

unleash the  
**TRUE**  
**POWER**  
of the  
work  
breakdown  
structure



Josh Nankivel, BSc PM, PMP

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*For Tamara, Mazaryk, Draven, and Ryker*

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# Introduction

**T**hank you for your interest in one of the most fundamental project management tools, the Work Breakdown Structure.

## Why Work Breakdown Structure Training?

In my career, I have seen many project managers and organizations limp along on projects in ways that were preventable with proper use of the WBS tool. I created WBS Coach to help combat this problem. In addition to this version, there are additional tutorial videos and audio resources available in the complete digital training package at <http://WBSCoach.com>. There is a discount on that course available to you as someone who purchased this book. See the final page of the book for your discount code.

I wrote this book for the new or aspiring project manager, the “accidental” project manager who may have no background of approaching project management as a formal discipline, and even the experienced project manager who is looking to enhance their ability to manage successful projects.

## Why This is Not Like Other Books

Other project management “how to” books read like textbooks. My style of writing includes talking directly to you, the reader. I imagine that you and I are working for the same organization and are sitting together at one of our desks chatting about the topic. It may be helpful for you to imagine this same scenario as you read this book. I recommend you start at the beginning and read the chapters in order. Do not skip around because the lessons build on each other.

Since you have purchased this book, I will consider you my student for the time being. As such, you should feel free to contact me at [josh@WBSCoach.com](mailto:josh@WBSCoach.com) with your questions and feedback. It could be about this topic or project management in general. I also invite you to check out my free newsletters available at <http://pmStudent.com>. There are several to choose from and it is very likely one of them will fit your situation.

I realize that people learn and absorb new information in different ways. I have taken pains to organize this book in a manner that separate notes on your part should be unnecessary. At the end of Chapter 6 there is a WBS Checklist you can print out and use while implementing the concepts we will be discussing.

I have also tried to make it easy to refer back to this eBook when you need to. Have you ever noticed how many PDF files have a mismatch

between the page numbers at the bottom of the page and the actual page of the file? If you want to go to page 112 and just type that into the page navigation box at the top, you end up on page 111 or 115. In this eBook, you will get to the right page by typing in the page number.

Additionally you can use the bookmarks toolbar to navigate through the chapters. I have structured this file so that all chapters and subheadings show up as bookmarks to make it as easy as possible to navigate.

See the image on the next page for an example of what I mean. It is a screen capture using Adobe Reader. I circled in green the various ways to navigate through the file. I especially like navigating via the bookmarks pane. You can open this by clicking the icon on the left that looks like a ribbon bookmark hanging over a page. Or you can use the top menu by clicking **View >> Navigation Panels >> Bookmarks**.

35 81 75% Find

**Only Children Are Not Allowed**

A WBS element that is decomposed further must have a minimum scope. Otherwise, no value is added by decomposing it to a lower level in the hierarchy. For example, if element 1 has a scope of 20%, then its children, 1.1 and 1.2, must have a combined scope of at least 20%. Element 2 has a scope of 70%, so its child, 2.1, must have a scope of at least 70%. In this case, element 2.1 has exactly the same scope as element 2. This is redundant, unnecessary, and incorrect.

```

graph TD
    Project[Project] --> 1[1  
20%]
    Project --> 2[2  
70%]
    1 --> 1_1[1.1  
50%]
    1 --> 1_2[1.2  
50%]
    2 --> 2_1[2.1  
100%]
  
```

Figure J - Multiple children only. 2.1 is redundant

The next section is a little about me. Use this to get into that mindset where you and I are sitting at a desk having a discussion. It is important for you to be aware of my background so that we can have a good conversation throughout this book together. It will help you remember my lessons learned and the concepts we will discuss.

## About Josh Nankivel, BSc PM, PMP

I have been managing IT and non-IT projects in Computing, Financial Services, Telecommunications, and Aerospace for over a decade. I have also been a team member on projects in both technical (as a database developer) and non-technical capacities, and I have been a project sponsor. I have worked on projects with a Waterfall approach, Scrum Agile, and various mash-ups including some elements of Critical Chain project management.

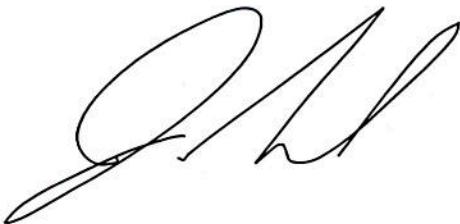
A major theme throughout my career is process improvement projects. My passion for processes has led me to lead many automation and organizational process initiatives. I initiated a sizeable chunk of these, as a sponsor or just a “concerned citizen” wanting to make things work better. That passion also makes me constantly evaluate my own project management processes and improve them on a continuous basis.

I was a professional trainer for several years before managing projects, and I love to teach. While working for Gateway computers I earned several internal technical training certifications and awards as a trainer before making the career switch to management and project management. My academic background includes a Bachelor of Science in Project Management and I am PMP certified.

I love to write and speak about project management. My blog at [pmStudent.com](http://pmStudent.com) has the goal of helping new and aspiring project managers learn about project management and reach their career goals. You can find my publications and interviews on dozens of sites and print publications. I am an avid volunteer for several project management organizations including the PMI New Media Council, past Vice Chair of Special Projects for the Students of Project Management Specific Interest Group (PMI). I speak from time to time at both large conferences and local events on various project management topics.

I live in Sioux Falls, South Dakota in the United States with my wife and our three sons. Oh, and I am a science & technology geek too!

Here we go!

A handwritten signature in black ink, appearing to read "Josh Nankivel". The signature is fluid and cursive, with a prominent initial 'J' and 'N'.

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Project Management Best Practices Instructor  
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## Chapter



# Chapter 1 - What Is A WBS? What Is It Not?

**R**emember a time when you had to do something that was so huge, so complex that you did not know where to start?

Many projects are exactly like this at the beginning. You only have a vague idea of what you are actually supposed to produce, and what it will take to make it happen. The Work Breakdown Structure (WBS) is essentially a special kind of outline, one that you use to plan and execute your project.

Have you ever started working on something and then kept having to change your plans repeatedly because of all the things you forgot you had to do?

Scope changes WILL occur on your projects, and you WILL forget to plan for activities and realize it very late. A WBS helps minimize these problems, and makes them easier to deal with when they occur.

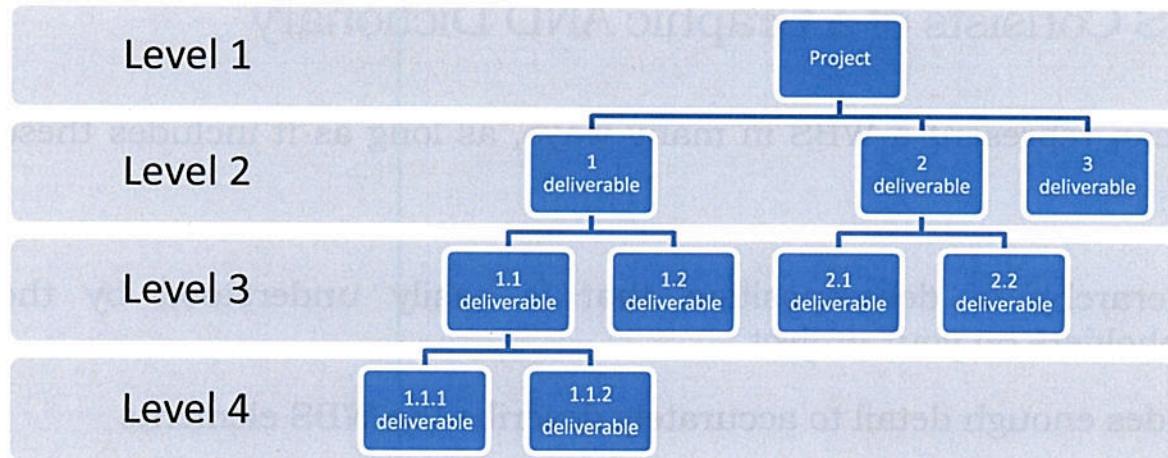


Figure A - Illustration of WBS graphic structure

## The WBS is an Outline

It is important to note that the WBS is an outline of the work; it is only intended to specify the **WHAT**, not the **HOW**. Just as in any standard outline, there is a level 1, level 2, level 3, etc. Each level decomposes the level above it in more detail.

The WBS needs to focus on outcomes (products or services) and not on tasks (how you will provide/produce them) or on resources (people and other resources doing the work). Do not go wrong with your WBS by trying to specify individual tasks with it. There are future steps where you will define individual tasks.

## The WBS Consists of a Graphic AND Dictionary

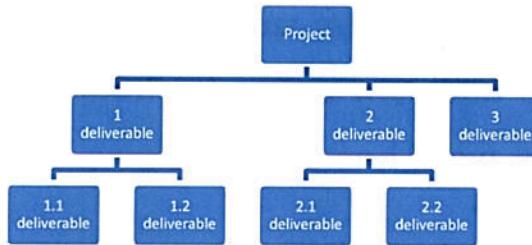
You can represent a WBS in many ways, as long as it includes these two things:

- ✓ A hierarchy of decomposition that is easily understood by the stakeholders on your project
- ✓ provides enough detail to accurately describe the WBS elements

Most organizations use a graphical representation of the WBS that looks similar to a company organizational chart. I have also seen the WBS in an outline format, and as a mind map.

The WBS dictionary is essentially just a collection of more detailed descriptions of the WBS elements. This is necessary because fully describing an element AND making it easily represented in a graphic format are two opposing goals. By using a numbering scheme and short title on the graphic and then providing more detail in a WBS dictionary, you get the best of both worlds.

I always include the WBS and WBS Dictionary in the same document. Never make your project team and stakeholders have to search for information. If they are looking at the WBS, everything the WBS holds should be easily available to them right there.



WBS	Element Title	Element Description
1	Deliverable	This is a detailed description
1.1	Deliverable	This is a detailed description
1.2	Deliverable	This is a detailed description
2	Deliverable	This is a detailed description
2.1	Deliverable	This is a detailed description
2.2	Deliverable	This is a detailed description
3	Deliverable	This is a detailed description

Figure B - WBS Graphic and Dictionary

## The WBS Defines Your Project

If a product or service is not on your WBS, it is not a part of your project. This outline of your project contains 100% of all the scope involved. Everything that is on your WBS is a part of your project. Therefore, at any time during the project you should be able to look at your WBS as the definition of all your project scope.

When someone requests a change at any time during the project (and they will), your first step is to go back to your WBS and see if this is really a change or not. The WBS graphic is a quick and easy way to help your stakeholders, sponsor, and project team understand what is and is not part

of the project scope. It also helps them understand why you have to stop and go through a process to add new scope (or take some away) and why you cannot just “fit it in” after work has begun.

Do not forget about project services when defining your WBS. This should be its own distinct item on your WBS. Even if it is just your work as the project manager, it is critical to include it. The same goes for support services that the project will use and relate directly or indirectly to the product you are creating. You may want to create a WBS item at level 2 called “Project Services” and then at level 3 break these down a bit further.

Here are some examples of project services. Depending on the size and complexity of your project, you may not have all of these, or you may have even more:

- ✓ Project Management
- ✓ Asset Management
- ✓ Configuration Management
- ✓ Quality Management
- ✓ Document Management
- ✓ System Administration
- ✓ Backups
- ✓ Security
- ✓ Administrative Assistant

## The WBS Helps Everyone Understand

A great benefit of the WBS (especially the graphic version of it) is that it helps everyone who is a stakeholder in the project share a common understanding of the scope.

Different people are interested in different parts of the WBS. For instance, your CEO may only want to know what the high-level scope is. She wants to know what you are delivering at a 10,000-foot view. Your software developer is mostly interested in the lowest level. He wants to know exactly what he will be expected to write code for, and what functionality it should deliver. Your engineer may “live” in between, being responsible for the integration of various elements but not worried about the minor details or the entire project either.

Additionally, you may have separate teams that care about a particular branch of the WBS but not so much about the rest. If your project has 10 subsystems that all need to work together, the team responsible for developing 1 subsystem may not care too much about the rest of the subsystems except for the interfaces between them. You may have 1 stakeholder for 4 subsystems, another stakeholder for the others. These stakeholders care very deeply about status reporting for their own pieces of the project, but not pay attention to the rest.

## The WBS is NOT a Task List

When I first began managing small projects, I used a task list to plan and remember what we needed to do. This is NOT a WBS, and it is not nearly as effective as a WBS either.

A task list has no levels of decomposition that clearly show how smaller pieces of scope will come together and produce the final output of your project. With a task list:

- ✓ You will lose sight of what the scope of your project really is
- ✓ You will not think of things that need to get done until you miss them  
“oh man, how did we miss that?”
- ✓ You will lose out on all the other benefits a true WBS gives you

The level of rigor you go through will vary depending on your project size and type. I have managed projects that lasted only a few weeks, and I used a WBS for them. The WBS is less complex and smaller on simple projects, and can get very large and complex on large projects. Complexity and size of the WBS correlate directly to your product(s).

## The WBS is NOT an Organizational Chart

Perry looked me straight in the eyes. “What do you mean I cannot organize my WBS this way? It is my WBS; I can do whatever I want!”

“Very true Perry” I said. “It is your WBS and you can do whatever you want. I am telling you that organizing your WBS artificially, to align with your organizational structure is a mistake. You will regret it later.”

Perry decided to do it his way. I knew he would uncover missing work his team had not thought of. Why?

Instead of being focused on the output of the project as a WBS should be, he organized it by one of the inputs, the resources doing the work. This takes the focus off the unique product the project is producing, and leads to unexpected omission of scope.

It can also lead to scope bloat! When you try to plan a project this way, scope can creep in that is not really a part of the product you are producing, and/or is not necessary to meet the requirements for your deliverables.

## The WBS is NOT Time-Phased

When you create a WBS, you will be tempted to organize it in phases. During the brainstorming process I will cover later, you will find it natural for people to think of work through time. “After we get that done, the next step will be...”

This is fine. When building a WBS I find it naturally tends to be in rough chronological order left to right, which is handy since the numbering scheme will probably go from left to right as well.

Some people say it is OK to organize your WBS by the phases of your project. In fact, the PMBOK Guide 4<sup>th</sup> Edition even has a graphic illustrating a WBS using phases for level 2 organization. **I disagree with this approach completely.** I have seen how this kind of project planning can lead to unstated assumptions and missing scope in your WBS. Again, you must focus on the unique product that your project is delivering in order to capture all of your scope in the most complete way.

There is a difference between organizing your WBS by phases and having some general chronology. For instance, System A may need to be developed before System B can be started, so your level 2 WBS items could be “System A” and “System B” and be in left-to-right order. That is fine.

If you put “System B” before “System A” that would be fine too. It may be more convenient to have “System A” be your 2.0 element and “System B”

be the 3.0 element just for aesthetics, but not necessary.

What is NOT fine is to organize your WBS by “Phase 1” and “Phase 2”. Phases are not deliverables or services, they are time periods.

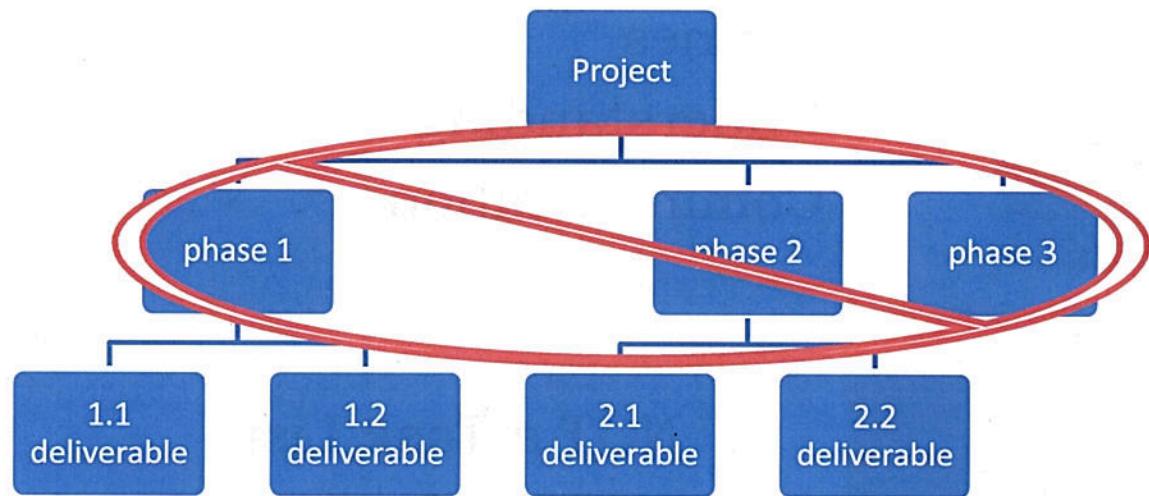
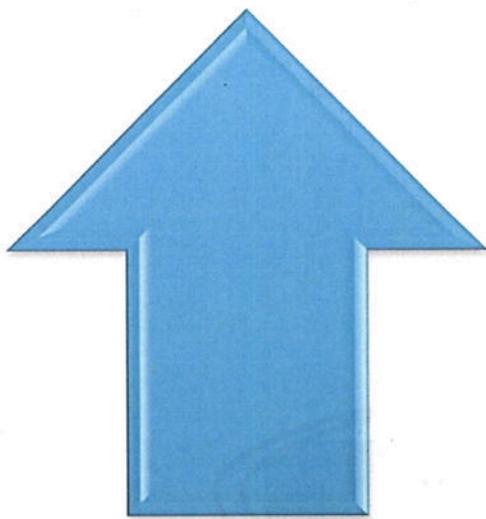
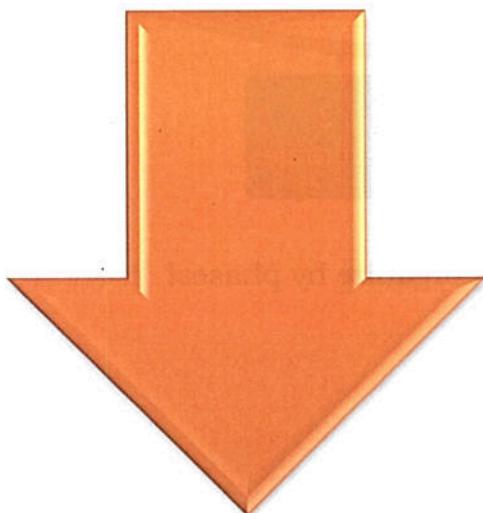


Figure C - WRONG way – do not organize by phases!

## What is a WBS? What is it NOT?

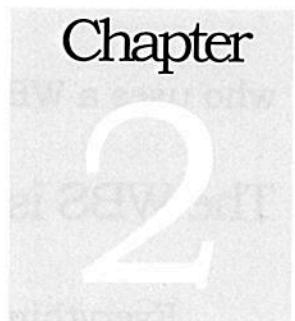


Outline  
Graphic  
Dictionary  
Defines  
Understanding  
Communication



NOT a Task List  
NOT an Organizational Chart  
NOT Time-Phased

Figure D - What is a WBS? What is it NOT?



## Chapter 2 - Why Do I Need a WBS Anyway?

**N**ow you have a general idea of what a WBS is, if you did not already. Let us talk about something else that is very important before we jump right into more chapters and tutorials about how to use the WBS tool.

