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## Acknowledgments

The **Project Management Primer** was developed when 5 members of Team 5's, 2007 Enterprise Leadership Academy saw value in capturing highlights of a comprehensive Project Management seminar. We have found that we are all involved in some level of "project management" in State government. The **Project Management Primer** is an attempt to capture important concepts and processes in one place that can be used by managers and staff alike. The information and helpful ideas are developed from several sources as acknowledged below. We hope that this primer is helpful in assisting and completing successful projects you are working on.

Department of Health and Family Services Project Management Resources Center Workweb. Link,

<http://www.oqi.wisc.edu/projectmanagers/getstarted/tabid/73/default.aspx>  
[X](#)

Enterprise Leadership Academy, June 19-20, 2007; Project Management seminar; Darin Harris and George Watson.

Skillpath Seminars; [www.skillpath.com](http://www.skillpath.com)

University of Wisconsin Project Management advisor site with a link to a 10 minute webinar on step by step approach to developing a Project charter. Link,

<http://www.oqi.wisc.edu/projectmanagers/getstarted/tabid/73/default.aspx>  
[X](#)

Project Auditors web site with a link to a project management dictionary. Link,

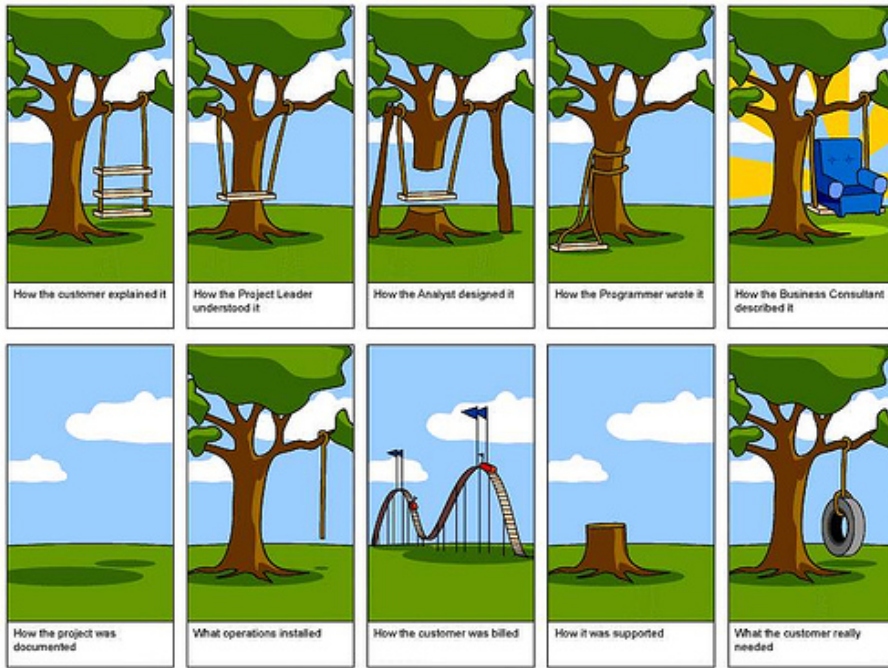
<http://www.projectauditors.com/Dictionary/DictionaryHome.html>

[http://en.wikipedia.org/wiki/Main\\_Page](http://en.wikipedia.org/wiki/Main_Page)

# Project Management Primer

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## Do I Need Project Management?



Does your organization have:

- [Projects](#) that are completed late, over-budget, or with results that are different than expected?
- Weak standard processes and techniques that are used inconsistently?
- Projects with problems or issues that are dealt with reactively instead of proactively?
- Projects that lack planning and oversight, creating heavy stress and workload during the life of the project?

If you can answer “yes” to any of the above, then your organization could use project management to improve your results.

Project Management is using tools and techniques to lead/direct objective oriented work in a controlled and consistent manner.

