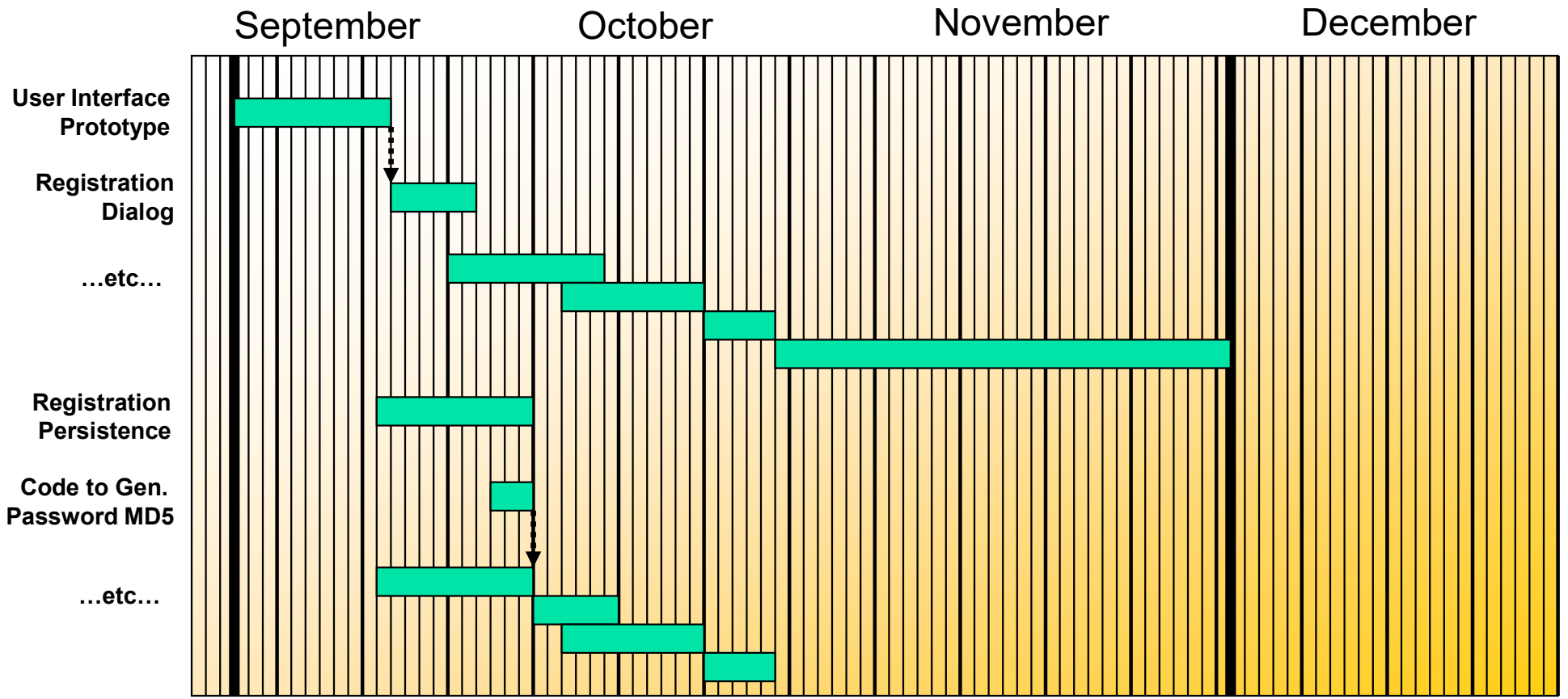
- It is basis for allocating resources, estimating costs, tracking project performance.
- Events – signifies only a moment in time
  - Interface Event – denotes changes in responsibility/ completion of one task & simultaneously start of one/ more subsequent tasks.
  - Milestone Event – signifies a major occurrence such as completion of several critical/ difficult tasks.

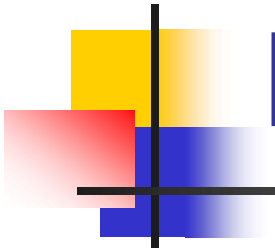
Types of Schedules

- **Project Schedules** – Used by PM & upper management for planning and reviewing entire project. Shows major project activities.
- **Task Schedules** – Show specific activities necessary to complete task.

Gantt Charts

Visual representation can help when a project manager needs an overview:





Expense charts

- Gantt charts can be used for labor planning, resource allocation & budgeting.
- E.g. (week, activities during week, week labor requirements, weekly expenses, cumulative expense)

Hierarchy of Charts

- Presents multilevel schedules.