Let us talk about WHY you want to use the WBS. Many times, people do a WBS because they “are supposed to”. If you do not understand exactly why a WBS is so useful on your projects, you will never use it to its full potential.

And that would be bad.

It would also be reflective of how most project managers treat their WBS, if they use one at all. Let’s do better than them. Let’s be the group

who uses a WBS on every project AND gets the most out of it.

## The WBS is the Foundation for All Future Activity

Everything else that happens on your project flows from the WBS. Project managers commonly refer to the triple constraints: scope, schedule, and cost. Your WBS defines scope. Schedule and cost can only be defined after you know what you are going to be producing.

Without the WBS, you have no deliverables to break down into scheduled tasks. Without either of these, you have no way to estimate costs. When you do your WBS correctly, the other project management processes become much easier to plan and manage.

## Use A WBS for Good Estimates

By breaking down work into smaller chunks, you end up with these things called work packages at the lowest level of detail. These end up being rather small in comparison to your whole project (usually less than 80 hours).

When you define work at this level, it becomes much easier to provide accurate estimates for how long it will take you to get things done. You then roll up these individual estimates to create your total project estimate.

Imagine you are going to take a 10-mile hike in the wilderness. Some

parts of the trail are familiar to you and others are not. Some parts are flat while others go uphill or downhill. Some parts have good trails that are easy to walk, and other parts are loose gravel. If you try to estimate against the whole 10-mile hike, it is going to be tough to get it right with all the variables involved.

Instead, break your hike up into chunks based on terrain. All of the chunks are unique subsets of the hike. You will have to “deliver” all of these sections of trail in order to “deliver” the hike. Each section will have different requirements and rate of progress based on the terrain. A difficult 3-mile section may take longer than a 5-mile section that is flat and smooth.

Some segments are going to be very similar to terrain you have hiked in the past, and if you timed yourself back then, you can insert actual historical data for your estimate. Do you see how structuring the work this way is helpful? Even if the similar terrain is not contiguous, segmenting this way helps you estimate. After you have estimated each element individually, add them up and you have your total estimate.

## Use A WBS to Help Assign Responsibility

Imagine your 10-mile hike is now a relay. Because you have decomposed the whole trek into smaller segments, it is now much easier to assign those segments to the right people. John is good at uphill climbs and Sarah has good knees for downhill hiking. Matt has strong ankles for rough uneven terrain.

The work package includes just enough definition so the resource (Sarah, John, or Matt) know what they should do and you can report progress sufficiently. It does not tell them how to hike, which boots to wear, etc. They are competent enough at these tasks to handle those details themselves and you do not need to specify them in your WBS.

This analogy of hiking is not perfect because on most projects, the team is going to be working both simultaneously and in sequence; not one or the other. A WBS for this hike would break down into elements like “uphill terrain”, “downhill terrain”, and “uneven terrain”. Time phasing comes in with the schedule, and you may have Sarah start the hike with a downhill stretch, hand off the baton to John, and then shuttle Sarah to the end where the last stretch is downhill again. (Be sure to include that shuttle service in your WBS too!)

Combine an Organizational Breakdown Structure (OBS) with the WBS to create a Responsibility Assignment Matrix (RAM), which is an assignment of responsibility for each work package in your WBS.

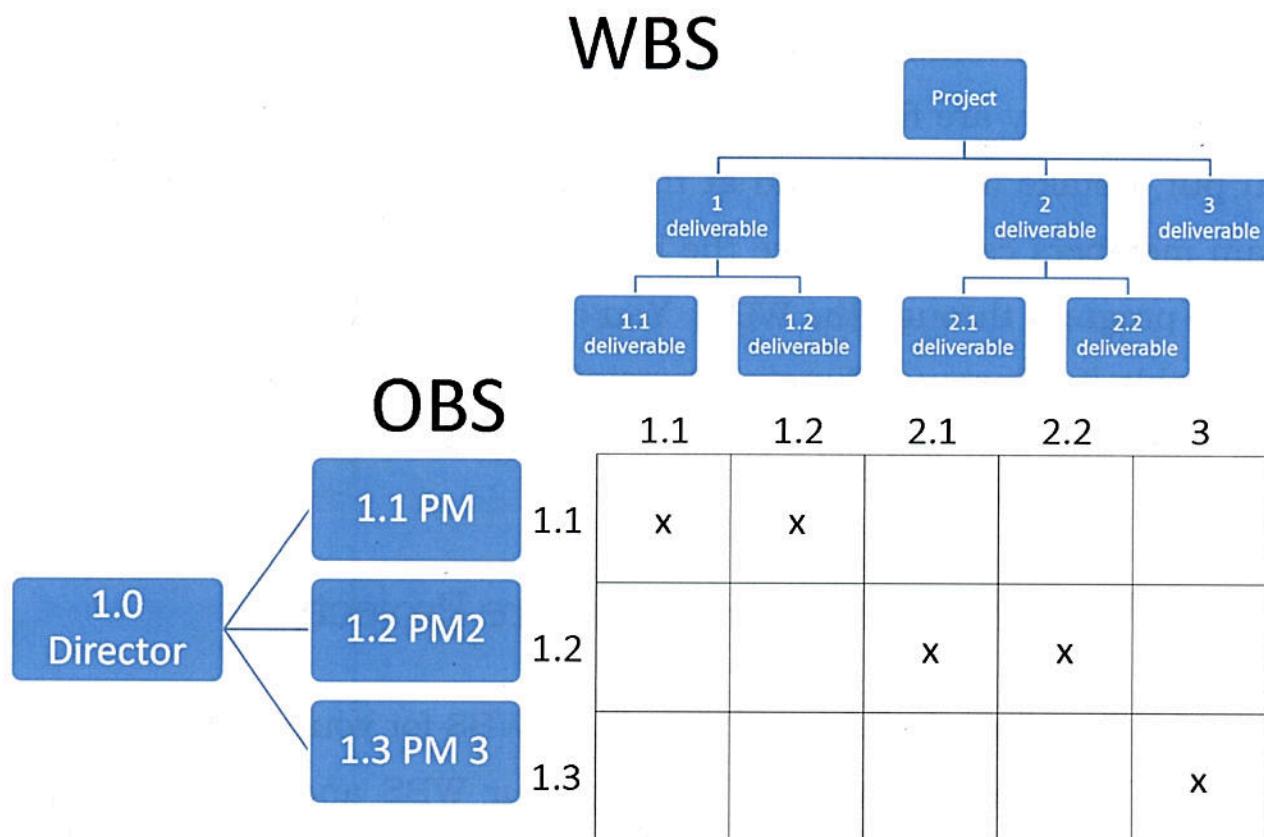


Figure E - Illustration of a Responsibility Assignment Matrix (RAM)

## Use A WBS for Ease of Measurement

Not only is it easier to estimate and assign people to work; a WBS also makes it easier to measure progress as you go along. When you have defined your deliverables and activities well, there is little to no ambiguity about when they are finished. In my example of the 10-mile hike, perhaps you put a stake in the ground at the beginning and end of each segment. Team members can clearly see the boundaries of their segments. You can roll up progress through the WBS. You can know how much of a particular deliverable (for instance “uneven terrain”) is complete. Communicate with your team and they will feel a sense of accomplishment along the way.

## Use A WBS for Reference on Future Projects

This is a marvelous benefit to using a WBS for your projects. If you do a good job in the beginning of creating your WBS and then MAINTAIN it throughout your project, it becomes part of what PMI calls “organizational process assets”. The next time your organization does a project, you can go back to this one and see if any re-use is possible for scope definition, estimates, etc. Even if a deliverable is not exactly the same, you can use past history as a reference point and scale it up or down. Any time you can use real data in your planning, take advantage of the opportunity.

## Use A WBS For Change Control

The work breakdown structure does not only function as a way to document and manage scope. When I started using it to its full potential it took on a completely new character and role in my projects.

Once the initial WBS is completed, the numbering scheme you choose is a great way to tie together all of the other pieces of your project. This means that from requirements through the WBS and to things like schedule, estimates, status reporting, etc. you have a consistent thread. When a change happens, this “traceability” allows me to find the specific requirements that are impacted by a scope change. It allows me to highlight the impacted schedule items for a requirements change from the customer. The positive impact on your project is enormous when you start seeing the WBS as the “central hub” of your entire project.

## A Consideration

You may be thinking to yourself “but Josh, my project is different. I am not building something. I am changing a process. Why do I need a WBS?”

## All Projects Have Deliverables

Service projects have deliverables, even if they are a special category of deliverables called activities. Research & Development projects have deliverables. All projects have deliverables, even if you cannot touch them. I will go into the different types of deliverables in the WBS Structure chapter but for now, you should know that every project needs a WBS of some sort if you want to be truly effective.

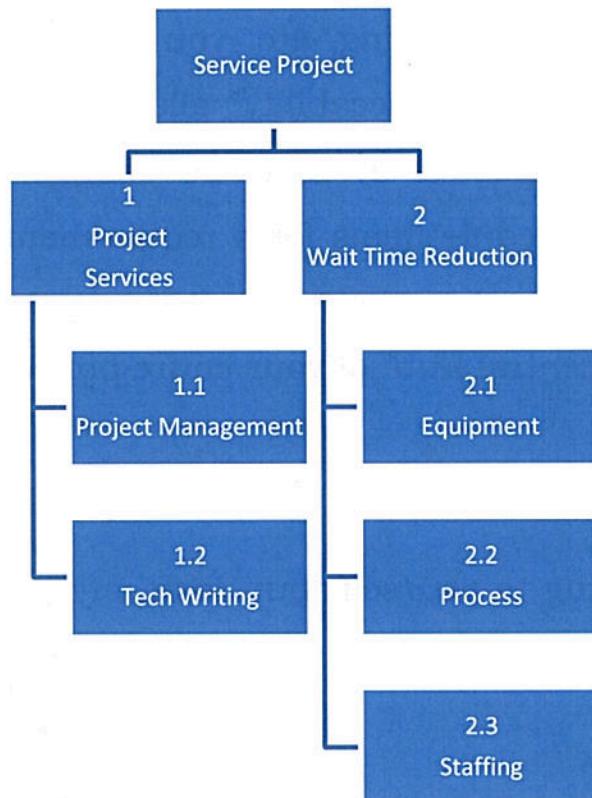


Figure F - Even service projects have deliverables!

## Why Do I Need a WBS Anyway?

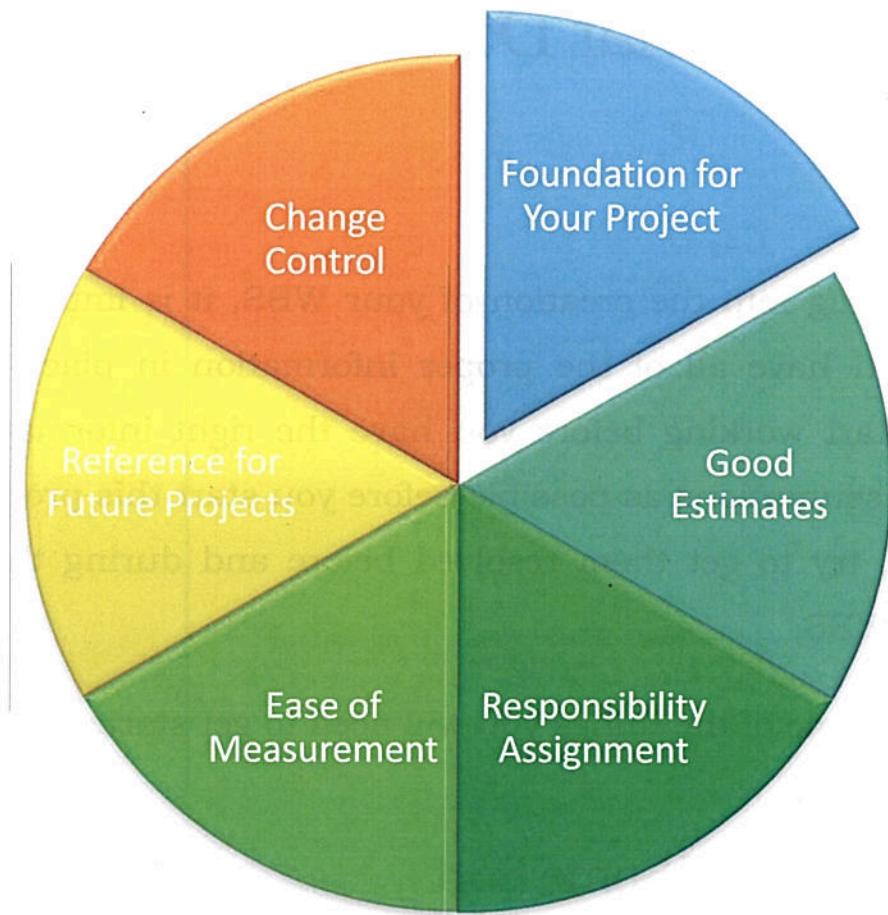
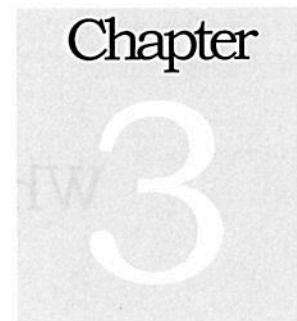


Figure G - Why Do I Need a WBS Anyway?



## Chapter 3 - What Do I Need Before I Start?

**B**efore diving into the creation of your WBS, it is important to make sure you have all of the proper information in place. It may be tempting to start working before you have the right information. Try to make as few assumptions as possible before you start this process. If there are questions, try to get them resolved before and during the process of creating your WBS.

Here are some of the things you will need to get started.

### A Project Charter of Some Sort

This could be a formal charter, or it could be as simple as an email. To me, it is critical that it be in writing however, not just a verbal agreement. Writing it down clarifies the goal of the project right from the beginning, and reduces the risk of future discord and misunderstanding.

This provides several critical functions

- ✓ Authorizes the project work
- ✓ Gives you authority to manage the project
- ✓ Specifies the high-level objectives/goals the project should achieve.

## High-Level Requirements

This should be in the project charter, but it is important enough for me to stress it twice. The people who thought this project should be done have a vision of what the result should look like. As the project manager, it is your job to make sure that vision is improved upon throughout the project and turned into reality.

Based on what you already know about the project objectives from the charter and speaking with the sponsor and customer, formulate some questions in your own mind about the project at a high level. I find it helpful to think in terms of constraints and metrics to define high-level requirements more precisely.

For instance, if the customer's goal was to decrease turnaround time, do not let them get away with that kind of ambiguity. What are we aiming for? 6 hours? 10%? Is there an operational process that might be impacted, and if so should a constraint be specified about the impact to operations?

Even if they do not have a solid answer for you, the process of asking these questions will help give you a better idea of the high-level goals of the project. It will likely help clarify the customer and sponsor's ideas about the project too, and keep all of you on the same page.

## Information from Previous Projects, If Available

Email. Word documents. Spreadsheets. If you have formal artifacts like a WBS from previous projects, even better.

All of these things can be referenced by the project manager and team when identifying and documenting the scope of your current project in the WBS. If the previous projects are similar enough, sometimes you can even start with a chunk of documentation that is already written and tweak it a bit to make it fit your project. I recommend you do this sparingly however, as it is easy to overlook aspects that are unique to your own project if you rely too heavily on past projects' assumptions and documentation.

## Who Is Involved?

The most important piece of creating your WBS is going to be involving the right people. I know many project managers who create the WBS by themselves, and just check it with their teams afterwards. Maybe this works for some people, but to me this is simply **wrong**.

You are likely to have many smart people on your project team. They know a lot about the work they do. They are the experts. They will catch things you do not. If you get the entire team (at least the leads) to collaborate on a WBS you will be amazed at how many things they think of collectively that you never would have thought of yourself.

Let me be clear. Even if you have the utmost technical expertise, you still should not do the WBS by yourself. If that were the case, you could just sit down with your chief engineer and plan the whole thing.

I am saying you should not do the WBS by yourself because you need lots of eyes and brains involved in this process. Every major area of scope needs representation from someone who knows it intimately. This way, the people who really know this stuff will ask the right questions like “how will my subsystem interface with your subsystem?” Or “who is taking care of xyz functionality? We will need to make sure one of these systems does that.”

You also want to bring in key stakeholders and the project sponsor. These people will not be a part of the team actively working on the project, but will be the users of the product after everything is finished, or are responsible to make sure the project fulfills the unique business need for which it came to be.

If you are unable to involve any of these key people in the creation of your WBS, I suggest you stop and find out why. In corporate culture today, we tend to hold meetings even though key people are not present. I am asking you to buck that trend. If someone who is key to the process is not there, reschedule. Reach out to them and sell them on why it is important **to them** that they be fully engaged in this process.

If you do not follow this rule and key stakeholders are “filled in” later about what the team came up with, I guarantee you will regret it. They **will** come back and ask why so-and-so functionality was not included. Just wait and see.

## What Do I Need Before I Start?



Figure H - What Do I Need Before I Start?

## Chapter

4

## Chapter 4 - How Do I Structure My WBS?

You will find me ranting on [pmStudent.com](http://pmStudent.com) from time to time about the need to understand underlying concepts before diving into a tool. The WBS is no different.

There are some very important considerations to bear in mind during the process of creating and maintaining your WBS. Forgetting some of these will mean big problems for your project at some time or another, probably when you least need to be spending a lot of time putting out fires. This chapter is about fire prevention with your WBS.

## Deliverables VS Activities

Everything in your WBS is a delivery of some sort. They could be something tangible like a foundation of a house, or they could be service oriented, like project management or integration of other elements on your project.

## Deliverables Or Activities, Not Tasks

Be sure the items are NOT tasks. A task is “provide project management services”. An activity is “Project Management”. Every element on the WBS should be a noun or a gerund. A gerund is a word ending with “ing” like planning or engineering. I try not to use gerunds in most cases because they can be confused with teams or functions in some cases, but there are times where they describe the WBS element best.

“Josh, this seems like a trivial thing. Why worry about it?”

I am so glad you asked.

The WBS should make it crystal clear WHAT is being produced by your project. It should not dictate the HOW, WHEN, WHY, or even WHO. By keeping it focused on deliverables and activities, you avoid these distractions. In my experience, focusing this way leads to clarity of scope

you will not achieve if you try to do everything all at once.

The following table gives some examples to illustrate my point. The verb version makes it difficult to determine what needs to be broken down further. It seems as if you have already identified a task, so why break it down further?

When you read the noun version, It is easy to ask yourself the question “What does [noun/deliverable] consist of?” and break it down into smaller pieces.

Verb	Noun Version
Design Website	Website Design
Research Tools	Tool Selection
Write Chapter 4	Chapter 4
Integrate	Integration

Figure I - Use Nouns (or gerunds) for your WBS elements!

Later on in the project planning process, you will start creating tasks which support your WBS and identify HOW, WHEN, and WHO. (WHY should already be clear in your project initiating documents and/or project charter.)