## TASK ANALYSIS FORM

<b>Task No.:</b>	<b>Task Name:</b>		
Predecessor Task(s):			
Specifications (Deliverables):			
Resources- People/Dept.			
Equipment/Supplies			
<div> <div> Constraining Dates: </div> <div> Must Start </div> <div> Must Finish </div> </div>			
Milestones:			
<div> <div> Optimistic </div> <div> Most Likely </div> <div> Pessimistic </div> </div>			
<div> Duration </div>			
Cost Estimate			

## Standards

A Guide to the Project Management Body of Knowledge. Newton Square, PA: Project Management Institute, Inc., 2000

## Templates

UW Madison – Division of Information Technology (DoIT) –  
Project Management Advisor  
<http://www.pma.doit.wisc.edu/templates.html>

# PROJECT CONTROL CHART

- Project control chart shows a trend in your project.
- Project control chart is a debrief tool to see what estimates were missed.

[illegible]

A project has 3 major parameters that must be managed during the life of the project:

## Scope



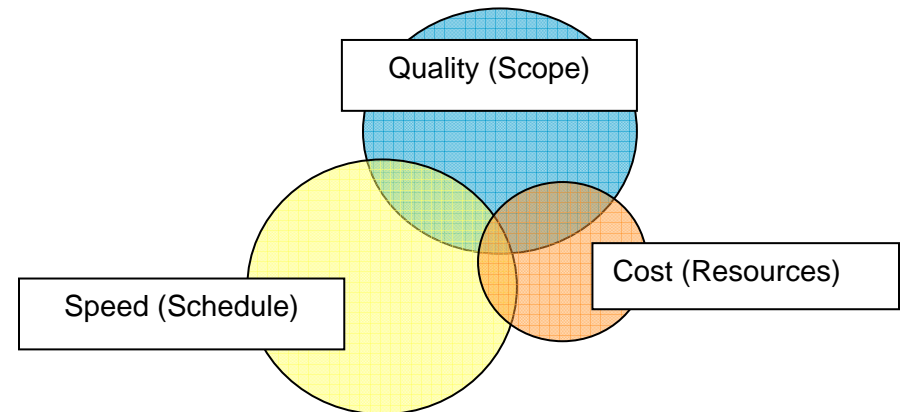
## Schedule



Cost



To illustrate this, consider a project in which you are soliciting proposals for improvements to be done by a contractor on your residence. To prepare his proposal, the contractor tells you (the Project Manager): "I can do it good (Scope), I can do it fast

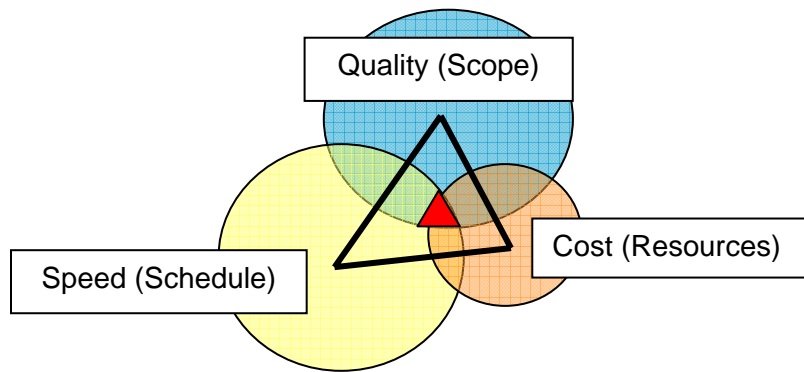


(Schedule), I can do it economically (Cost). But, you can only pick 2 of the three!" In other words, he is telling you that he can do it "good and fast, but it will be costly", or that it will be "good and economical, but I'll take my time", or that it will be "fast and economical, but not my best work". The contractor's response is an attempt at getting you to prioritize the parameters. As the Project Manager, you ideally like to see all 3 parameters in some kind of a balance – one or more possibly having more of a priority than the others. Perhaps, you have a limited budget, as illustrated in the Venn diagram to the right:

The outer boundaries of the circles represent how far any of the parameters could extend.

However, the small triangle where the three circles intersect represents where you would like to end up at the conclusion of

your home improvements. This represents the quality, cost, and time you hope your improvements will require. It is sometimes referred to as the Triangle Inner.



The area within a triangle formed by the centers of each circle represents the maximum extent of the parameters that you could live with, and still have a successful home improvement. If any one of the parameters goes outside this boundary, you may not be completely happy with the results (the project is a failure). This is sometimes referred to as the Triangle Outer. The difference between the inner and outer triangles can be thought of as the “contingency” or “what we know we don’t know” for each parameter.

