The WBS is a foundation document in project management because it provides the basis for planning and managing project schedules, costs, resources, and changes. Because the WBS defines the total scope of the project, work should not be done on a project if it is not included in the WBS. This is a critical point in the definition of the WBS: The WBS contains 100% of the deliverables (often called "work") of the project—not 95%, not 102%, but 100%. The WBS puts the project team, and its stakeholders, on the same page as it is the first time that everyone can look at the work that will be completed. If something is missing, it should be apparent. If something is added in error, it should be apparent. Therefore, it is crucial to develop a good WBS.

A WBS is often depicted in a graphical format, similar to an organizational chart. The name of the entire project is the top box, called level 1, and the main groupings for the work are listed in the second tier of boxes, called level 2. This level numbering is based on PMI's *Practice Standard for Work Breakdown Structure*, *Second Edition (2006)*. Note that some organizations call the entire project level 0. Each of those boxes can be broken down or decomposed into subsequent tiers of boxes to show the hierarchy of the work. Project teams often organize the WBS around project products, project phases, system modules, geographical regions, or other logical groupings. People often like to create a WBS in a graphical format first to help them visualize the whole project and all of its main parts. You can also show a WBS in tabular form as an indented list of elements.

Example WBSs

Understanding how to create a WBS is difficult. Many people learn by example, so this section includes several of them. The first involves a very simple demonstration of the basic reason for a WBS—to breakdown major project deliverables into smaller ones. Figure 4-8 is a WBS designed to represent a project to bake a Birthday Cake. The cake is decomposed into the cake itself, the frosting, toppings added to the top of the cake, and candles. Note that there is no oven, no pan, and no mixer in the WBS. Furthermore, it does not indicate how to mix the ingredients, the amount of the ingredients, the order of the construction, the baking temperature or time, or any other steps required to actually make this cake. Why? Because

the WBS should represent the project deliverables, not the tools, techniques, or actions required to create those deliverables.