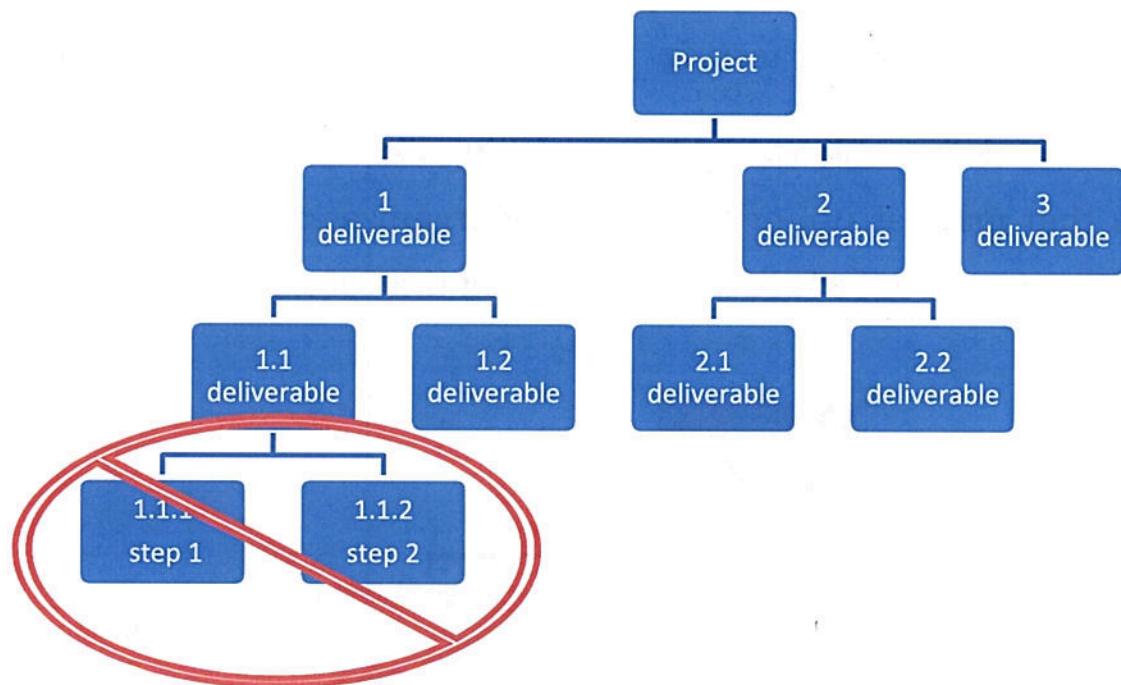


Figure J - No tasks on the WBS!

## External VS Internal

“Project Management” is a good example of an internal deliverable. It is something that makes the project run, but is not a part of the product that end users will likely see. Configuration Management is another good example, and so is training or testing.

An external deliverable would be something like an IT system and the subsystems that make it up, or the resulting organizational transition and benefits from a project to reduce the turnaround time of a process.

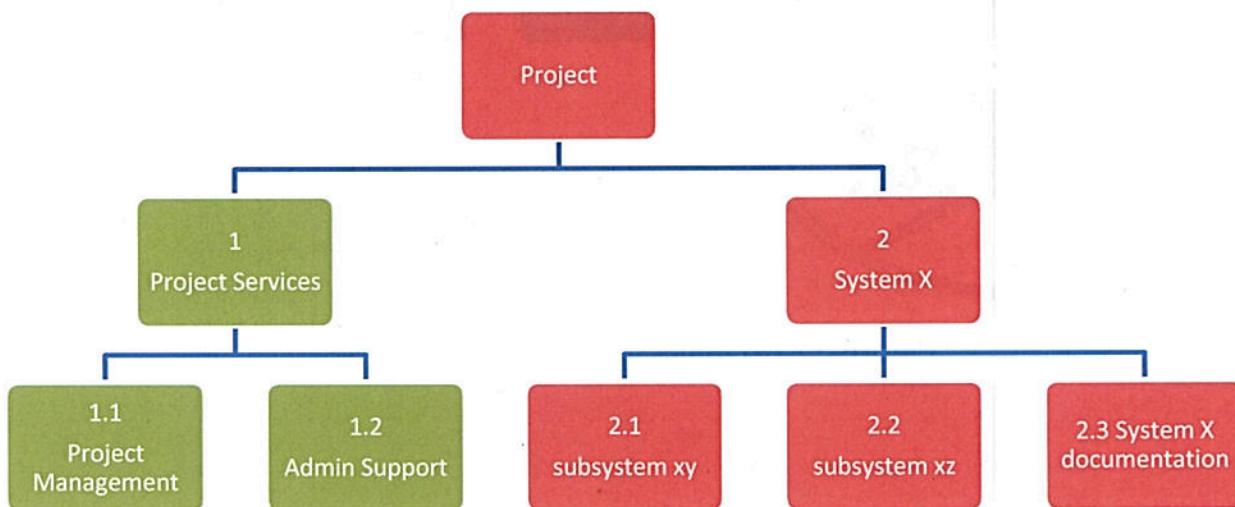


Figure K - Internal (green) and external (red) deliverables

## The 100% Rule

This is a very simple rule. In your WBS, when you add up the lower-level items that are decomposed from a higher one, they should add up to 100% of the scope. 1 item decomposed into 5 means those 5 items still have to represent 100% of the scope in the higher level item.

In other words, do not leave stuff out.

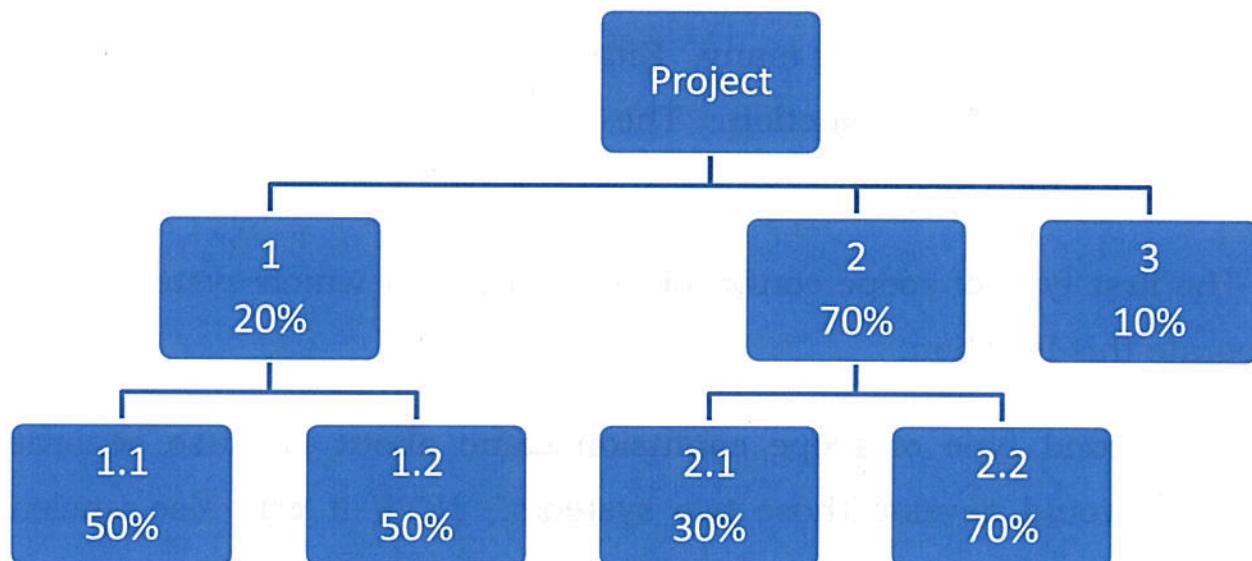


Figure L - Illustration of the 100% rule

## No Redundant Scope

At some point after the creation of your WBS, you will need to assign each work package to resources on your project. Have you ever worked on something as a part of a team and run into conflict because more than one person thought some specific thing was their job?

I remember a specific example where this occurred. It resulted in two types of scope confusion because the WBS was too fuzzy. There were two systems on the project among many. Either of the two may have been able to carry out a particular function. The WBS (and requirements) did not clearly specify which system.

The first type of scope confusion was regarding which system would incorporate this function.

The second type of scope confusion came about because separate contractors would develop those two systems. NOW it was also unclear which contract should be developing this too. That had a direct impact on the contract value and many political ramifications.

I have also seen cases where the “fuzzy scope” was fun and exciting, and two people got their hopes up to be responsible for it. Upon discovering this, you pull something away from someone who was looking forward to it. This is not a great team-building event, jealousy and discontent may ensue!

Each element in your WBS represents a distinct and unique piece of scope on the project. When scope could be shifted around between elements or people it is especially critical you do this well. Otherwise, you could wind up with wasted effort because the same scope is in two places, or conflict when your team starts fighting about it.

## Use a Consistent Naming Convention

If you use a descriptive name such as “order entry system” to describe WBS elements then stick with it. Do not use descriptive terms in one place, and then specify the specific names of other systems. For instance, let’s say you know you will be using a system called “ACE” for one element but do not know the rest. Rather than specify “ACE” I would use a more descriptive term such as “order entry system”. That would be consistent with the other systems AND make it clear to a casual observer what that WBS element is, without having to dig down into the WBS Dictionary.

You may discover that “ACE” really is not the right solution after all. Do not corner yourself by making too many assumptions about the solution.

## How Much Detail?

Some project managers always use the same level of detail in their WBS for every project they do. For instance, they may specify that all work packages are at level 4 of the WBS, and designate level 3 for all control accounts.

This is wrong.. You should keep decomposing the work until you get to something called a Work Package. Work packages can happen at level 2, 3, 4, etc. for the same project. The work package is the lowest level of the WBS for any given “branch” because it is something you can hand off and assign to a person. Work packages have owners.

How will you know when you have decomposed your WBS far enough? About 80 hours per work package is standard, except for some service elements like “Project Management”.

Also, look at the people who will be doing the work. Is it fine enough so they could take it and get it done? Is it clear enough for them to understand the scope and run with it? Would they be able to start identifying the tasks that will be necessary to accomplish the work?

Ask yourself these questions. After doing this for a while, you will probably get to the point where you just know how much detail is needed. It will come natural.

## Only Children Are Not Allowed

A WBS element that is decomposed further must have a minimum of 2 children. Otherwise, you add no value by decomposing it to a lower level in the WBS. In the figure below, 2.1 has exactly the same scope as 2. This is redundant, unnecessary, and confusing.

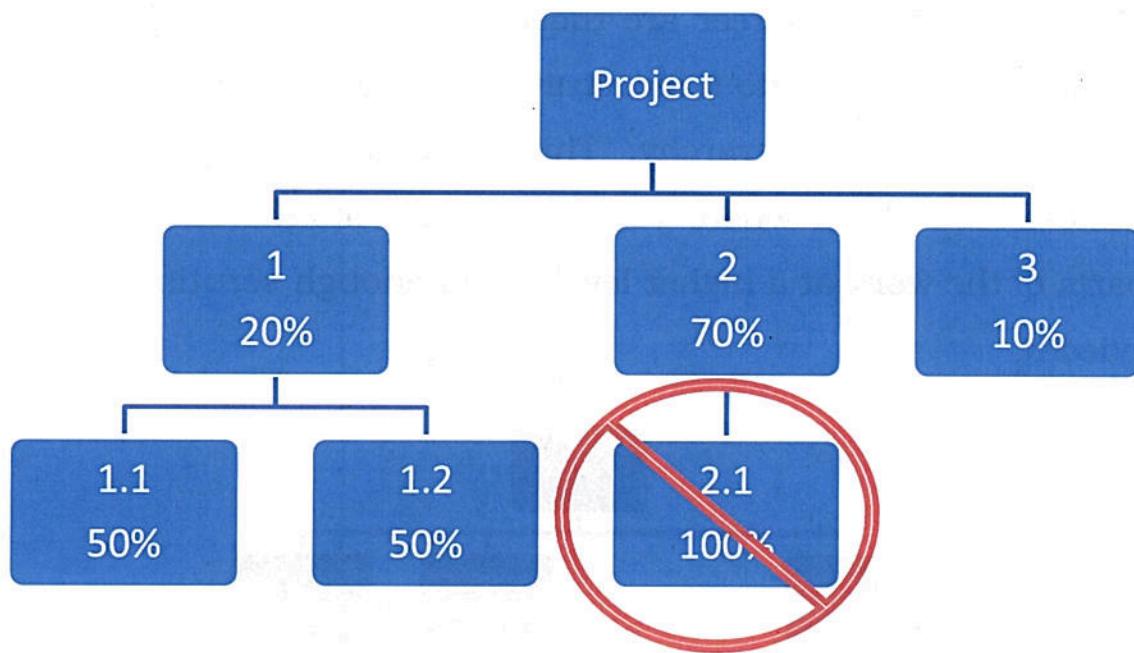


Figure M - Multiple children only; 2.1 is redundant

## Not All WBS Elements Are the Same

Work packages can reside at various levels in your WBS. There are also different types of WBS elements, and they serve drastically different purposes on your project.

## Work Packages Live at Different WBS Levels

“Project Management” normally stays at level 2, although I have seen cases where work packages for project management reside at level 3.

For different sections of your WBS (and on different projects), there will be a variety of different levels at which work packages lie. One of the pitfalls I have seen in my career are those where project managers try to artificially force their WBS into a structure where all work packages live at the same level in the WBS hierarchy. This results in many problems down the line, like forced detail where you could have monitored & controlled specific parts of the work at a higher level or not enough scrutiny where you really needed it.

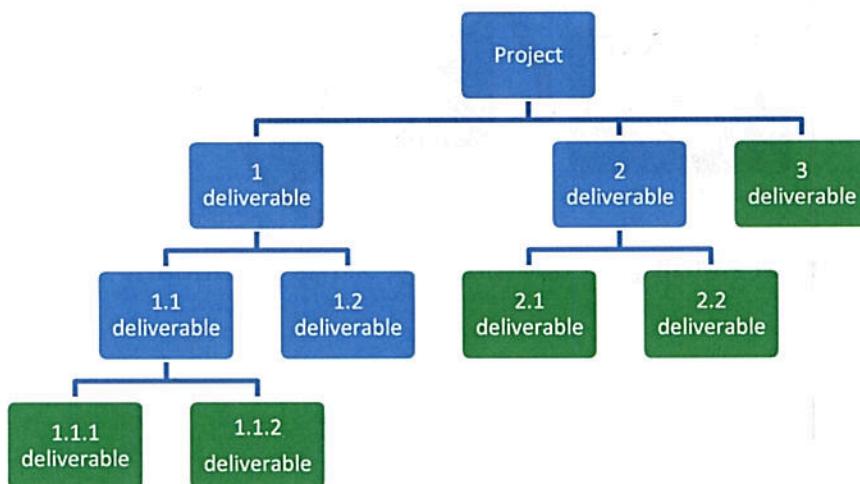


Figure N - Work packages defined across multiple levels

## Support Elements

A support element is a special type of WBS element. It does not relate directly to a tangible output of the project, but brings other pieces together or supports them in some way. Sometimes project managers will split these out into integrative and process elements, but I personally find this distinction unhelpful. This type of activity supports other elements; that is the bottom line.

For example, let's say your project is delivering a software program. That software program contains several subsystems or modules, and you represent each of these as a separate element on your WBS. You have different people developing these subsystems. Integration is the process of ensuring these subsystems work together properly; that their interfaces can talk to each other the way they need to, etc.

The support element here is a special activity, which ties together other WBS elements. Do not take this for granted; call it out separately somewhere in the WBS. The same goes for testing... if you do not call out testing as a separate activity, it probably will not get the attention it deserves. Make it a separate element and define the scope of that element well.

Do NOT assume that support activities will occur within the various elements. It is a separate activity and requires definition.

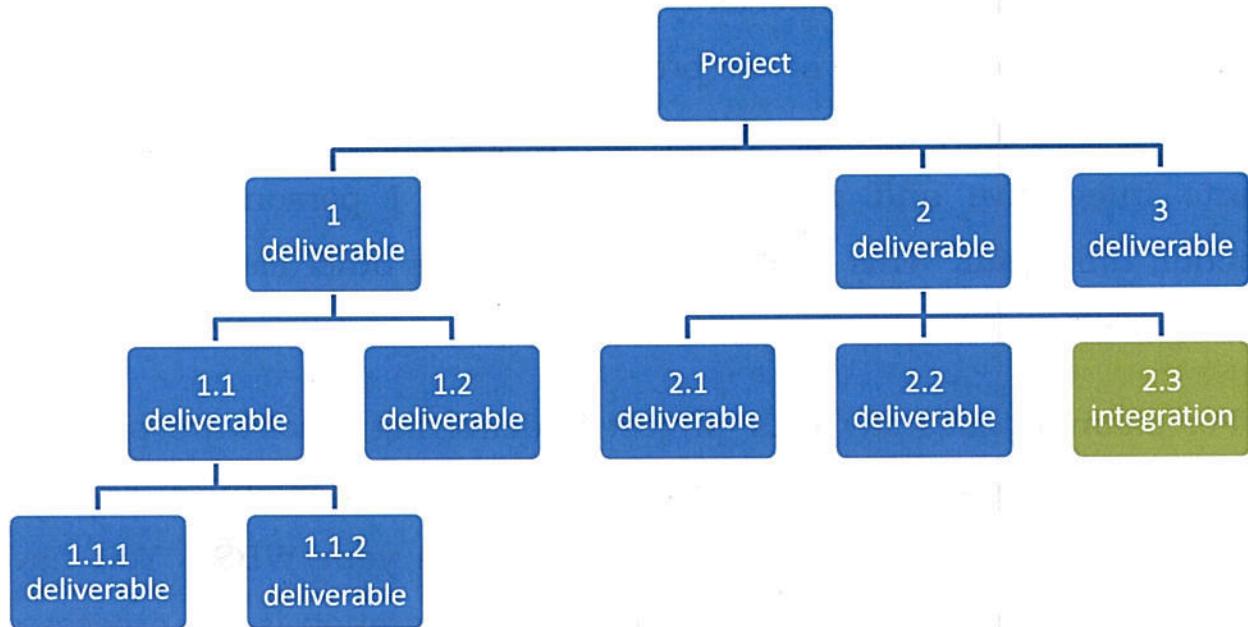


Figure O - Support element illustration (green)

## Analytical Elements

Analytical elements in a WBS are another special kind. On my last project, the “Science R&D” element is a good example of this. The work going on here does not directly result in the creation of a product, but it is a necessary piece of activity that is required to make the project successful.

Often, outputs from analytical elements are input for other WBS elements at various times in your project’s life cycle. For instance, the “Science R&D” element may produce algorithms and other information and data, which an engineering activity requires for proper design of their system.

Another example would be an element which will do trade studies to inform the selection of a particular technology or approach. It is important that the analysis work is separate from the design, development, and implementation work that happens after selection of the approach. If you get too fuzzy with this, you are inviting scope creep and an inability to know accurately which type of work is happening when and where.