## Links and Appendix

### Project Management Dictionary

<http://www.projectauditors.com/Dictionary/DictionaryHome.html>

### Associations/Certification/Vendors

The Project Managers home page

<http://www.allpm.com/index.php>

Project Management Institute, Inc.

<http://www.pmi.org/Pages/default.aspx>

PM Boulevard

<http://www.pmboulevard.com/Default.aspx?page=92>

Projects @ Work

<http://www.projectsatwork.com>

Ten Step Project Management

<http://www.tenstep.com>

PM Connection

<http://www.pmconnection.com>

Mind Tools, Project Management page

[http://www.mindtools.com/pages/main/newMN\\_PPM.htm](http://www.mindtools.com/pages/main/newMN_PPM.htm)

### Project Management Dictionary/Glossary

<http://www.allpm.com/glossary.php>

<http://www.projectauditors.com/Dictionary/DictionaryHome.html>

### Software

Microsoft Project

<http://office.microsoft.com/en-us/project/default.aspx>

Method 123

<http://www.method123.com/project-management-kit.php?AID=068830>

Primavera

<http://www.primavera.com>

- In-house
- Other Division/Agency
- Consultants - Costs
- Volunteers
- Stakeholders

#### Material Resources

##### Reference Resources, including:

- Applicable Standards/Guidelines
- Policies & Procedures
- Standard Specifications

#### Communication Resources

- Routine updates -Meeting action items
- Electronic reporting -Project status reports
- "Dash Board" reports

## What is a Project?

A project is a one-time, coordinated undertaking that:

- Has definable goals/outcomes
- Has interrelated and dependant tasks and activities
- Is finite in duration with starting and ending points
- Uses financial, staff, and/or equipment resources
- Produces unique products, services, information, results
- Operates with time, quality, cost, and scope constraints

What is a Project Manager? The Person ultimately responsible for providing the deliverables of a selected project to the customer.

#### Roles:

- Task Master and People person
- Integrator as well as technical expert
- Big picture thinker and detail person
- Consider politics and other priorities
- Balance the project with ongoing functions

## What is Project Management

Project management is managing everything that needs to be done to hand over the final deliverable to a customer in a way that satisfies the customer and key stakeholders and includes establishing a framework for managing the following processes:

- Change/Scope Management – a process to evaluate how changes will affect final deliverables, estimate impacts of changes on resources, costs and schedule, and to educate the customer about the consequences of changes. It should define how to request a change, how the request will be evaluated (cost, time, etc.), who will decide whether a change request will be accepted, how the change will be scheduled, an appeals process for denied change requests, and how changes will be documented and tracked.

- Issue resolution – a process to address any unexpected event that may jeopardize the output of the project and may include people, time, scope, quality, political factors, etc. It should define the type and severity of issues, how issues will be documented and tracked, how issues are assigned and resolved, and how and when issues are escalated.
- Risk Management (Risk: an issue that hasn't occurred but could severely affect the project) - a process to resolve or control risks during the project. It should define levels of risk and how they are assigned, how risks are documented and tracked, who is responsible for monitoring each risk, a plan to address each identified risk, and how to determine when the danger is gone or the risk is resolved.
- Approval or signoff – a process to ensure each deliverable is reviewed and approved by the appropriate people before continuing in order to develop shared responsibility and reinforce the customer's commitment. The process should define the main deliverables, who is responsible to sign off/approve each identified deliverable, and what steps must be taken if a deliverable is not approved.
- Communication Management – a process to determine the information needs of stakeholders and the how, what and when of meeting those needs. It should define the scope, deliverables, and roles/responsibilities, identify the audience/stakeholders, establish communication goals, determine a strategy for communication messages, establish communication tools and opportunities, establish measurements of success, and establish a communication timeline and activities.