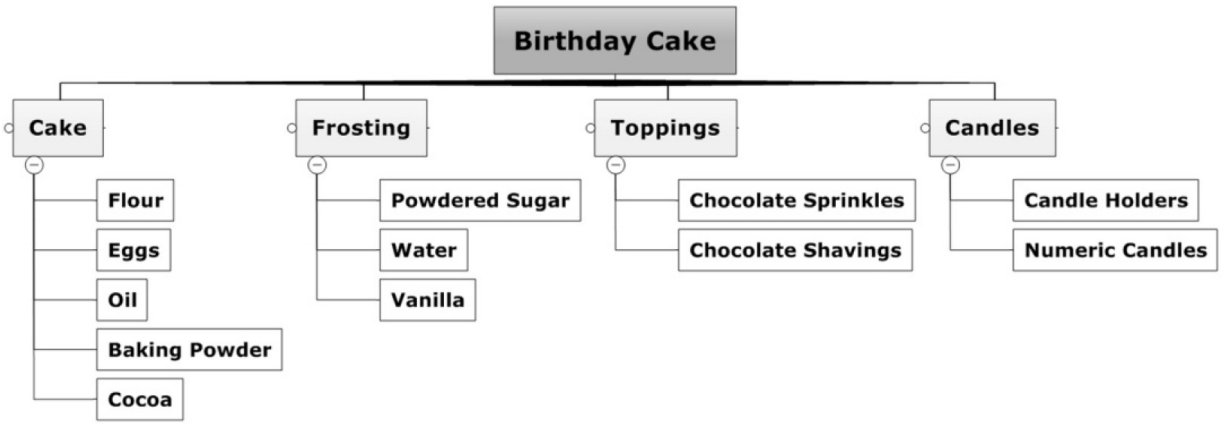


Figure 4-8. WBS for a birthday cake

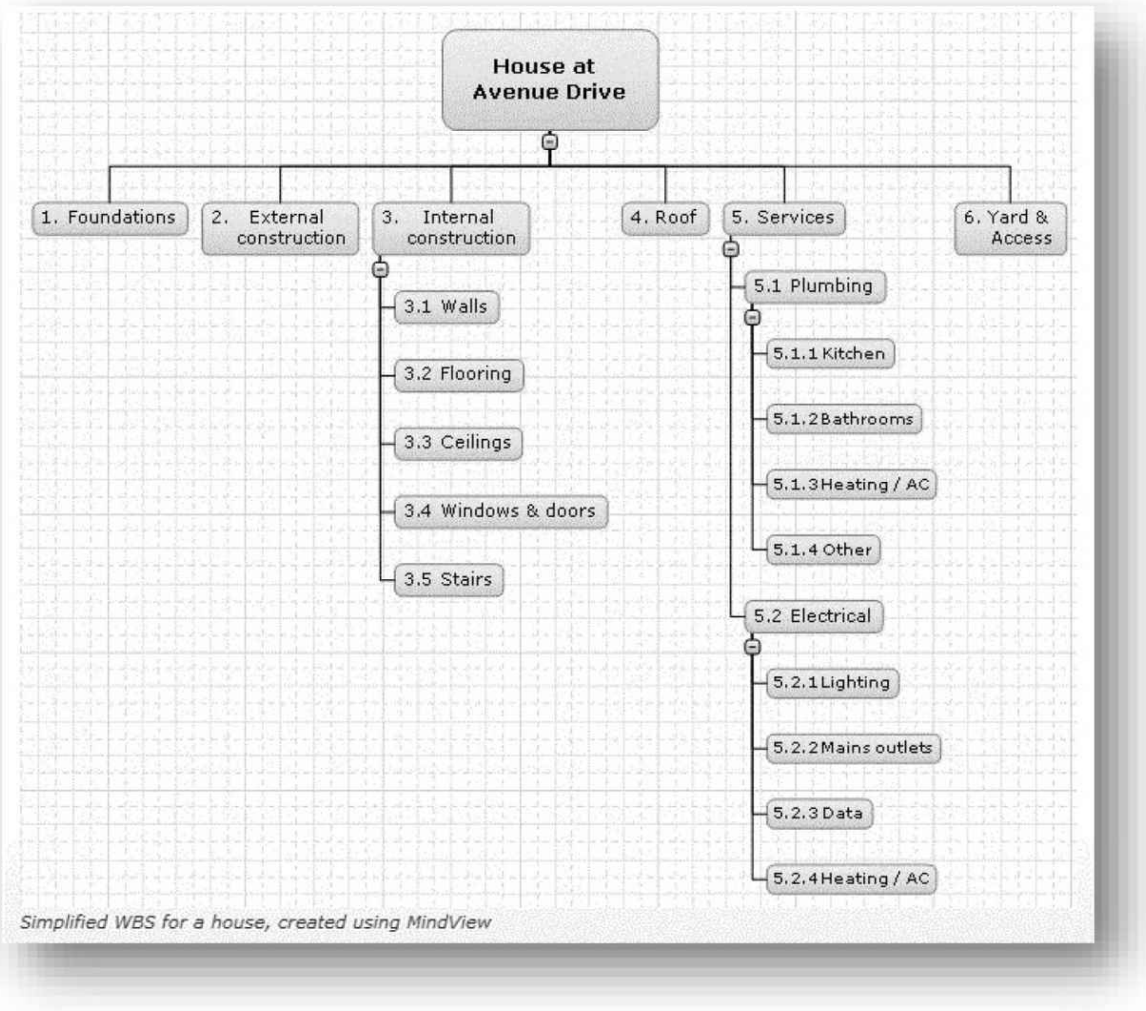
Of course no one would create a WBS for a birthday cake, but many of us have created documents that are very similar in construction to a WBS, such as a shopping list for a birthday party. You begin with your party's concept and then define the things that you must have in order to make the party happen (food, drinks, decorations, etc.). A WBS is not unlike that shopping list, except you are defining the things that your project must deliver to be successful. It is important to understand that the project does not have to create each of the deliverables (the boxes on the WBS), but it must create, purchase, or in some other way provide those items.