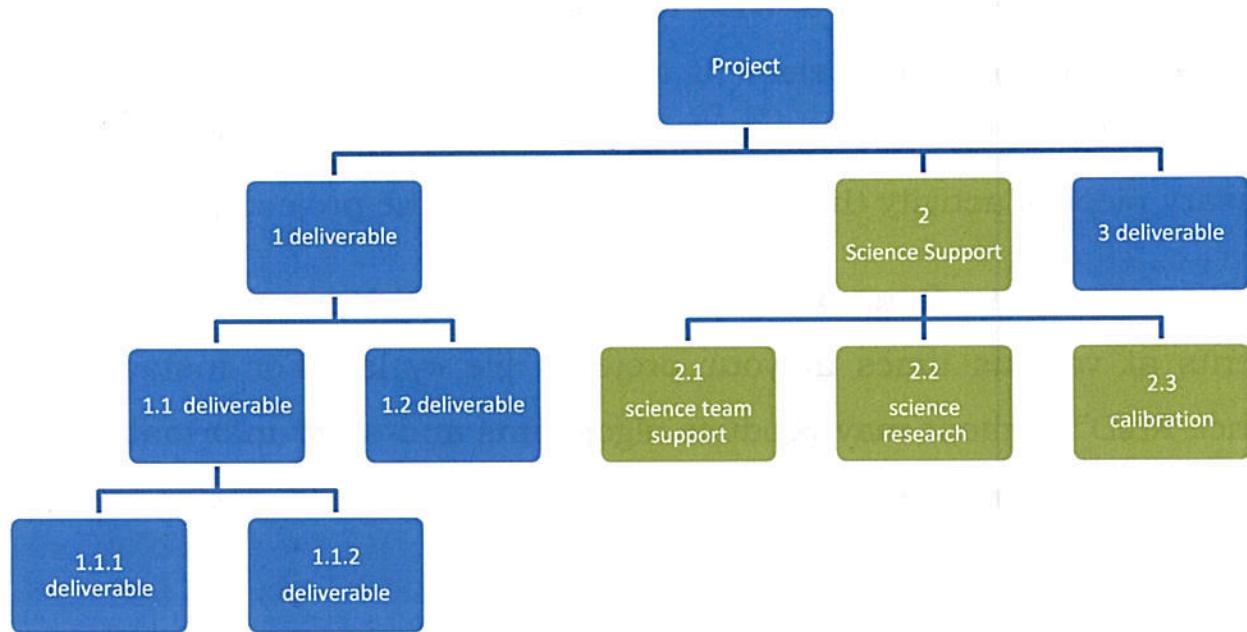


Figure P - Analytical elements illustration (green)

## Project Management Elements

So where is the work of the project manager defined? Unfortunately, in many projects I have seen the answer is simple.

Nowhere.

Yikes. Realize right now that your WBS defines what is in scope for your project. This includes your work as the project manager.

I do recommend you be somewhat flexible here. Define the project management activities to the level of detail that makes sense. Remember that you will be responding to events as they occur, so you need to allow for that “fire fighting” activity.

Here are just a few examples of activities and deliverables that come out of the project management element. On a large project, you may see these items as separate WBS elements. On smaller projects, the work package may just be “Project Management” or “Project Services” with a thorough description in the WBS Dictionary.

- ✓ Schedule Management
- ✓ Risk Management
- ✓ Reporting
- ✓ Management Plans & Artifacts
- ✓ Project Monitoring & Controls

- ✓ Administrative Support
- ✓ Configuration Management

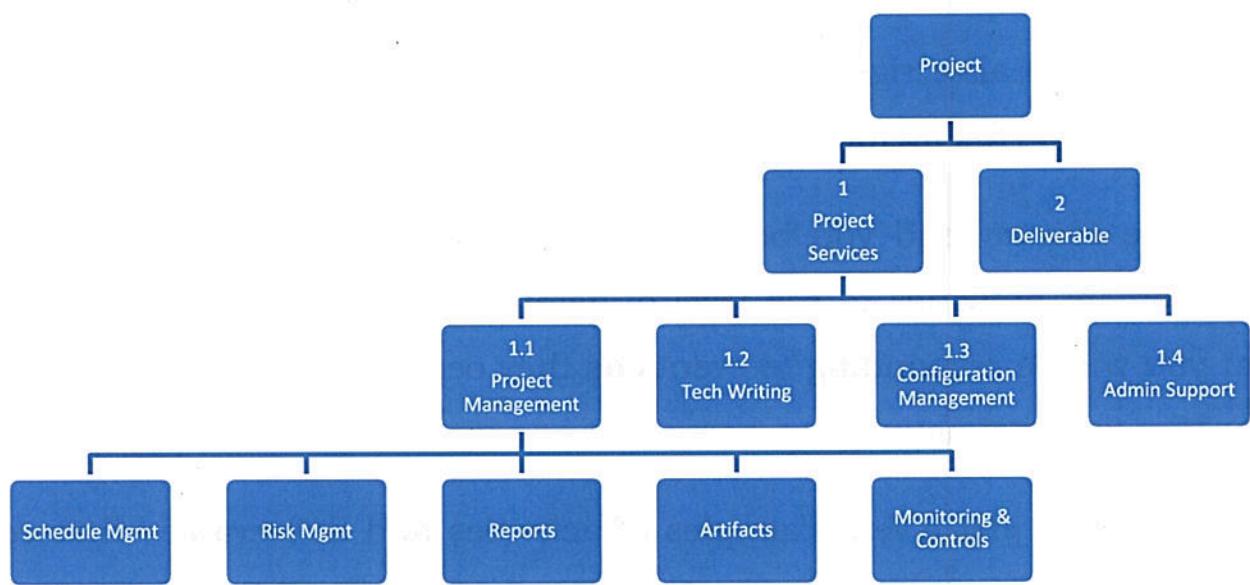


Figure Q - Project management elements illustration

## How Do I Structure My WBS?

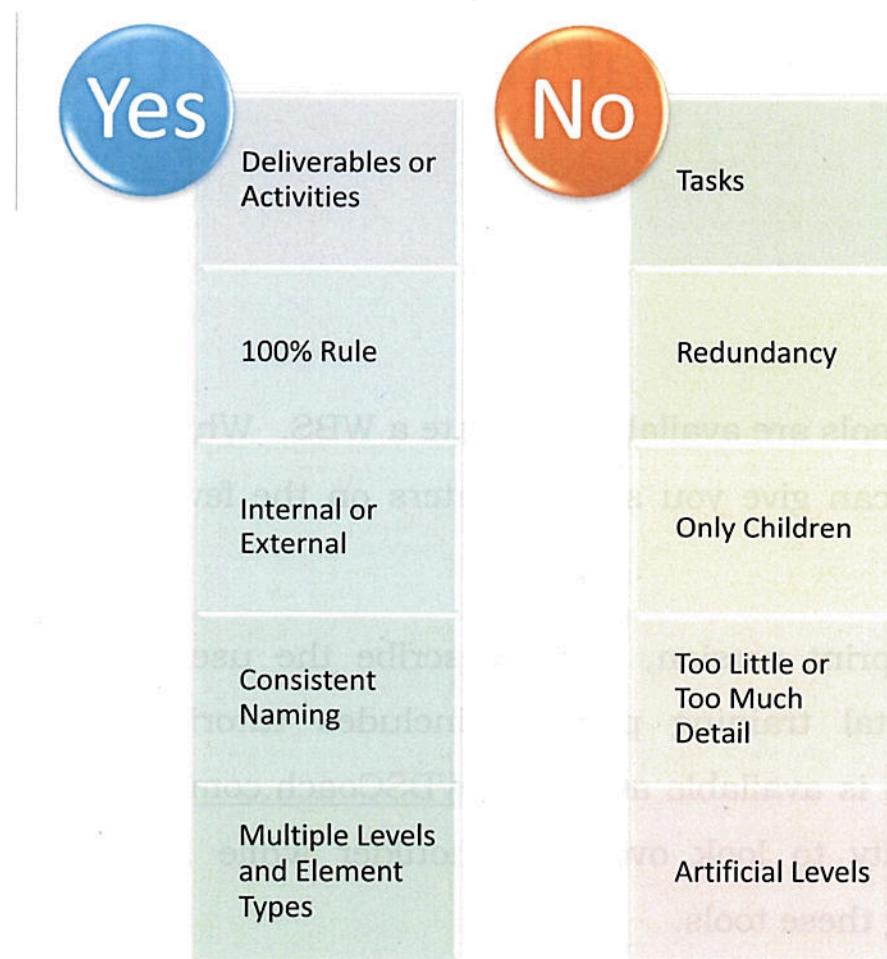


Figure R - How Do I Structure My WBS?

## Chapter

A large, stylized number '5' is centered within a light gray rectangular box.

## Chapter 5 - What Tools Can I Use For My WBS?

**M**any tools are available to create a WBS. While I cannot cover them all, I can give you some pointers on the few methods and tools I have used.

In this print version, I will describe the use of these tools. The complete digital training package includes tutorial videos and audio resources and is available at <http://WBSCoach.com>. There you will have the opportunity to look over my shoulder while I create sample WBS artifacts using these tools.

With the computer-based software applications in this chapter, I recommend using some kind of online desktop-sharing software if you have remote users that will be assisting. I have used vyew.com for this (free) and WebEx, and there are many other options available. Be sure to use a

robust conference call phone or VOIP solution so everyone can speak and hear clearly. You will also need to project the screen or do something similar so everyone can see and be engaged in the process.

Do not have a projector? You could do a WBS planning session with everyone at his or her own desks. Use vyew.com or some other desktop sharing software to share your own computer screen with everyone, and go to it!

## Post-It Method

This technique is very popular in the project management community. All you need is a flat surface like a wall or board, post-it notes, and the right people all in the same room. This does not work well if you have remote team members; they really have to be in the same room if this is going to work.

Team members all have their own pad of post-it notes, and they start writing down activities or deliverables for the project. At first, you just stick these on the wall anywhere. As you start getting more, group them together in local sets of deliverables or activities.

A great way to start the process is by identifying the high-level deliverables. From there you can break those large deliverables down into

their constituent parts. Stay focused on deliverables though (nouns or gerunds) and do not make the mistake of jumping into tasks!

The advantage of the post-it method is that for a co-located team it removes technology and focuses on the human interaction completely. It is easy for someone to step up to the board and move a piece to demonstrate where they think it should go, etc. It makes the planning process more tangible when individuals take action instead of viewing a computer screen or projector.

This is a great opportunity for you as the project manager to act as a facilitator, allowing everyone to have the chance to write out their own post-its and put them on the wall. If the project manager does all the writing and handling the post-it notes, you have missed an opportunity to get everyone truly engaged. The whole team should be standing up and sitting down repeatedly throughout the whole process. If someone is not contributing, you can always ask him or her some leading questions about their area of expertise.

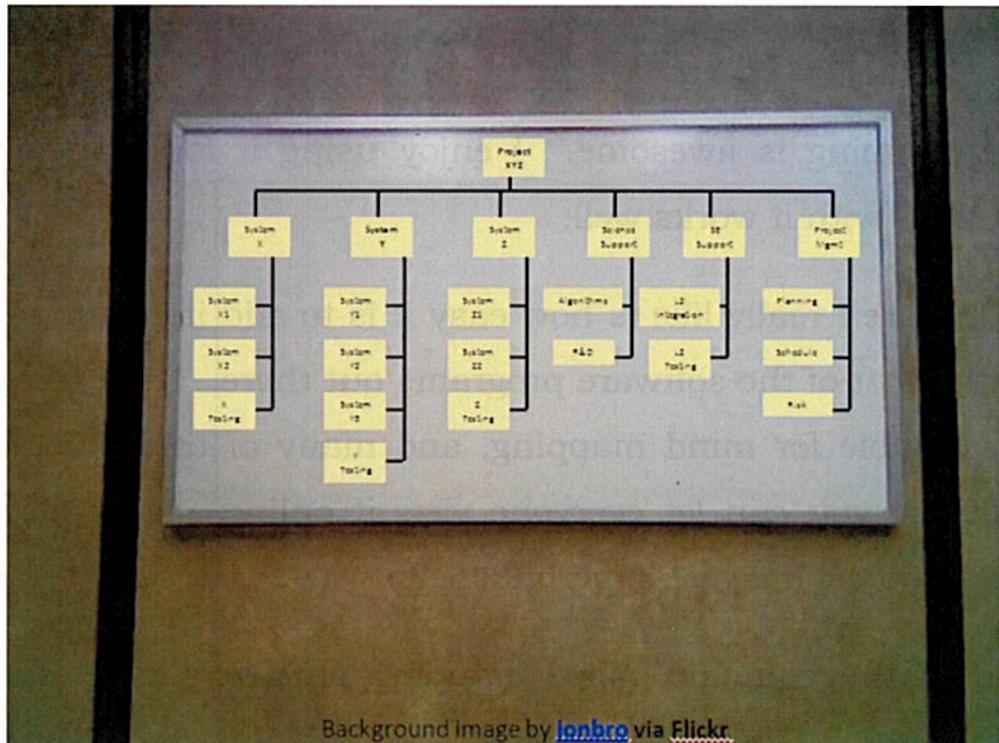


Figure S - Post-it Method

Of course, you will have to have someone transfer the final WBS structure to an electronic format. Otherwise, you will not be able to baseline, control, and provide the WBS as a reference to your stakeholders.

## Mind Mapping

Mind mapping is awesome. I enjoy using it for many things, and building a WBS with it works well.

One feature I really like is how easy it is to add items and move them around with most of the software programs out there. Even free web-based tools are available for mind mapping, and many of them include sharing functionality so you can let everyone view it online. Most also allow the option to add notes, images, hyperlinks, etc.

Some of the common mind mapping tools available include Mind Manager, Mindomo, XMind, Free Mind, and Mindmeister. Mind Manager, Free Mind, and XMind are local applications you install on your computer. Mindomo and Mindmeister are cloud applications, meaning the companies host them and you just need an internet browser to access them. Free Mind and XMind are open source, which means they have a free version available, whereas Mind Manager is a paid-for software package. Both of the cloud applications have a free level of functionality and a paid version, which allows more collaboration, file storage, and other options.

The best thing about mind maps for a work breakdown structure is the non-traditional representation of the project level in the middle. This ensures that any time phasing does not occur and you focus entirely on scope.

Mind mapping software also automatically gives you the ability to expand or collapse branches of a mind map. This is helpful because you are then able to export graphic snapshots of the WBS that are specific to your audience. For instance, you may just export a graphic of level 2 deliverables for status reporting to senior management. In other cases you may just expand one particular branch that is relevant to a particular stakeholder and leave the other branches they do not care about collapsed.

I normally export a mind map to an image file such as .jpg, .gif, or .png in order to insert it into the WBS document along with the WBS dictionary. If you do this, you can either export the image first then import it into the WBS document, or copy and paste from one application to the other. If you decide to copy and paste, be sure to do a “Paste Special” operation in Word and use the “enhanced metafile” option. If you do not, I have had problems with printing the documents in the past where the image will be completely black even though it shows up fine on a computer screen.

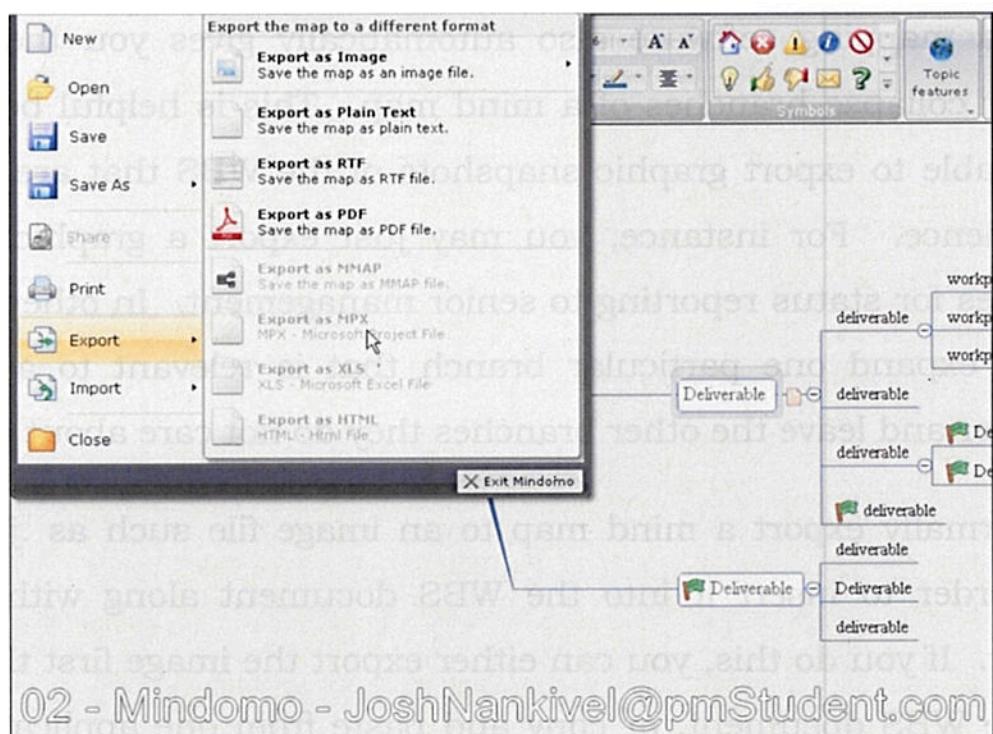


Figure T - Mind Mapping

## Visio

Visio is certainly an option for creating a WBS graphic. I personally have used this option, but will probably not use it much in the future. It does not come standard with the Microsoft Office suite of applications and you can have problems sharing it in the Visio format if people do not have the application installed themselves. There are options like having them download the free Visio viewer application or exporting the WBS to an image file for sharing purposes.

Still, Visio is a solid tool and you can do many cool things with it if you use advanced features. It can generate a WBS from a database connection or by importing/linking to a file if you know what you are doing. I will not go into that level of detail with Visio, but the options are there.

You can use the organizational structure wizard that is built-in to create a WBS. Sometimes this works great, but the automatic layout options can be problematic and you may have to mess around with them a lot. I have had instances where I added a new WBS element only to have the entire layout destroyed and sometimes it takes a long time to get it looking presentable.

Visio is very flexible in that you can use different shapes and colors to call out specific WBS elements (for instance if you wanted to highlight all the control accounts in green) or if you want to color all WBS elements at specific levels.

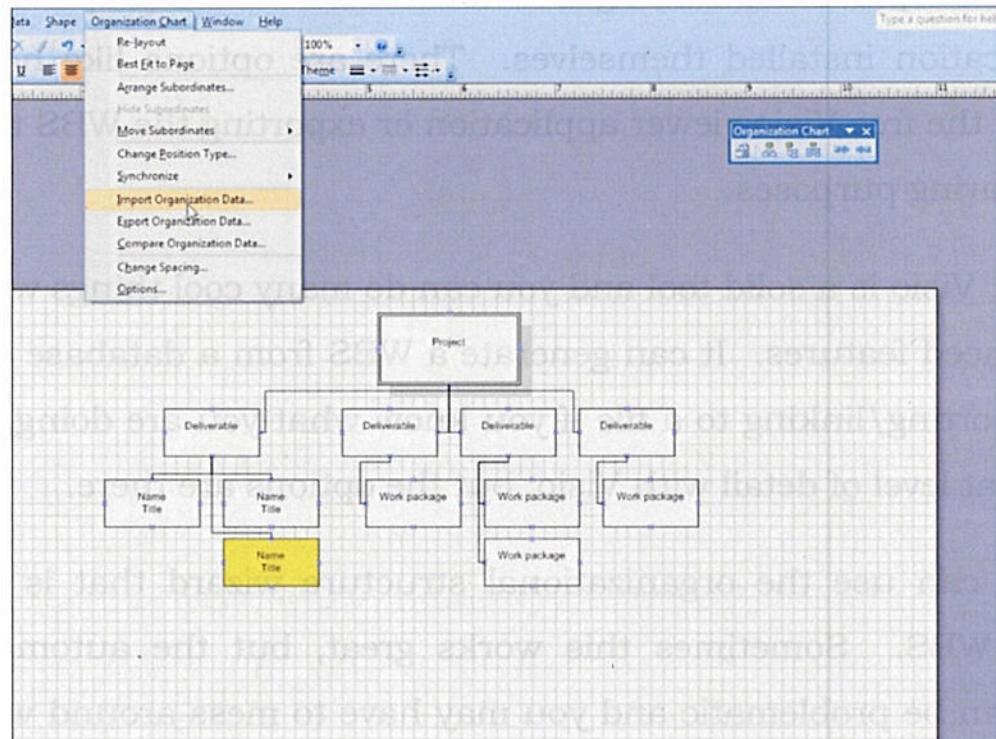


Figure U - Microsoft Visio

## Word

One simple solution for creating a WBS is using Word. Features built-in to Word will allow you to create the graphic. The great thing about this is you do not have to worry about importing images into a Word document, just create the WBS graphic right inside the document itself!