## **Project Costs and Resources**

### Financial

#### Expenses/Fees

#### -Project Manager Responsibilities

- Influence the factors that create change to the cost baseline to ensure agreement
- Determine where or if the cost baseline is changed
- Manage changes as they occur

#### Budget

- Project budget is your baseline
- Develop and implement the Cost management plan
  - Cost control reports
- Compare budget to actual costs
  - Monitor variances to control costs
- Modify estimates
  - Adjust budget if necessary
  - Modify schedule if necessary

#### Estimates: Statement of approximate cost; Should utilize:

- Past Costs
- Established and accepted Price List
- Industry/Regional Standards or Guidelines

#### Resources Utilize all resources that are available to you including:

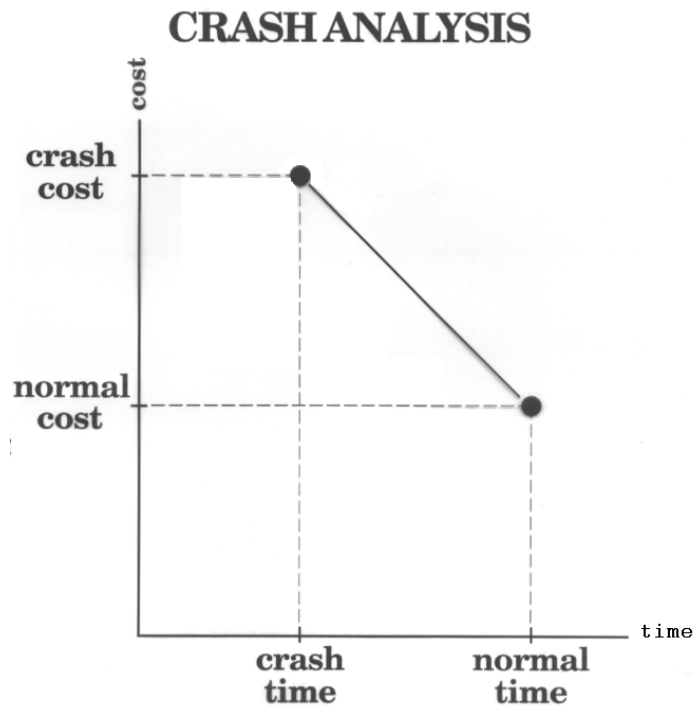
#### Personnel Resources



### Resource Allocation Based on Events

One potential event is the reassignment of a resource from one activity to another, which can occur under certain conditions. For example, if an activity requires more resources to complete it within a fixed period, this will trigger an event to reallocate the resource from another activity. Reallocation of resources can also occur when activity duration reaches a certain deadline or the cost exceeds a certain value. Events can be used to model different situations with resources, e.g. temporary leave, illness, vacations, etc.

A **Crash Analysis** is done when it is necessary to reduce the time for a project completion, or if deadlines have been jeopardized or missed. A graphic example of a crash analysis is shown below. Refer to the triple constraints for more information.



### Project Phases:

- Conceptualization – recognizing the business need(s) for a project and determining whether it is practical or not.
- Initiation – assembling resources in preparation for and actually commencing the work of the project.
- Planning/scheduling – determining the means, resources and actions necessary to complete an objective and when those resources are available and activities can or must occur in the overall project timeline.
- Executing/controlling – that portion of the project life cycle when the project deliverables are being created and managing the work activities within the established project triple constraints.
- Closure – completion of all work on a project and final approval of the project deliverables by the customer.

There are many useful templates available to the project team to manage Change/Scope, Issues, Risk, Approval, and Communication during the various phases of a project and a link to templates on the University of Wisconsin Project Management Advisor site is provided in the [Links and Appendix](#) section at the end of this primer.

A Project Charter is a document of an agreement between parties that explains how the project is going to be managed and structured. The document is a collection of all the information that the team needs to perform its day to day activities; it will define the basic approach or process to be taken. The document should clearly and concisely articulate the project strategy.

Resources / Budget: identify monetary and human resources available/required.

Note (1) the critical path is in yellow, (2) the slack is the black lines connected to non-critical activities, (3) when using MSP, you must use the task ID when labeling predecessor activities, and (4) since Saturday and Sunday are not work days (as described above) some bars on the Gantt chart are longer if they cut through a weekend.