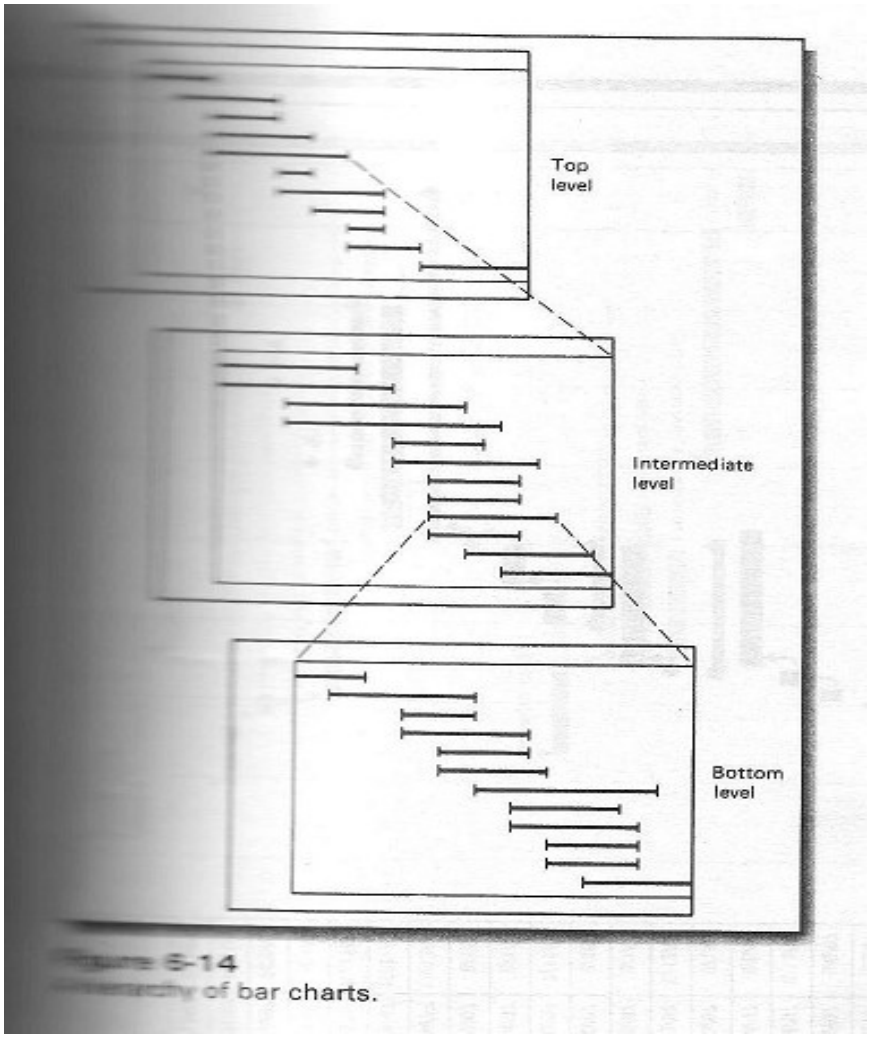


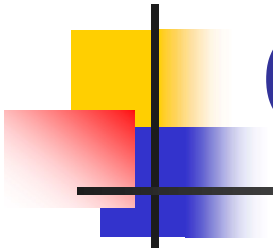
Figure 5-14
Hierarchy of bar charts.

Disadvantage of Gantt Charts

- It does not explicitly show interrelationships among work elements.
- It doesn't reveal effect of one work element falling behind schedule on other element.

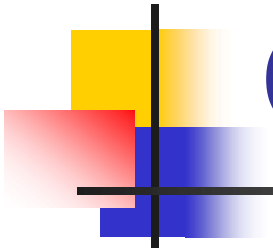
Advantages of Gantt Chart

- Gives clear pictorial model of project
- Simple for planner and user
- Easy to construct & understand
- Must be updated on daily/ weekly basis.
- Advantageous for small projects



Questions

- What is purpose of project master plan?
- What is purpose of project scope statement? What information is used to create scope statement? How is scope reflected to WBS Structure?
- What is role of functional manager in developing WBS?
- Differentiate between interface event and milestone event?
- Construct Gantt chart
  - Task – A, B, C, D, E, F, G
  - Start time – 0,6,7,7,8,9,12
  - Duration – 5,3,4,9,2,8,7
- When will last task be completed?



Common Schedule Problems

- Problems with estimates or deadlines:
  - Customer or upper management set deadline without team consultation
  - Schedule is based on 'best case' estimates
  - Target date moved up without re-adjustment to scope, resources, or schedule
- Problems with requirements:
  - Schedule omits necessary tasks
  - Project size is impossible within allotted time
  - Project is larger than estimated
  - Effort is greater than estimated
- Problems with schedule management:
  - Schedule was based on specific team members that will not be available
  - Schedule slips are ignored when schedule is re-evaluated (velocity)
  - Delays in tasks result in delays in dependent tasks
  - Unfamiliar territory causes unexpected delays
- Problems with productivity:
  - Demotivated personnel (e.g. schedule pressure)
  - Weak personnel
  - Friction between team members