Just go to Insert >> “Smart Art” and insert an organization chart into the document. From there you can use the toolbar to add WBS elements. You can also click on the border of the WBS box and bring up a list-view outline of the WBS. This is a great way to edit and create the WBS.

I will use the graphic to add and move elements when collaborating with the team to create and modify the WBS. Then, you can open up the organization chart (list view) and copy/paste this into a table to start your WBS dictionary.

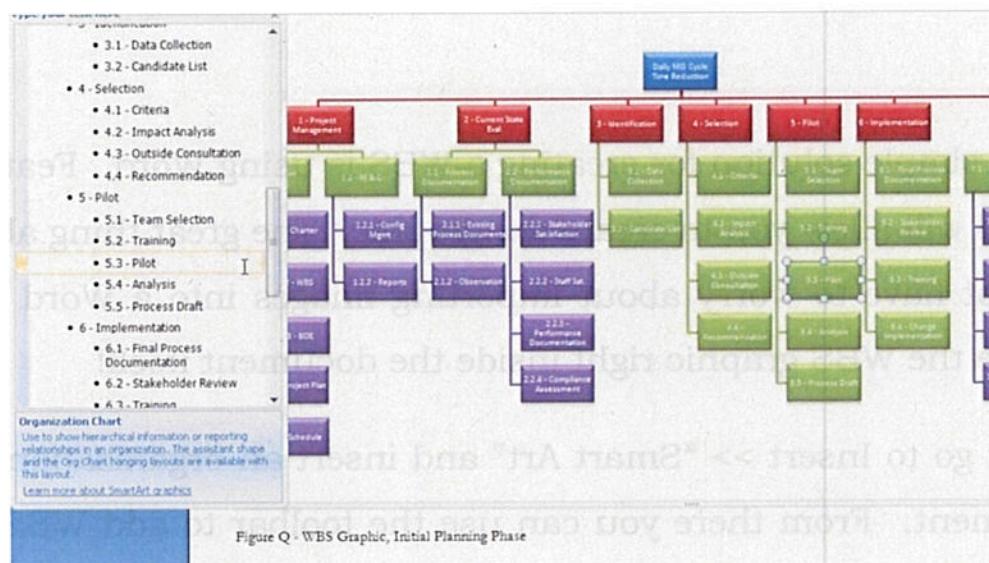


Figure Q - WBS Graphic, Initial Planning Phase

Figure V - Microsoft Word

Excel

Excel is an option to create list-format WBS artifacts that can work well, although I prefer the visual approaches of mind mapping or an organizational chart structure.

Start on the left column as Level 1, and then as you move to the right each column moves to a lower level in your WBS. This gives you a work breakdown structure that is not very pretty, but contains the information you need in a condensed format.

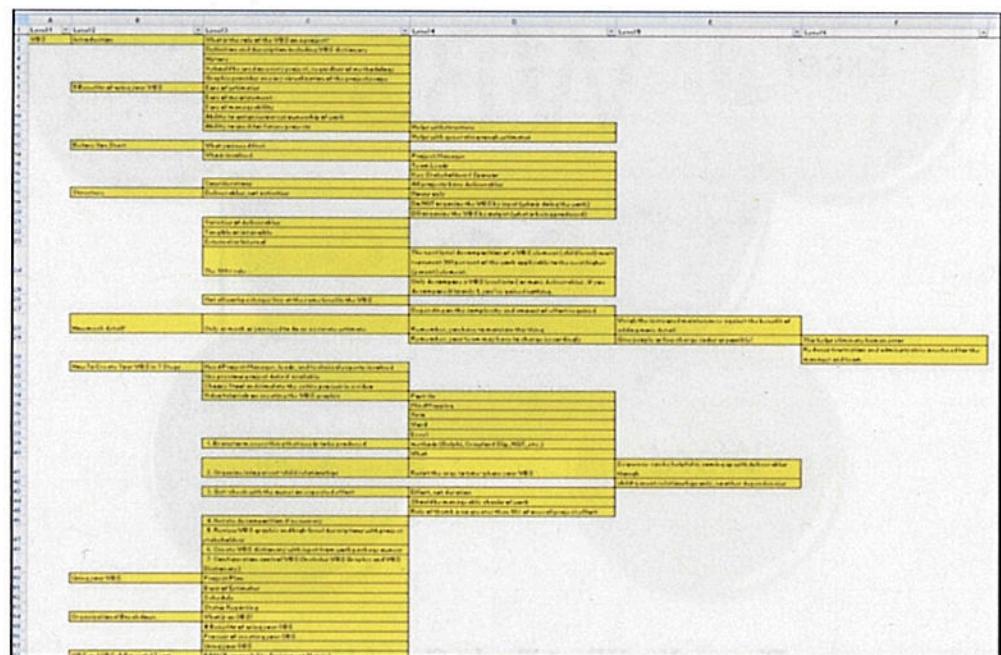
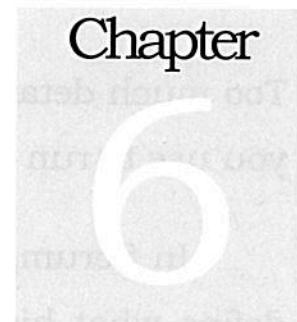


Figure W - Microsoft Excel

## What Tools Can I Use For My WBS?



Figure X - What Tools Can I Use For My WBS?



## Chapter 6 - How Do I Actually Create A WBS?

**T**here are as many ways to create WBS as grains of sand on the beach. (Well, perhaps not that many!) I am going to walk you through my preferred method of creating a WBS. This applies to any project, large or small. The amount of rigor you apply will change based on the specific size and complexity of your project, but the steps are all relevant everywhere.

On the topic of iterative project management methodologies like Scrum and others, I have some experience. In my experience with Scrum, I was a team lead but not a Scrum Master or Product Owner. We did not implement Scrum in its fully prescribed way per the creators of that methodology.

I have found this process of WBS creation useful on every type of project, even in Scrum. The WBS is high-level enough to work well in an iterative environment, or at least it can be high-level if you make it that way.

Too much detail in any WBS can be detrimental regardless of what method you use to run projects.

In Scrum, the product owner can use and maintain the WBS to help define what high-level deliverables will be produced without planning the details. In this way, the team plans individual sprints (these are the iterative cycles in Scrum) to define features and functionality using regular feedback they receive from the end users.

## 1) Review What You Already Know

I start WBS planning sessions by reviewing the project charter and high-level requirements. These are helpful to identify at a high level what the project should produce.

Normally if there is a good charter available (which you as the PM may need to write in many cases!), it is good to review the charter with the team. The following are particularly important to keep in mind as you go through the WBS creation process:

- ✓ Who will be using the results of the project? Who are the key stakeholders?
- ✓ What are the goals and objectives of the project?
- ✓ What is explicitly NOT part of the project's goals and objectives?
- ✓ What constraints are in force?

Rather than have individuals read the charter separately, I suggest you walk through the document together. If necessary, summarize the charter in bullet point format and walk through that. Everyone should be clear about the initial state of the project and the goal.

## 2) Brainstorm and Evaluate

There are a few ways to go about this. I will explain two that I have used. In general, I find the two-step method better for complex projects, and the one-step method is more convenient for smaller and simple projects.

### **Two Stepping**

No, this is not a type of dance.

In this method, you write down ideas that people throw out in one area first, say on a specific whiteboard or section of a whiteboard. Tell the team not to filter any of their ideas. Just throw them out and write them up there. This is kind of a brain dump where anything anyone can think of goes up there.

You can certainly structure the conversation by starting with high-level deliverables and then decomposing them, but do not restrict the team

to this. Write down all ideas, even if you are not sure where it goes yet. You do not want to lose any of this valuable information.

I recommend using post-it notes if the entire team is in the same room. This way you can move the post-it notes across in step two. If you have remote team members, you can do a similar thing through electronic white board tools.

Step two of this method is going to the list you have generated and evaluating each one to assess whether it is really part of the project, and if it is stated correctly. Take the first one on the list and ask the following questions:

- ✓ Is this really a part of this project?
- ✓ Is it in noun or gerund form?

As you move through the listed items, discard the ones where the consensus is that they are not part of the project. Move and modify those that are in scope to another area where you can start forming the WBS. Start grouping things together into logical sets of deliverables and activities.

If you run into questions that need answering, mark those and assign actions for follow-up. Ideally, all of the right people are in the room and few questions will require outside input.

You will discover that some of the ideas thrown out are actually just different ways of saying the same thing, or in other words, duplicates. You

will also find that some of the elements you brainstormed live at level 2 in your WBS, others live at level 3, etc. Whatever tools you use to evaluate and organize your initial input, be sure it is easy to move things around as much as you need to.

You might even want to try some new tools available in the social media realm like Twitter or Yammer as a way to generate many ideas and collect them. Yammer in particular might be good because you can make the updates private and only viewable by people at your organization. Have people generate ideas on the fly as you talk through the preliminary scope and charter...what the goals of the project are.

### **One Step Brainstorming**

As the team throws out ideas, you try to start organizing and discussing the validity, format, and location of the elements. You may brainstorm a few items for a while and then organize items in a repetitive manner.

### 3) Iterate

You may find that some of the deliverables and activities are really too broad and need to be broken down a bit more. A general guideline is that the lowest elements of your WBS should take about 80 hours to complete or less. At this point, you do not have estimates to go from, so this is a gut-

feel activity. You can do this during the brainstorming session, although most of the time I prefer to review what the team came up with a day later, flag the items that seem too large, and have another session later with the team to review these and other potential changes.

You may also find holes in your project scope that no one thought of during the brainstorming session, but when you start piecing the puzzle together these holes become obvious. Keep the 100% rule in mind, and be sure that every level 2 element is fully covered by its level 3 children; every level 3 is covered by its level 4 children, etc.

Keep reviewing and iterating with your project team until it feels right. When everyone on the project team feels confident you have captured the scope of your project, it is time to review with all stakeholders.

## 4) Review

This is an important step that some project managers forget or ignore. Sure, the team has created a WBS by this point, at least the graphic and high-level understanding of scope. However, what if some of the objectives and assumptions made from the charter or scope statement turn out to be misinterpreted? Communication is a 2-way function, and this review is to give feedback to the entire stakeholder group on your project. Think of this as using the technique of “So what I am hearing you say you want is....”

You will very likely have a few stakeholders that ask questions like “where is xyz functionality? I am going to need that!” Take great notes and ask probing questions to ensure you are throwing out as many assumptions as possible. The goal is to KNOW what your stakeholders want from the project and make as few assumptions as possible.

## 5) Final Team Review

Now that you have input from everyone and have incorporated all changes, I like to do a final review with the team. This will not take long as the team is already familiar with most of the WBS. Point out the items that have changed since the last time your team saw it.

There are usually a few small changes made during this review, which put a final polish on your WBS graphic. This review also fosters

understanding across the entire team about the scope of your project and gives everyone confidence that you have accounted for all known scope.

## 6) Create WBS Dictionary

The WBS Dictionary is a more detailed description of your WBS elements. I recommend not starting this until you are very clear on the high-level scope documented in the WBS graphic, which is why this step comes very near to the end. By this point, you already should be on the same page with your project team and stakeholders.

The WBS Dictionary can be very simple, just listing the WBS elements and then a short description of them. “Element xyz – This element includes the effort to design, develop, and implement xyz.” I recommend also listing out all of the discrete deliverables and/or activities that the WBS element will produce. For instance, if the WBS element is “Project Management” you will specify the specific plans, artifacts, reports, and management support.

See Figure FF from Chapter 8 for an illustration of the WBS Dictionary.

## 7) Configuration Control

Scope creep is a big problem on projects, and one of the primary reasons for that is a lack of proper configuration control. Configuration control is a critical step in general, not just for the WBS. If you want to ensure everyone is working from the same version of documents and artifacts you must have a system in place to control them. Changes to any formal project documentation or products must go through a Configuration Control Board (CCB) to get done. As a part of the process, the CCB assesses impacts as well.

The WBS is THE source of documented scope for your project. No changes are made to the scope of the project unless the WBS is updated if you are doing this right.

## WBS Checklist

On the following page you will find a WBS Checklist. This chapter detailed the process of creating a WBS, and the following checklist incorporates all of the concepts of WBS Coach.

Use this checklist when creating your work breakdown structure. There is a section for the general WBS as a whole and another check for each WBS element. If you are able to validate your WBS against this checklist, you have done it correctly and won't have to memorize each point.

## WBS Checklist

### In General

Evaluate checks in gray boxes for actions to be taken.

Description	Yes	No
1 Have you created both a WBS Graphic and WBS Dictionary?		
2 Did you include all tangible deliverables?		
3 Did you include all support, analytical, and project management elements?		
4 Did you start with a project charter with clear project objectives?		
5 Did you utilize all applicable information from previous projects?		
6 Did you involve your entire team and key stakeholders when creating the WBS?		
7 Was a consistent naming convention used across the WBS?		
8 Did you baseline the WBS to ensure proper change control?		
9 Does your WBS provide traceability across other relevant project documents?		
10 Have you organized your WBS based on your organization and functions?		
11 Have you structured your WBS starting with phases of the project?		
12 Did you place all work packages at the same level on purpose?		

### For Each WBS Element

Evaluate checks in gray boxes for actions to be taken.

Description	Yes	No
13 Is the element name a noun or gerund?		
14 Do the children elements total 100% of the parent element?		
15 Is the detailed scope description in the WBS Dictionary clear and accurate?		
16 Did you define relevant exclusions in the WBS Dictionary?		
17 Do you know what "done" looks like and what is being delivered?		
18 Do the key stakeholders for this element clearly understand it?		
19 Is there any other element with some of the same scope?		
20 Are there sub-deliverables ~80 hrs that should be defined?		
21 Is there a one-to-one parent/child relationship?		
22 Is this element not a part of your project?		

# How Do I Actually Create A WBS?



Figure Y - How Do I Actually Create A WBS?

## Chapter

7

## Chapter 7 - How Do I Use My WBS?

**S**o now your WBS is created and is a good reflection of the scope of your project. Now what?

Your newly created WBS will become the foundation for many other planning processes and artifacts in your project. It will also be a living document, something that you update as scope changes are approved BEFORE they become reality. Wherever applicable, it is critical that your project artifacts are traceable to each other. When a change in the WBS occurs, the impacted areas should be easy to find. Other aspects of the project will require analysis and updates.

Traceability allows for this.

In the same way, when the WBS numbering scheme is utilized across all of your project artifacts it is easy for any change's impact to be fully assessed by tracing the change across all of them.

## Requirements

Requirements have a shared role with the Work Breakdown Structure. Whereas the WBS is the definition of “WHAT” the project will produce, requirements define the qualities “WHAT” should have. These two will work hand in hand.

Most projects should start with high-level requirements that come from the project charter and business case. There are major goals and attributes the final project should achieve and have. These act as a key input to the process of creating a WBS.

After you create the initial WBS, use it to formulate detailed requirements with the customer. For each deliverable, brainstorm what attributes it should have. What constraints are on it? In general, what qualities should it have when you envision the end state?

A great tool that I have used in the past for generating both high-level and detailed requirements is a use case diagram. It shows how users will interact with the completed product. It is a visual model depicting a simplified scenario. Because it is so visual, it works well for understanding requirements.

There are more and less formal methods of implementing use case diagrams. For me, doing a diagram in Visio or Word usually worked well to help visualize and understand the actions users will take on the resulting system.

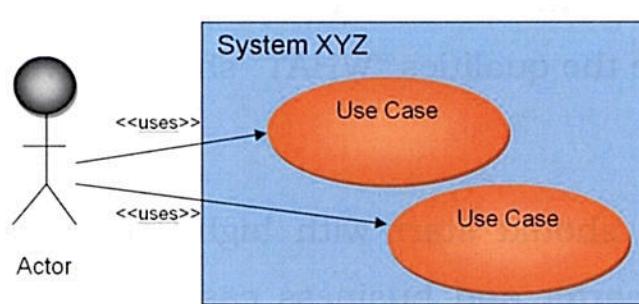


Figure Z - Use Case Diagram

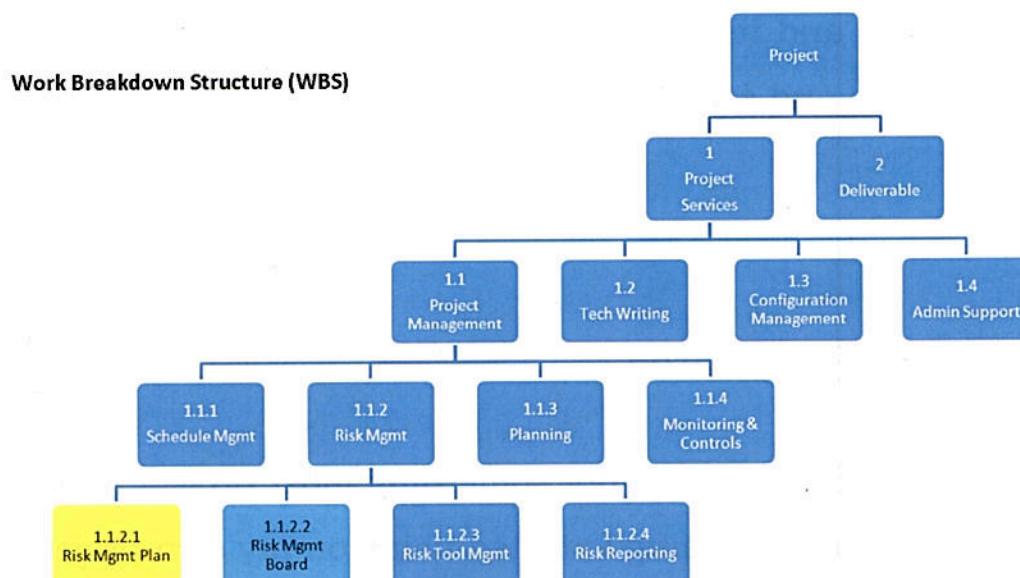
You should have at least one requirement for each WBS element. In some cases, you may have quite a few requirements. The purpose of this book is not to address good requirements elicitation and definition, which is an art and science worthy of its own book and training course.

In the end, every requirement will reference the WBS element it pertains to. This way when changes come around you can always trace a requirement to the WBS and vice-versa. Requirements at higher levels inherit all of the requirements that pertain to their lower-level children in the WBS. In other words, the collection of all requirements pertaining to

WBS element 2.1 and its children (2.1.1, 2.1.2, 2.1.2.1, etc.) make up the total requirements and scope for WBS element 2.1.