[illegible]

Activity 1

Activity 2

Activity 1 Repeated

An activity or group of activities (small schedule) that augment the project schedule if a certain event occurs. The solution is to assign the mitigation plan to an event or event chain. These small schedules will be triggered when an event chain occurs. The same mitigation plan can be used for different events.

In the following example there are seven tasks, labeled a through g. Some tasks can be done concurrently (a & b) while others cannot be done until their predecessor task is complete (c cannot begin until a is complete). Each task has three time estimates: the optimistic time estimate (O), the most likely or normal time estimate (M), and the pessimistic time estimate (P). The expected time ( $T_E$ ) is computed using the formula  $(O + 4M + P)/6$ .

Act	Precursor	Opt. O	Norm. M	Pess. P	$T_E$ (O + 4M + P) / 6
a	--	2	4	6	4.00
b	--	3	5	9	5.33
c	a	4	5	7	5.17
d	a	4	6	10	6.33
e	b, c	4	5	7	5.17
f	d	3	4	8	4.50
g	e	3	5	8	5.17
aceg	critical	13	19	28	19.5
beg		10	15	24	
adf		9	14	24	
Sequential Task estimate					19.5

*Note:* All times are in **work days** (Mon - Fri, 8 A.M. to 5 P.M. with a one hour lunch break). Once complete, draw a Gantt chart or a network diagram (project management).

Deliverables: provides a list of the products or services that the project is expected to deliver the success criteria. If there is an on-going process associated with the project, performance measures for the on-going process will be deliverable.

Issues and Constraints / Risk Management: list any critical issues (time, funding, staffing, statutory requirements, change management, other organizational issues) affecting the successful completion of the project.

## Project Scope

Project Scope is one of the 3 primary project parameters addressed in the Project Charter or Program Statement and can be broadly defined as the sum of the products and services that are the result or the output of the project. Project Scope can and should be more narrowly and specifically defined for a given project by stating or describing all activities to be performed, the resources which will be consumed, and the end products which result including both quantity and quality standards. The scope should include limits of what is and what is not included in the project.

The elements of the Project Scope include the following:

Goals/Objectives: A goal is something you wish to accomplish and is broader than an objective – it is a desired and targeted happening. Goals should be 'SMART', that is, Specific, Measurable, Attainable, Results-based, and Time-bound. Objectives are predetermined results toward which effort is directed. If you are able to achieve all of the objectives you should reach the goal.

Deliverables/Outputs (numbers, size, quality, life expectancy): In broad terms any measurable, tangible, verifiable item that must be produced to complete the project. The term is often used more narrowly to refer to an external deliverable that is subject to approval by the project sponsor or client.

Level of Service: description of the project deliverables/outputs in qualitative terms and may be described in prescriptive or performance language.

Scope, in addition to the above items, may include:

Description of Work: a summary of the work that must be done to reach the project goals and objectives.

Measures/Metrics: used to define and determine the success of the project.

Tasklist (Work Breakdown Structure): a detailed list of all of the tasks that must be accomplished to perform the work.

period of time).  $T_E = (O + 4M + P) \div 6$ . 68% of projects are completed within the time designated by  $T_E + \sigma$  where  $\sigma$  = one standard deviation or  $(P-O)/6$ ; 95% are completed within  $T_E + 2(\sigma)$  and 99% are completed within  $T_E + 3(\sigma)$ .

- *Critical Path:* the longest possible continuous pathway taken from the initial event to the terminal event. Notes time delays that will delay the project.
- *Lead time:* time a *predecessor event* must be completed by in order to allow sufficient time for the activities to elapse before another event is reached.
- *Lag time:* the earliest time by which a *successor event* can follow a specific PERT event.
- *Slack:* measure of excess time & resources. **Positive(+)** indicates *ahead of schedule*; **negative(-)** indicates *behind schedule*; & **zero** indicates *on time*.

## Program Evaluation and Review Technique (PERT)

A method to analyze tasks involved in completing a project, especially the time needed to complete each task, identifying the minimum time needed to complete the total project.

- A *PERT event*: is a point that marks the start or completion of one or more tasks. It consumes **no time**, and uses **no resources**.
- *predecessor event*: event immediately preceding another event without any other events intervening. May be the consequence of more than one activity.
- *Successor event*: event that immediately follows another event without any other events intervening. It may be the consequence of more than one activity.
- A *PERT activity*: is the actual performance of a task. It consumes **time**, it requires **resources** (such as labour, materials, space, machinery), and it can be understood as representing the time, effort, and resources required to move from one event to another.
- *Optimistic time (O)*: the minimum possible time required to accomplish a task, assuming everything proceeds better than is normally expected
- *Pessimistic time (P)*: the maximum possible time required to accomplish a task, assuming everything goes wrong (but excluding major catastrophes).
- *Most likely time (M)*: the best estimate of the time required to accomplish a task, assuming everything proceeds as normal.
- *Expected time (T<sub>E</sub>)*: the best estimate of the time required to accomplish a task, assuming everything proceeds as normal (the implication being that the expected time is the average time the task would require if the task were repeated on a number of occasions over an extended

Risk Assessment (Allowable Risk, Assignment of Risk): considering the potential risks that may occur during the project, assigning a risk level to each, a response to each risk that may occur, and the overall amount of risk that can be tolerated

Network (Logic) Diagram: a schematic/graphic display of the sequential and logical relationship of the activities which compromise the project (also called a flowchart, PERT chart, or logic diagram).

### Level of Quality, may reference:

- **Quality Standards**: measurable physical properties or characteristics, which materials, equipment, or constructed items must meet at a minimum.
- **Standard Specifications**: written, pictorial, or graphic information which describes or defines the services or items to be procured or the deliverable of a project.
- **Established Guidelines**: a recommended or customary method of working to accomplish an objective.
- **Maximum or Minimum Constraints/Limits**: any applicable restriction which will affect or limit the project scope or when an activity can be scheduled.

Carefully defining the project scope is important. If the scope is too narrow you will not accomplish the desired goal and if it is too broad the project will be over-schedule, over-budget and may never come to a satisfactory end. The project scope should be monitored periodically to limit 'scope creep' which is a progressive increase in the scope in terms of project mission or objectives and with more work involved there are associated increases in the time and budget required to complete the project.

One final thought on project scope from the UW Madison Office of Quality Improvement. If project content is allowed to change freely, the rate of change will soon exceed the rate of progress.

## Project Schedule

To create a workable schedule, we use the following:

- The project's [triple constraints/control variables](#)
- **Critical Path Method**
  - [Dependency calculations](#)-determine causal logic
  - [A Work Breakdown Structure](#)
  - [PERT](#)- Calculating uncertainties in the estimates of the duration of each task
  - [Gantt Charts](#)- Arranging tasks to meet various deadlines
  - [Task Analysis/](#)
  - [Project Control Chart](#)
  - [Calculating crash](#)

### **Provides information**

- Tasks lists for people, and allocation schedules for resources
- Overview information on how long tasks will take to complete
- Early warning of any risks to the project
- Information on workload, for planning holidays
- Evidence
- Historical information on how projects have progressed, and in particular, how actual and planned performance are related.

### **Triple constraints**

As discussed earlier, Projects need to be performed and delivered under certain constraints. Traditionally, these constraints have been listed as **scope**, **time**, and **cost**. Each side represents a constraint. One side of the triangle cannot be changed without impacting the others.

The time constraint refers to the amount of time available to complete a project. The cost constraint refers to the budgeted amount available for the project. The scope constraint refers to what must be done to produce the project's end result. These three constraints are often competing constraints: increased scope typically means increased time and increased cost, a tight

**The 100% Rule...***states that the WBS includes 100% of the work defined by the project scope and captures all deliverables – internal, external, interim – in terms of the work to be completed, including project management. The 100% rule is one of the most important principles guiding the development, decomposition and evaluation of the WBS. The rule applies at all levels within the hierarchy: the sum of the work at the “child” level must equal 100% of the work represented by the “parent” and the WBS should not include any work that falls outside the actual scope of the project, that is, it cannot include more than 100% of the work... It is important to remember that the 100% rule also applies to the activity level. The work represented by the activities in each work package must add up to 100% of the work necessary to complete the work package. (p. 8)*