## Your Basis of Estimates

The Basis of Estimates is not something most project managers use in my experience. It is something I started using on my own projects and have found to be a powerful tool. It is essentially a decomposition of your lowest-level WBS elements (work packages) into the tasks you will execute to achieve them. It includes extended task descriptions, 3-point effort estimates, estimate assumptions, rationale, and other task-specific documentation.

**Basis of Estimates**

WBS	WBS Name / Task	Opt.	Likely	Pess.	Mean	Estimator(s)	Assumptions and Considerations
1.1.2.1	Risk Mgmt Plan				47.5		
1.1.2.1.1	Define Risk Mgmt approach with key stakeholders	3	4	6	4.3	Sarah Johnson	~2 2 hr sessions
1.1.2.1.2	Outline Risk Mgmt Plan	2	3	5	3.3	Sarah Johnson	use of standard template
1.1.2.1.3	Solicit & incorporate stakeholder feedback	1	2	4	2.3	Sarah Johnson	expect minimal deviation from outline
1.1.2.1.4	Draft Risk Mgmt Plan	15	16	20	17.0	Sarah Johnson	expect 75% re-use from prior projects
1.1.2.1.5	Facilitate Peer Review	1	2	4	2.3	Sarah Johnson	desk reviews followed up by session
1.1.2.1.6	Incorporate Peer Review feedback	3	4	6	4.3	Sarah Johnson	based on past projects
1.1.2.1.7	Configuration Control	0.5	1	3	1.5	Sarah Johnson	standard configuration control process
1.1.2.1.8	Maintain Plan	11	12	14	12.3	Sarah Johnson	2 updates at ~6 hrs each
1.1.2.2	Risk Mgmt Board						

Figure AA - The WBS and Basis of Estimate (BOE)

## Your Schedule

The WBS decomposes the work for your project down to work packages. From there, your Basis of Estimates decomposes work packages down to tasks. You can then take these tasks, start defining dependencies, and start the scheduling process. Without the WBS, you would not be sure you called out all the necessary work.

Your schedule also needs to be traceable to your WBS. Each line of your schedule should correlate to a number in your WBS in a many-to-one relationship. That is, one WBS item will correspond to many lines of your schedule.

This way when project scope changes, you know exactly which lines of your project schedule may be impacted. Imagine trying to update your project schedule without any indicators to tell you what points to where in your WBS. On any project of significant complexity, you would quickly pull your hair out. Get in the habit of setting your projects up the right way from the very beginning and you will never have to deal with issues like this. Projects have enough problems all on their own without the project manager creating them too!

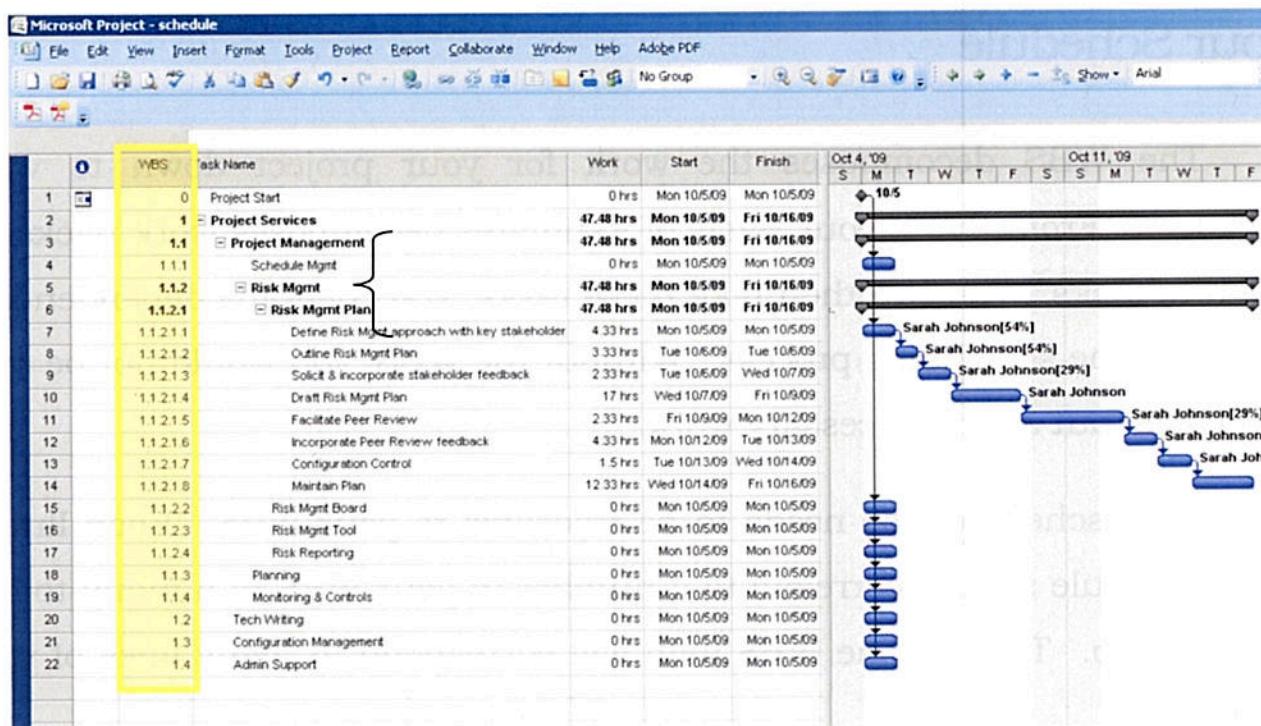


Figure BB - The WBS and Schedule

Note in the figure above how I labeled the WBS column in the example schedule. Your WBS in this case probably goes down to 1.1.2.1 for the “Risk Mgmt Plan” and the level below that is in your Basis of Estimates and schedule.

## Monitoring & Controlling Your Project

When it comes time to assign charge codes and keep track of who is working on what, your WBS is the map. On my projects, charge codes are transparently labeled so that everyone speaks the same language when it comes to scope; the language of our shared WBS. For instance, if a WBS work package is “3.2.2.4 Order Entry Subsystem” then name the charge code “Order Entry Subsystem 3.2.2.4”. You will probably want to put the description first, and then the number because many timekeeping systems have a 12-16 character limit when displaying charge codes to the user. Be sure your team can easily identify which charge code is correct for them to use.

On my projects, we usually track charges at the work package level. Depending on the type of project, industry, size, and complexity, your projects may be different. You may even track the hours your team works at the task level.

The level at which you track costs is a balancing act. If you have too few charge codes, you miss that detailed data about performance for use on future projects as well as the current effort. If you have too many charge codes, the team will get frustrated with spending way too much time tracking their own time and struggling to decide whether a particular hour of work should be charged to A or B.

In my experience, it is best to err towards less charge codes. I would rather have a happy and productive team than a frustrated team who feels like half their job is time keeping. You can always add charge codes later if you need to.

## Status Reporting

If you have a large and complex project, there may be different individuals who are the primary stakeholders or customers for various elements of your project. In these cases, the WBS provides a framework by which you can identify key individuals and tailor status reporting to meet their needs.

Recently I was a contractor working for the federal government. We had many different individuals on both the contractor and government customer side who were not responsible for the success of the project as a whole, but for their own areas of focus. These individuals were less interested in status reports on the project as a whole, or for the status of WBS elements outside their area of responsibility. They wanted status reporting on their own WBS elements. Essentially, groupings of WBS elements became “mini-projects” for all intents and purposes, which each of the government customers as a separate customer, and each contractor a project manager for their own miniature projects. This is a loose analogy,

because I still had responsibility for my contract's performance as a whole, and all of the areas had to work together in many different ways.

The following example illustrates how you might organize your status report by the WBS. It is an EVM status report slide, and other parts of the status report such as accomplishments, issues, risks, etc can also be organized by the WBS in a similar way.

## Project Status Report

	BCWS	BCWP	ACWP	CV	SV	CPI	SPI	ETC	EAC	BAC
Daily MIS Cycle Time Reduction	\$ 227,500	\$ 217,240	\$ 231,150	\$ (13,910)	\$ (10,260)	0.94	0.95	\$ 252,984	\$ 484,134	\$ 455,000
1 - Project Management	\$ 34,000	\$ 37,400	\$ 35,700	\$ 1,700	\$ 3,400	1.05	1.10	\$ 29,209	\$ 64,909	\$ 68,000
2 - Current State Eval	\$ 26,000	\$ 24,700	\$ 23,400	\$ 1,300	\$ (1,300)	1.06	0.95	\$ 25,863	\$ 49,263	\$ 52,000
2.1 - Process Documentation	\$ 12,000	\$ 10,800	\$ 13,200	\$ (2,400)	\$ (1,200)	0.82	0.90	\$ 16,133	\$ 29,333	\$ 24,000
2.2 - Performance Documentation	\$ 26,000	\$ 24,700	\$ 23,400	\$ 1,300	\$ (1,300)	1.06	0.95	\$ 25,863	\$ 49,263	\$ 52,000
3 - Identification	\$ 25,000	\$ 22,650	\$ 26,900	\$ (4,250)	\$ (2,350)	0.84	0.91	\$ 32,482	\$ 59,382	\$ 50,000
3.1 - Data Collection	\$ 18,000	\$ 16,200	\$ 19,800	\$ (3,600)	\$ (1,800)	0.82	0.90	\$ 24,200	\$ 44,000	\$ 36,000
3.2 - Candidate List	\$ 3,000	\$ 2,850	\$ 2,700	\$ 150	\$ (150)	1.06	0.95	\$ 2,984	\$ 5,684	\$ 6,000
4 - Selection	\$ 4,000	\$ 3,600	\$ 4,400	\$ (800)	\$ (400)	0.82	0.90	\$ 5,378	\$ 9,778	\$ 8,000
5 - Pilot	\$ 46,500	\$ 44,890	\$ 44,350	\$ 540	\$ (1,610)	1.01	0.97	\$ 47,531	\$ 91,881	\$ 93,000
5.1 - Team Selection	\$ 500	\$ 495	\$ 550	\$ (55)	\$ (5)	0.90	0.99	\$ 561	\$ 1,111	\$ 1,000
5.2 - Training	\$ 5,000	\$ 4,750	\$ 4,500	\$ 250	\$ (250)	1.06	0.95	\$ 4,974	\$ 9,474	\$ 10,000
5.3 - Pilot	\$ 26,000	\$ 24,700	\$ 23,400	\$ 1,300	\$ (1,300)	1.06	0.95	\$ 25,863	\$ 49,263	\$ 52,000
5.4 - Analysis	\$ 12,000	\$ 12,095	\$ 13,200	\$ (1,105)	\$ 95	0.92	1.01	\$ 12,993	\$ 26,193	\$ 24,000
5.5 - Process Draft	\$ 3,000	\$ 2,850	\$ 2,700	\$ 150	\$ (150)	1.06	0.95	\$ 2,984	\$ 5,684	\$ 6,000
6 - Implementation	\$ 88,000	\$ 80,200	\$ 92,800	\$ (12,600)	\$ (7,800)	0.86	0.91	\$ 110,851	\$ 203,651	\$ 176,000
6.1 - Final Process Documentation	\$ 3,000	\$ 2,850	\$ 2,700	\$ 150	\$ (150)	1.06	0.95	\$ 2,984	\$ 5,684	\$ 6,000
6.2 - Stakeholder Review	\$ 2,000	\$ 1,900	\$ 1,800	\$ 100	\$ (100)	1.06	0.95	\$ 1,989	\$ 3,789	\$ 4,000
6.3 - Training	\$ 15,000	\$ 14,250	\$ 13,500	\$ 750	\$ (750)	1.06	0.95	\$ 14,921	\$ 28,421	\$ 30,000
6.4 - Change Implementation	\$ 68,000	\$ 61,200	\$ 74,800	\$ (13,600)	\$ (6,800)	0.82	0.90	\$ 91,422	\$ 166,222	\$ 136,000
7 - Post-Change Eval	\$ 4,000	\$ 3,800	\$ 3,600	\$ 200	\$ (200)	1.06	0.95	\$ 3,979	\$ 7,579	\$ 8,000
7.1 - One-Month Eval	\$ 2,000	\$ 1,900	\$ 1,800	\$ 100	\$ (100)	1.06	0.95	\$ 1,989	\$ 3,789	\$ 4,000
7.2 - 6-Month Eval	\$ 2,000	\$ 1,900	\$ 1,800	\$ 100	\$ (100)	1.06	0.95	\$ 1,989	\$ 3,789	\$ 4,000

### Legend

BCWS	Budgeted Cost of Work Scheduled
BCWP	Budgeted Cost of Work Performed
ACWP	Actual Cost of Work Performed
CV	Cost Variance
SV	Schedule Variance
CPI	Cost Performance Index
SPI	Schedule Performance Index
ETC	Estimate to Complete
EAC	Estimate at Complete
BAC	Budget at Complete

	Summary
	Control Account

Within 5%
6% to 10% variance
Greater than 11% variance

# How Do I Use My WBS?

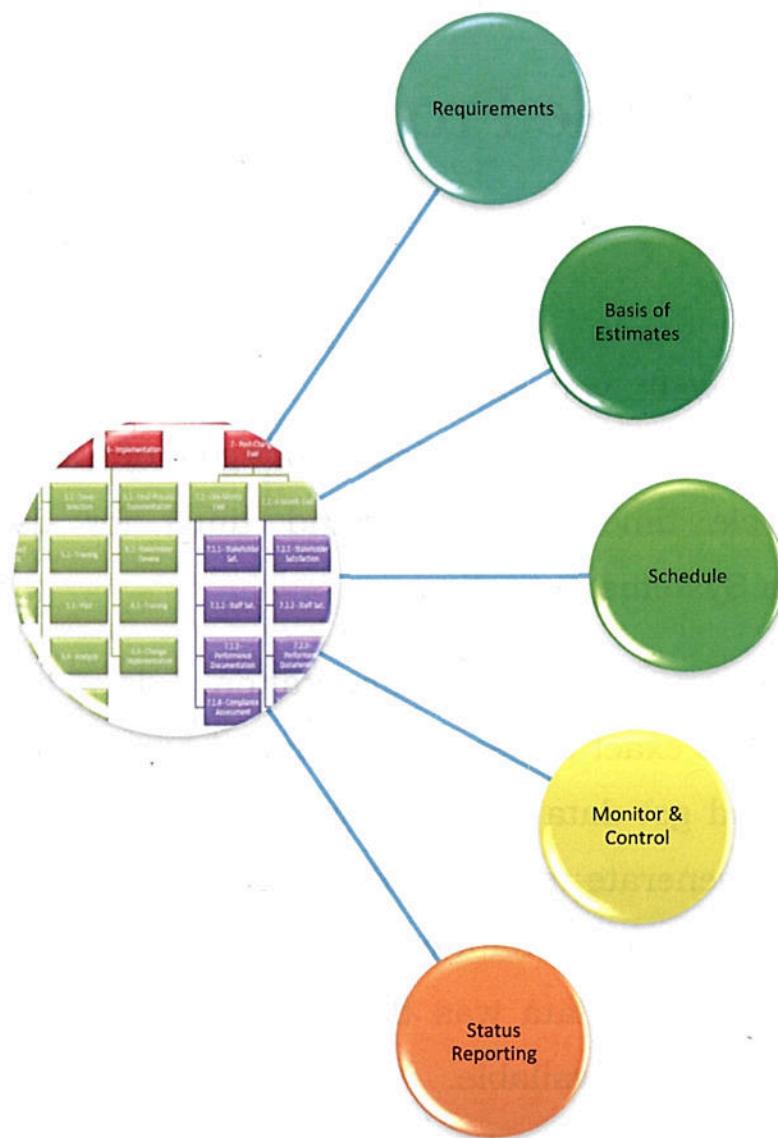


Figure DD - How Do I Use My WBS?



## Chapter 8 – Example Project

In this Chapter I will walk you through an example project. The example will be a process change. Specifically, the goal of this project is to reduce the daily cycle time (or turnaround time) for daily MIS (Management Information Systems) reporting.

While this is not the actual project documentation, I drew it from my personal experience with this exact project in a financial services firm. The operational MIS team would get data from many sources at various times each morning and need to generate reports and analysis of the data. Many daily and weekly meetings where this data would be useful had to work off reporting from the previous day (data was then 2 days old) because the current day's reports were not yet available.

Within the scope of this project is the activity of identifying candidate solutions, selecting one, then running a pilot program and finally implementation. Current state and post-change evaluations are also called

for. Note that selection of the solution could drive major changes to the WBS later on. For instance if we end up building a system in-house, we will need to document the scope of the system and subsystems to build.

## Multiple Iterations

After the first planning cycle, some of the elements are defined only at a high level. For instance, WBS elements “5 - Pilot” and “6 - Implementation” in Figure EE could not be defined to any great detail at the beginning, because the specific scope is going to be discovered through WBS elements 3 and 4.

Figure EE shows what the WBS looks like in a sample project after the first planning cycle. Later on when you reach key milestones (such as selection of a candidate), another planning cycle will need to occur and you will flesh out the WBS further (to lower levels of detail) at that time.

You will notice that WBS elements 1, 2, and 7 are fairly well defined initially, because regardless of the solution found and implemented they will not change much if at all. We already know how we want to manage this project and how to tell if we were successful or not through a comparison of the current state and after project completion. You will notice we will be taking measurements of stakeholder satisfaction, process compliance, and performance before we start, one month after the new process is

implemented, and then again six months after the new process is implemented.

## Chronology

I chose the sample project WBS on the following pages specifically because it is a service-related project and it could be misinterpreted as a phased WBS at first glance.

Although the first level of WBS elements may appear to be phases, they are not. For example, “2 – Current State Documentation” could be occurring simultaneously as “3 – Identification”. As I said in Chapter 1, there is a difference between general chronology and organizing your WBS by phases.

You can see the same pattern in some places lower down as well. For instance in “1 – Project Management” you will see some of the work packages following a generally chronological order. You do some of these in parallel however, and iterate them during the life of this project.

## WBS Levels

Also, note that I am using color-coding to differentiate between the WBS levels. You may not wish do this on an actual WBS, but for the sake of illustration I am including that formatting here.

Different elements get broken down to various depths in the WBS based on the amount of work they require or the level of definition required to achieve clarity of scope.

Also, note the way Microsoft Word 2007 has automatically formatted the WBS graphic. Some of the branches at the same level go horizontally while others are vertical. This is just a result of trying to fit everything on one page and has no significance beyond that. You can adjust the format to structure everything in a similar way based on the level, but that would likely create something that wastes white space and is difficult to read on one page.