### **Mutually exclusive elements**

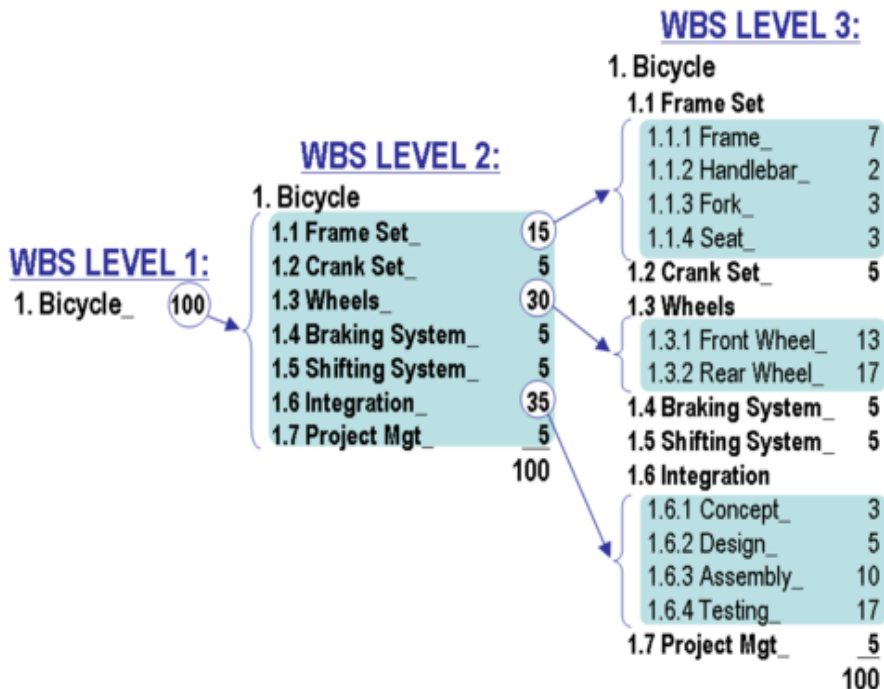
In addition to the 100% Rule, it is important that there is no overlap in scope definition between two elements of a WBS. This ambiguity could result in duplicated work or miscommunications about responsibility and authority. Likewise, such overlap is likely to cause confusion regarding project cost accounting.

### **Decomposition Considerations (Breadth vs. Depth)**

A common pitfall is to inadequately group related elements, resulting in one or more nodes of the WBS becoming "too wide" to support effective management. A common rule-of-thumb is to avoid having more than 7 immediate sub-elements below any given node of the WBS. It is common for WBS elements to be numbered sequentially to reveal the hierarchical structure. For example **1.3.2 Rear Wheel** identifies this item as a Level 3 WBS element, since there are three numbers separated by a decimal point. A coding scheme also helps WBS elements to be recognized in any written context.



**Figure 1: WBS Construction Technique.** This WBS is from PMI's *Practice Standard for Work Breakdown Structures (2nd Edition)*. This image illustrates an objective method of employing the 100% Rule during WBS construction quantitatively. At the beginning of the design process, the project manager has assigned 100 points to the total scope of this project, which is designing and building a custom bicycle. At WBS Level 2, the 100 total points are subdivided into seven comprehensive elements. The number of points allocated to each is a judgment based on the relative effort involved; it is NOT an estimate of duration. The three largest elements of WBS Level 2 are further subdivided at Level 3, and so forth. The largest terminal elements at Level 3 represent only 17% of the total scope of work. These larger elements may be further subdivided. In this example, the WBS coding scheme includes a trailing "underscore" character ("\_") to identify terminal elements. This is a useful coding scheme because planned activities (e.g. "Install inner tube and tire") will be assigned to terminal elements instead of parent elements. One of the most important WBS design principles is called the 100% Rule. The *Practice Standard for Work Breakdown Structures (Second Edition)*, published by the Project Management Institute (PMI) defines the 100% Rule as follows:



time constraint could mean increased costs and reduced scope, and a tight budget could mean increased time and reduced scope. The discipline of project management is about providing the tools and techniques that enable the project team (not just the project manager) to organize their work to meet these constraints. Another approach to project management is to consider the three constraints as finance, time and human resources. If you need to finish a job in a shorter time, you can throw more people at the problem, which in turn will raise the cost of the project, unless by doing this task quicker we will reduce costs elsewhere in the project by an equal amount.