## Daily MIS Cycle Time Reduction – Initial Planning

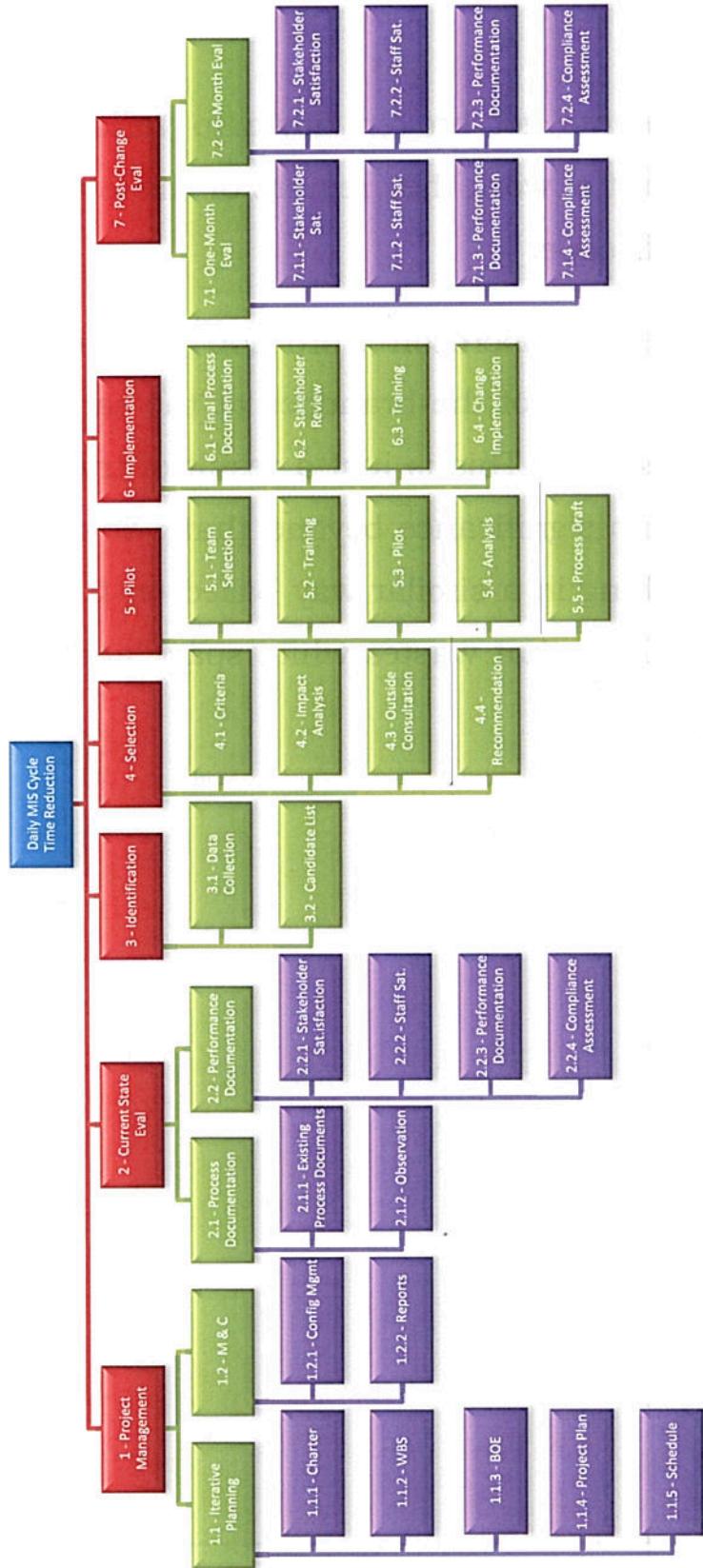


Figure EE - WBS Graphic, Initial Planning Phase

Figure FF- WBS Dictionary, Initial Planning Phase

WBS Element	Scope Description	Exclusions
<b>1 - Project Management</b>	Project Management	activity specific to technical WBS elements
<b>1.1 - Iterative Planning</b>	Scope around the creation and maintenance of planning artifacts	
<b>1.1.1 - Charter</b>	Project initiation document	
<b>1.1.2 - WBS</b>	Documentation of the project scope	
<b>1.1.3 - BOE</b>	Basis of Estimates including task definition and 3-point estimates	
<b>1.1.4 - Project Plan</b>	Documentation of how the project will be managed	
<b>1.1.5 - Schedule</b>	Schedule including tasks, their dependencies, and project milestones	
<b>1.2 - M &amp; C</b>	Monitoring and Controls for the project in relation to the project baseline	
<b>1.2.1 - Config Mgmt</b>	Configuration Management ensures proper change authorization and control	
<b>1.2.2 - Reports</b>	Project reporting including weekly status reporting	
<b>2 - Current State Eval</b>	Documentation of how the existing process is working, and how effectively	
<b>2.1 - Process Documentation</b>	Existing documentation and observation of compliance	
<b>2.1.1 - Existing Process Documents</b>	Current organizational process assets	
<b>2.1.2 - Observation</b>	Observation of the actual process in use	
<b>2.2 - Performance Documentation</b>	Comprehensive performance documentation	
<b>2.2.1 - Stakeholder Satisfaction</b>	Analysis of key stakeholder satisfaction	Any indirect stakeholders
<b>2.2.2 - Staff Sat.</b>	Analysis of staff satisfaction	Any staff not directly working this process
<b>2.2.3 - Performance Documentation</b>	Documentation of current performance baseline for all relevant quantitative metrics	Qualitative measures of any kind
<b>2.2.4 - Compliance Assessment</b>	Analysis of staff compliance and deviations from existing process documentation	
<b>3 - Identification</b>	Research to inform process candidate selection	
<b>3.1 - Data Collection</b>	Industry research and resources, analysis of process and performance documentation	
<b>3.2 - Candidate List</b>	List of candidate process approaches for consideration	
<b>4 - Selection</b>	Selection and refinement of process Change possibilities	
<b>4.1 - Criteria</b>	Key Performance Metrics (KPIs) Establishment	
<b>4.2 - Impact Analysis</b>	Organizational impact analysis for each candidate approach	
<b>4.3 - Outside Consultation</b>	Objective review and consultation from a qualified source outside the organization	
<b>4.4 - Recommendation</b>	Final recommendation for process change approach	

WBS Element	Scope Description	Exclusions
<b>5 - Pilot</b>	Small pilot implementation to simulate the new process and identify issues	
<b>5.1 - Team Selection</b>	Pilot team selection	
<b>5.2 - Training</b>	Pilot team training	
<b>5.3 - Pilot</b>	Implementation of pilot program	
<b>5.4 - Analysis</b>	Analysis of pilot program	
<b>5.5 - Process Draft</b>	Process Draft includes adjustments as necessary based on pilot program feedback	
<b>6 - Implementation</b>	Activities and deliverables related to go-live of the process change	
<b>6.1 - Final Process Documentation</b>	Documentation of the final process	
<b>6.2 - Stakeholder Review</b>	Review by all key stakeholders	
<b>6.3 - Training</b>	Staff Trained and ready to transition to the new process	
<b>6.4 - Change Implementation</b>	Actual transition to the new process and related activities	Any activity after the project sponsor deems implementation complete (this will be treated as operations and not part of this project)
<b>7 - Post-Change Eval</b>	Short-term and long-term evaluations of the process change	
<b>7.1 - One-Month Eval</b>	Evaluation one month after implementation	
<b>7.1.1 - Stakeholder Sat.</b>	Analysis of key stakeholder satisfaction	Any indirect stakeholders
<b>7.1.2 - Staff Sat.</b>	Analysis of staff satisfaction	Any staff not directly working this process
<b>7.1.3 - Performance Documentation</b>	Documentation of current performance baseline for all relevant quantitative metrics	Qualitative measures of any kind
<b>7.1.4 - Compliance Assessment</b>	Analysis of staff compliance and deviations from existing process documentation	
<b>7.2 - 6-Month Eval</b>	Evaluation six months after implementation	
<b>7.2.1 - Stakeholder Satisfaction</b>	Analysis of key stakeholder satisfaction	Any indirect stakeholders
<b>7.2.2 - Staff Sat.</b>	Analysis of staff satisfaction	Any staff not directly working this process
<b>7.2.3 - Performance Documentation</b>	Documentation of current performance baseline for all relevant quantitative metrics	Qualitative measures of any kind
<b>7.2.4 - Compliance Assessment</b>	Analysis of staff compliance and deviations from existing process documentation	

## Later in the Project

Now let us assume it is later in the project. Before, we did not know what solution would be selected, so the details of the WBS elements “5 - Pilot” and “6 - Implementation” could not be defined to any great detail yet. Now we have accomplished a milestone and have selected our solution.

It could have been many different things. Imagine what the different deliverables would have been for the following scenarios:

- ✓ In-house COTS technology solution – buy and configure existing software...host it on local servers
- ✓ In-house custom technology solution – build and configure our own software...host it on local servers
- ✓ Cloud technology solution – everything is hosted remotely and we pay a recurring fee
- ✓ Non-technology solution – get the benefits of process re-engineering without additional technology tools

These are just some of the possible scenarios. In the following figures, I flesh out the WBS element “5 - Pilot” a little more based on an in-house custom technology solution. Remember, change control is vital. You do not just change the WBS. You take it through a configuration management process whereby there is usually a board of key stakeholders who analyze the impacts of any proposed change and reject or approve it.

## Daily MIS Cycle Time Reduction – Post-Milestone Snapshot

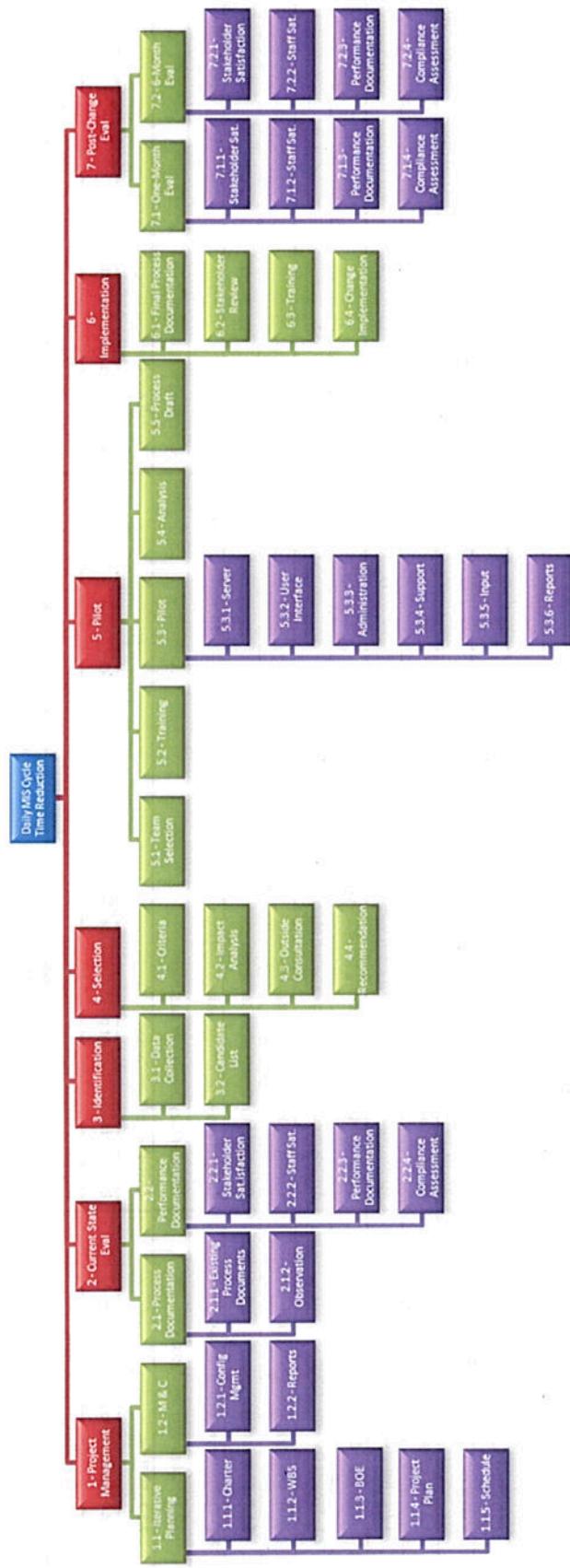


Figure GG - WBS Graphic, Post-Milestone Snapshot

Figure HH- WBS Dictionary, Post-Milestone Snapshot

WBS Element	Scope Description	Exclusions
1 - Project Management	Project Management Scope around the creation and maintenance of planning artifacts	activity specific to technical WBS elements
1.1 - Iterative Planning	Project initiation document	
1.1.1 - Charter	Documentation of the project scope	
1.1.2 - WBS	Basis of Estimates including task definition and 3-point estimates	
1.1.3 - BOE	Documentation of how the project will be managed	
1.1.4 - Project Plan	Schedule including tasks, their dependencies, and project milestones	
1.1.5 - Schedule	Monitoring and Controls for the project in relation to the project baseline	
1.2 - M & C	Configuration Management ensures proper change authorization and control	
1.2.1 - Config Mgmt	Project reporting including weekly status reporting	
1.2.2 - Reports	Documentation of how the existing process is working, and how effectively	
2 - Current State Eval	Existing documentation and observation of compliance	
2.1 - Process Documentation	Current organizational process assets	
2.1.1 - Existing Process Documents	Observation of the actual process in use	
2.1.2 - Observation	Comprehensive performance documentation	
2.2 - Performance Documentation	Analysis of key stakeholder satisfaction	Any indirect stakeholders
2.2.1 - Stakeholder Satisfaction	Analysis of staff satisfaction	Any staff not directly working this process
2.2.2 - Staff Sat.	Documentation of current performance baseline for all relevant quantitative metrics	Qualitative measures of any kind
2.2.3 - Performance Documentation		
2.2.4 - Compliance Assessment	Analysis of staff compliance and deviations from existing process documentation	
3 - Identification	Research to inform process candidate selection	
3.1 - Data Collection	Industry research and resources, analysis of process and performance documentation	
3.2 - Candidate List	List of candidate process approaches for consideration	
4 - Selection	Selection and refinement of process change possibilities	
4.1 - Criteria	Key Performance Metrics (KPIs) Establishment	
4.2 - Impact Analysis	Organizational impact analysis for each candidate approach	
4.3 - Outside Consultation	Objective review and consultation from a qualified source outside the organization	
4.4 - Recommendation	Final recommendation for process change approach	
5 - Pilot	Small pilot implementation to simulate the new process and identify issues	

WBS Element	Scope Description	Exclusions
<b>5.1 - Team Selection</b>	Pilot team selection	
<b>5.2 - Training</b>	Pilot team training	
<b>5.3 - Pilot</b>	Implementation of pilot program	
<b>5.3.1 - Server</b>	Deliver server and related components and space for pilot	
<b>5.3.2 - User Interface</b>	Pilot program user interface	
<b>5.3.3 - Administration</b>	Administrative support for pilot program	
<b>5.3.4 - Support</b>	Technical support & troubleshooting for pilot program	
<b>5.3.5 - Input</b>	Data for input into pilot program, related interfaces	
<b>5.3.6 - Reports</b>	Reporting for pilot program	
<b>5.4 - Analysis</b>	Analysis of pilot program	
<b>5.5 - Process Draft</b>	Process Draft includes adjustments as necessary based on pilot program feedback	
<b>6 - Implementation</b>	Activities and deliverables related to go-live of the process change	
<b>6.1 - Final Process Documentation</b>	Documentation of the final process	
<b>6.2 - Stakeholder Review</b>	Review by all key stakeholders	
<b>6.3 - Training</b>	Staff Trained and ready to transition to the new process	
<b>6.4 - Change Implementation</b>	Actual transition to the new process and related activities	Any activity after the project sponsor deems implementation complete (this will be treated as operations and not part of this project)
<b>7 - Post-Change Eval</b>	Short-term and long-term evaluations of the process change	
<b>7.1 - One-Month Eval</b>	Evaluation one month after implementation	
<b>7.1.1 - Stakeholder Sat.</b>	Analysis of key stakeholder satisfaction	Any indirect stakeholders
<b>7.1.2 - Staff Sat.</b>	Analysis of staff satisfaction	Any staff not directly working this process
<b>7.1.3 - Performance Documentation</b>	Documentation of current performance baseline for all relevant quantitative metrics	Qualitative measures of any kind
<b>7.1.4 - Compliance Assessment</b>	Analysis of staff compliance and deviations from existing process documentation	
<b>7.2 - 6-Month Eval</b>	Evaluation six months after implementation	
<b>7.2.1 - Stakeholder Satisfaction</b>	Analysis of key stakeholder satisfaction	Any indirect stakeholders
<b>7.2.2 - Staff Sat.</b>	Analysis of staff satisfaction	Any staff not directly working this process
<b>7.2.3 - Performance Documentation</b>	Documentation of current performance baseline for all relevant quantitative metrics	Qualitative measures of any kind
<b>7.2.4 - Compliance Assessment</b>	Analysis of staff compliance and deviations from existing process documentation	

## When the WBS Graphic Becomes Too Big!

When I managed projects that were less than 3 months in duration, the level of complexity was low. The number of deliverables was small and I could easily fit a WBS graphic on a single page.

Moving to larger and more complex projects, this became a problem. Now I had too much information in a WBS to make it all fit nicely on a single page, or when I tried it was unreadable. When I was the lead project manager in aerospace, our mission and the scope of the project was everything you can think of from NASA launching the satellite into orbit to getting the data down to the ground and all the processing, archive, and distribution functions. The ground system alone was vastly complex. So what to do?

I have used two different methods in the past.

## Use Tabloid Paper Size (or larger)

In Word, you go to the page setup options and then only have the section you want resized selected. Then you can change the paper size to tabloid by going to Page Layout >> Page Setup >> Paper >> Paper Size.

The tabloid page size is good because you can fold the paper in half and it will fit nicely with the rest of a letter-sized document.

If you have a plotter at your disposal, this can be another great option. You can print the WBS very large and put it on the wall where your team is so people can see all deliverables very clearly.

See figures II and JJ for an example. Note that because of the format of this book I split the WBS in half. On your project, this can be one sheet of tabloid paper folded down the middle.

## Segment your WBS

For this method, I recommend you still have one complete file with the WBS. This will ensure continuity. Essentially, you are just going to take parts of the WBS and represent them in separate sections of the WBS document.

You can copy/paste the entire WBS to a new section. Then cut out the elements that are not part of the section. For instance, if you have 10 high-level deliverables on your WBS, perhaps you split the WBS into five sections with two high-level elements in each section.

Functionality is a valid way to group these. So perhaps you will have one section for project management and support activities. Focus another section on two or three systems that are related. Dedicate yet another section to science activities, etc.

However you organize it, be sure to label each section with the high-level deliverables that are being shown. I keep the entire WBS Dictionary together though, without splitting them out by section.

See figure KK for an example of a segmented WBS graphic.

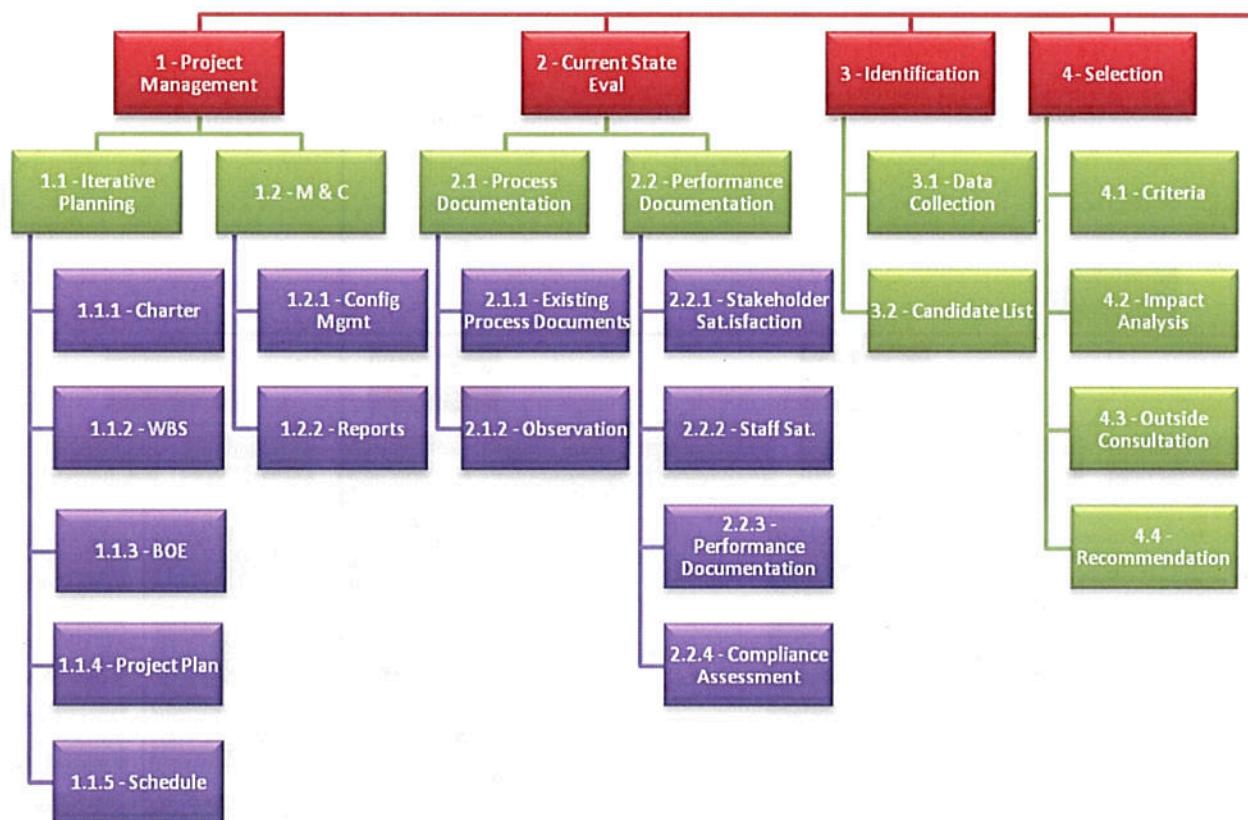


Figure II - WBS Graphic, tabloid page representation (left half)

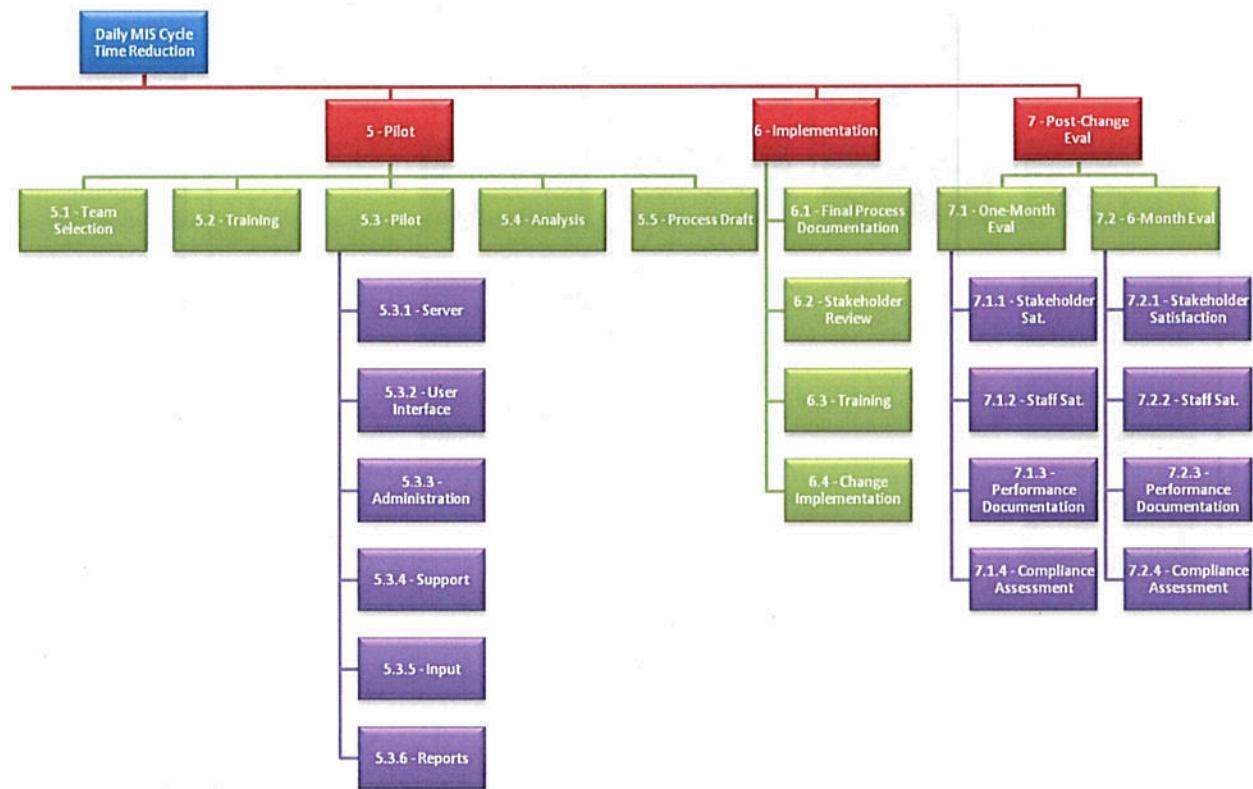


Figure JJ - WBS Graphic, tabloid page representation (right half)

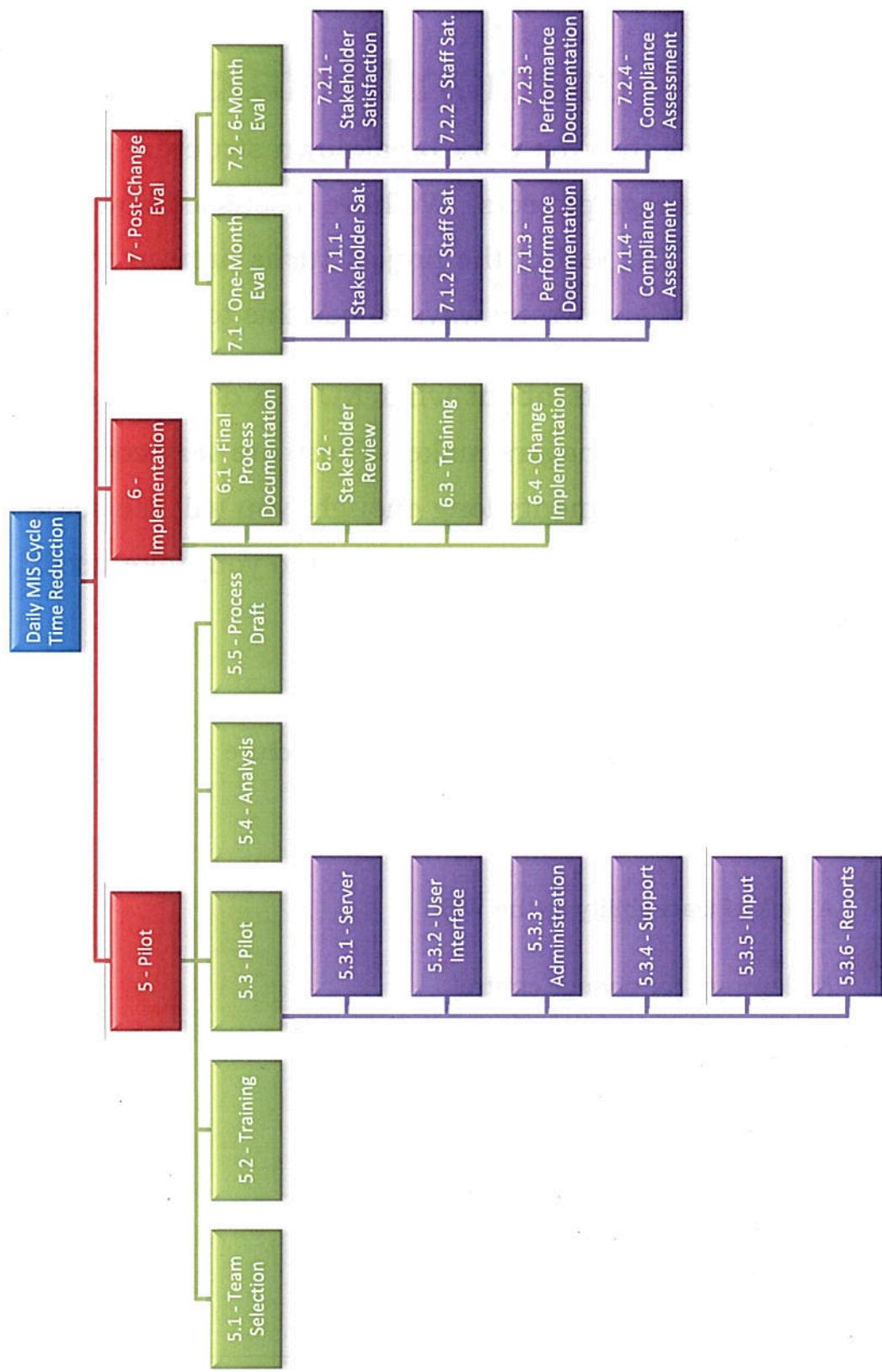


Figure KK - Segmented WBS Graphic for Complex Project

## Chapter 9 - Common Mistakes

You know by now that the work breakdown structure is very important to the way I manage projects. We have discussed how it is the central feature of a project. The rest of the project turns around the WBS. I have gone through the right and wrong ways to use this tool.

To reinforce the points about what NOT to do, here are some of the major mistakes project managers make. These are very common and if you are around project environments long enough, you will see some if not all of them done in practice. Do not let this happen to you; take heed!



Using the WBS as a task list



Organizing the WBS by organizational structure



Time-phasing the WBS



A lack of traceability to the WBS



No leverage for change control



No support activities



Taking the WBS for granted

## Using the WBS as a task list

When I first began managing small projects, I used a task list to plan. I was making a mistake, and it showed because conversations about scope immediately turned to how, who, and when (tasks/schedule) instead of what (deliverables). A WBS gives you this focus for initial planning and scope control throughout the project. A task list has no levels of decomposition that clearly show how smaller pieces of scope will come together and produce the final output of your project. With a task list:

- ✓ You will lose sight of what the scope of your project really is
- ✓ You will not think of things that need to get done until you miss them "oh man, why didn't we think of that?"
- ✓ Managing scope change will become a nightmare!

The level of rigor you go through will vary depending on your project size and type. I have managed projects that lasted only a few weeks, and I used a WBS for them. In that case, my WBS was a simple spreadsheet where I broke down deliverables.

The WBS is even more important when it comes to medium and large projects. More complexity means more pieces that might fall on the ground if you are not using a good system to capture them.

## Organizing the WBS by org structure

The mistake I want to highlight here is another very common one. This is one of those natural intuitions we have as regular people; and we must recognize that and resist the urge as project managers.

Do you remember my story about Perry? He wanted to organize his WBS to align with his team structure, not the product and deliverables. Instead of being focused on the output of the project as a WBS should be, he organized it by one of the inputs, the resources doing the work. This takes the focus off the unique product(s) being produced by the project, and leads to unexpected omission of scope.

It can also lead to scope bloat! When you try to plan a project this way, scope can creep in that is not really a part of the end product, and/or isn't really necessary to meet the requirements for your deliverables.

The WBS should be output-oriented for optimal effectiveness, not input-oriented!

## Time-phasing the WBS

This WBS mistake has a special place in my heart. :-) It's organizing your WBS by phases of the project, and it's probably the most controversial.

While I say it is a mistake, note that most project managers think it's fine. My project experience has taught me that it is NOT fine.

When you create a WBS, you will be tempted to organize it in phases. It is natural for people to think of work through time. "After we get that done, the next step will be..."

This is fine. When building a WBS I find it naturally tends to be in rough chronological order left to right, which is handy since the numbering scheme will probably go from left to right as well.

Some people say it is OK to organize your WBS by the phases of your project. In fact, the PMBOK Guide 4th Edition even has a graphic illustrating a WBS using phases for level 2 organization. I disagree with this approach completely.

I have seen how this kind of project planning can lead to unstated assumptions and missing scope in your WBS. Again, you must focus on the unique product you are delivering in order to capture all of your scope in the most complete way.

There is a difference between organizing your WBS by phases and having some general chronology. For instance, System A may need to be developed before System B can be started, so your level 2 WBS items could be "System A" and "System B" and be in left-to-right order. That is fine.

If you put "System B" before "System A" that would be fine too. It may be more convenient to have "System A" be your 2.0 element and "System B" be the 3.0 element just for aesthetics, but not necessary.

What is NOT fine is to organize your WBS by "Phase 1" and "Phase 2". Phases are not deliverables or services, they are time periods. Creating a WBS using these project phases is one of the biggest contributors to "unforeseen" and missing scope that I have come across. You will add that scope eventually anyway, at a higher cost and with unhappy stakeholders.

On my last project, the major phases were SRR (System Requirements Review), PDR (Preliminary Design Review), CDR (Critical Design Review), Readiness Testing, etc. These occurred at an element level, segment level, ground system level, and mission level.

Part of NASA's mission WBS was our ground system, and immediately beneath the ground system was its constituent parts, for instance our DPAS segment. Phase-based deliverables absolutely show up underneath, and I am not saying it is forbidden to think about phase requirements at all when developing the WBS. We absolutely had to find out what level of maturity and artifacts would be required at the various phases to capture

100% of the scope.

Phase-based organization is a schedule activity though. On a larger and more complex project like this, it is the IMS (Integrated Master Schedule) interfacing with all of the intermediate and detailed schedules. This is where the phases really come together. It is helpful to have an identifier in the schedule that identifies relationships with phases.

Even (especially?) on smaller projects without an IMS I've observed how basing WBS structure on phases (and the other mistakes I already covered) take the focus away from the end-result and muddy the waters when it comes to scope/schedule.

Sometimes we would need to move functionality forward or back based on circumstances...the scope of the project did not change, just the timing. I do not touch the WBS unless the scope of the project is changing.

## A lack of traceability to the WBS

This mistake highlights something many project managers do that is not a problem with the WBS itself, but how you implement and use it on the project.

Your newly created WBS should become the foundation for many other planning processes and artifacts in your project. It will also be a living document. You will use the WBS to assess potential changes before acting on them. Wherever applicable, it is critical that your project artifacts are traceable to each other. When a change in the WBS occurs, you want to be able to easily find the places in other project documentation that require analysis and updates. When there is a question about some aspect of your scope, you want to easily find all the relevant information about it.

Traceability allows for this.

The WBS numbering scheme becomes a kind of common language used for nearly everything else you do on the project:

- ✓ Requirements
- ✓ Basis of Estimates
- ✓ Product Backlog (in Scrum)
- ✓ Scheduling
- ✓ Budgeting
- ✓ Status Reporting
- ✓ Charge Codes
- ✓ Risk Management
- ✓ Quality Management
- ✓ Scope Verification
- ✓ ...and more

Generating reporting becomes especially easy when you organize your entire project by the WBS. It means that for any given deliverable you can easily generate a report at any time with everything relevant, almost as if it was a mini-project all by itself.

This may seem simple (and it is) but it's very powerful at making your life easier as a project manager.

## No leverage for change control

The last mistake highlighted how important it is to create and maintain traceability between your project artifacts and processes, using the WBS as the central hub.

Let's take that concept a bit further.

Say a stakeholder comes to you with a change request. How easy is it for you to know for sure what impacts that change might have? How do you evaluate that? Unfortunately, a lot of project managers use intuition. Intuition is great, but there is a better way.

Remember when I said the WBS numbering scheme should become a kind of common language used for nearly everything else you do on the project?

When the WBS numbering scheme is utilized across all of your project artifacts it is easy for any change's impact to be fully assessed by tracing the change across all of them. The WBS should be the central hub where you can assess what pieces of your project will be impacted by a proposed change, especially if it's an emergency change that needs to be implemented pronto.

Filter your other artifacts for the impacted WBS element(s). Use this as a systemic way to evaluate the impact of any given change across the

various artifacts. Take the guesswork out.

For instance, let's say the proposed change is for a specific requirement. If you had no traceability on your project you are likely to think about the change for a little bit and make your best guess as to the impact. Even more common is that we just "fit it in".

Imagine instead that you have implemented full traceability using the WBS as a central theme. Now you look at the requirement and see it is tied to three WBS elements, on various levels of the WBS structure. You check to see if the requirement influences deliverables outside the original three. If not, you evaluate the impact of this change on those three deliverables. Traceability means you have full information at your disposal, from the impacts on risk management to what kind of scope verification and testing impacts are going to occur.

## No support activities

Back to the makeup of the WBS itself. Some project managers try to include only the things that directly relate to tangible deliverables on their projects, and ignore the support activities that are a necessary part of the project or track them separately.

This is a mistake for several reasons.

I covered Support elements, Project Management elements, and Analytical elements earlier. These are categories of support elements and they are very important. Activities like these have substantial costs associated with them and a dramatic impact on your projects.

The WBS should represent the total scope of your project. Every penny spent should track to your WBS somewhere. Anything outside of your WBS is not a part of your project, period.

When you are creating project artifacts with your team or doing status reports, where does that time get charged? Those activities are a part of getting your project done, and they show up on your WBS under a project management element.

When the customer modified an EVM requirement on a project I once worked as a federal contractor, it had significant impacts on our project. Because I captured it on my WBS, I could point to the scope there and assess what the changes would be. If I had not captured it on my WBS the whole process would have been more complex, and I probably would have missed something.

Consider that administrative assistant who supports you and your project team. His or her role in the project should be captured somewhere on your WBS. Even if someone is not turning screws, this represents real work that is getting done and real costs to your project.

Incidentally, you should also capture this work on your basis of estimates. Being complete has saved me more than a few times, like when I was at risk of losing administrative support for my project. When you can point to a place in your WBS, and then a list of tasks with good estimates showing the value being added it becomes easy to defend your team against bad decisions. You can say things like "which of these things are we going to stop doing?" and then (through traceability) assess exactly what that means.

One more mistake to go.

## Taking the WBS for granted

The final mistake I see lots of project managers make is just ignoring their WBS.

So you have created a great WBS that captures all deliverables, 100% of your project scope. Congratulations!

Now what?

On many projects, the WBS just sits there. It never gets updated again, or it's just put on a schedule ("we'll check it again in a year and update it.")

This approach to utilizing the WBS is almost completely worthless. It

is just paperwork.

Updates to the WBS should be event-driven. Things like change requests, new information, etc. should trigger you as the project manager to look at your WBS. It is your first stop. Moreover, changes to your project DO NOT HAPPEN unless you update the WBS to reflect them. The WBS IS your scope control. It is right there...why do so many project managers "wing it" and leave their WBS to collect dust?

## More Resources

Here I will refer you to other resources regarding the Work Breakdown Structure that will be helpful. Some of these relate to projects and industries that may be completely different from your own, but you can often apply best practices from other industries universally.

Work Breakdown Structures For Defense Materiel Items - United States Department of Defense. <http://www.acq.osd.mil>

Work Breakdown Structure (WBS) Handbook – National Aeronautics and Space Administration. <http://evm.nasa.gov>

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