### Time

For analytical purposes, the time required to produce a deliverable is estimated using several techniques. One method is to identify tasks needed to produce the deliverables documented in a work breakdown structure or WBS. The work effort for each task is estimated and those estimates are rolled up into the final deliverable estimate. The tasks are also prioritized, dependencies between tasks are identified, and this information is documented in a project schedule. The dependencies between the tasks can affect the length of the overall project (dependency constrained), as can the availability of resources (resource constrained). Project Managers will often make a call to double down to prevent a project from breaking deadlines in the final stages of the implementation phase. Time is not considered a cost nor a resource since the project manager cannot control the rate at which it is expended. This makes it different from all other resources and cost categories.

### Cost

Cost to develop a project depends on several variables including (chiefly): labor rates, material rates, risk management, plant (buildings, machines, etc.), equipment, and profit.

### Scope

Requirements specified for the end result. The overall definition of what the project is supposed to accomplish, and a specific description of what the end result should be or accomplish. A major component of scope is the quality of the final product. The amount of time put into individual tasks determines the overall quality of the project. Some tasks may require a given amount of time to complete adequately, but given more time could be

completed exceptionally. Over the course of a large project, quality can have a significant impact on time and cost (or vice versa).

Together, these three constraints have given rise to the phrase "On Time, On Spec, On Budget". In this case, the term "scope" is substituted with "spec(ification)".

### Project control variables

Project Management tries to gain control over variables such as risk:

Customers (either internal or external project sponsors) and external organizations (such as government agencies and regulators) can dictate the extent of three variables: time, cost, and scope. The remaining variable (risk) is managed by the project team, ideally based on solid estimation and response planning techniques. Through a negotiation process among project stakeholders, an agreement defines the final objectives, in terms of time, cost, scope, and risk, usually in the form of a charter or contract.

To properly control these variables a good project manager has a depth of knowledge and experience in these four areas (time, cost, scope, and risk), and in six other areas as well: integration, communication, human resources, quality assurance, schedule development, and procurement.

**Critical Path Method** is a mathematically based algorithm for scheduling a set of project activities. It is a very important tool for effective project management.

The essential technique for using CPM is to construct a model of the project that includes the following:

1. A list of all activities required to complete the project (also known as Work breakdown structure),
2. The time (duration) that each activity will take to completion, and
3. The dependencies between the activities.

Using these values, CPM calculates the longest path of planned activities to the end of the project, and the earliest and latest that each activity can start and finish without making the project longer.

This process determines which activities are "critical" (i.e., on the longest path) and which have "total float" (i.e., can be delayed without making the project longer). In project management, a **critical path** is the sequence of project network activities which add up to the longest overall duration. This determines the shortest time possible to complete the project. Any delay of an activity on the critical path directly impacts the planned project completion date (i.e. there is no float on the critical path). A project can have several, parallel, near critical paths.

These results allow managers to prioritize activities for the effective management of project completion, and to shorten the planned critical path of a project by pruning critical path activities, by "fast tracking" (i.e., performing more activities in parallel), and/or by "crashing the critical path" (i.e., shortening the durations of critical path activities by adding resources).

### Dependency Types:

1. Causal (logical)
  - *It is impossible to edit a text before it is written*
  - *illogical can't pour concrete before digging foundations*
2. Resource constraints
  - *It is logically possible to paint four walls in a room simultaneously but there is only one painter*
3. Discretionary (preferential)
  - *I want to paint the living room before painting the dining room, although I could do it the other way round, too*

### Work Breakdown Structure

(WBS) is a project management technique for defining and organizing the total scope of a project, using a hierarchical tree structure. The first two levels of the WBS (the root node and Level 2) define a set of Planned outcomes, not planned actions that collectively and exclusively represent 100% of the project scope. At each subsequent level, the children of a parent node collectively and exclusively represent 100% of the scope of their parent node. Outcomes are the desired ends of the project, and can be predicted accurately; actions comprise the project plan and may be difficult to predict accurately.

A well-designed WBS makes it easy to assign any project activity to only one terminal element of the WBS.