One basic method to verify that your WBS is complete is to look at the lowest level of deliverables and ask yourself, "If I have these deliverables will they, in combination, give me everything I need to create the higher level deliverable?" In the Birthday Cake example, consider the Cake deliverable. The Cake deliverable is decomposed into five smaller deliverables: flour, eggs, oil, baking powder, and cocoa. The question you would then ask the team is, "If I have flour, eggs, oil, baking powder, and cocoa, will I have everything I need to create a cake?" Of course the answer is no, as you forgot about the salt and water! You would then correct the WBS by adding salt and water as two other sub-deliverables under the Cake deliverable. Every box on the WBS is referred to as a deliverable in context

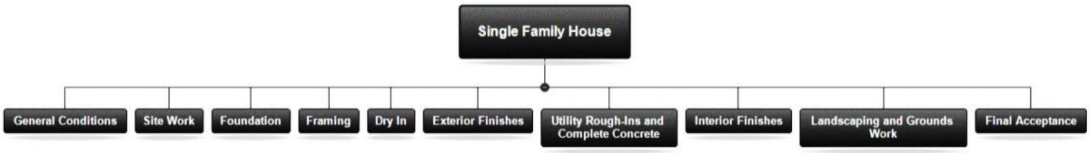
of itself, but it is called a sub-deliverable when talking about it in reference to the larger deliverable above it.

Because project managers rarely create Birthday Cakes as projects (with the popular Great British Baking Show or similar television shows as possible exceptions), the following examples are more representative of projects that most project managers can understand. For example, building a house is a common project, but there are many ways to create a WBS for it.

Figure 4-9 and 4-10 show two different WBSs for building a house from examples provided by two companies that design software to help manage projects—MatchWare and Microsoft. MatchWare creates a software product called MindView, mentioned in Chapter 2. You can use this software to create a mind map for many different purposes, including creating a WBS. Microsoft creates Project 2016, mentioned in Chapter 1 and described in detail in Appendix A. Notice that the second tier, or level 2, WBS items in Figure 4-9 includes *six* major deliverables: the foundation, external construction, internal construction, roof, services, and yard & access. (For this example, only the internal construction and services categories are broken down further, but for a real house project they would all be broken down several more levels.) However, in Figure 4-10, there are *ten* different categories for the level 2 items: general conditions, site work, foundation, framing, dry in, exterior finishes, utility rough-ins and complete concrete, interior finishes, landscaping and grounds work, and final acceptance. Some categories are similar, while others are not. Notice that *nouns* are used to describe the deliverables, not verbs.



4-9. WBS for a house showing 6 main deliverables (www.matchware.com)



4-10. WBS for a house showing 10 main deliverables (Microsoft Project)

The main thing to understand is that you are organizing the main deliverables based on *what* work needs to be done and *not how* the work will be done. Neither of these examples for building a house includes

obtaining financing or moving items from a former residence to the new house. If this work is in the scope of the project, then you could include WBS level 2 deliverables called “financing” and “relocation.” If it was important to you to include outdoor recreational items in the scope of the project, you might also include a level 2 category called “outdoor recreation” with level 3 sub-deliverables called “swimming pool,” “tennis court,” and “hot tub.” The key concept is that the WBS includes 100% of the work required to complete the project. If your project will create something, it should be shown in the WBS. Nothing should be created that is not in the WBS. This concept is also true for interim deliverables that will not end up in the hands of the customer. For example, when a firm built a patient walkway that connected two buildings separated by wetlands, the project team had to first build a temporary wooden causeway that stood above the marsh, protecting it from equipment and giving the workers a platform from which to work. When the project was completed, they removed the temporary causeway. This temporary causeway would be included in the WBS as it was required for the project, even though it was not the final deliverable.

These three examples, the birthday cake and two different house projects, show a WBS in a graphical or tree view, resembling the format of an organizational chart. You can also create or display a WBS in a tabular or list view that is text-based. Figure 4-11, described in the next example, shows both a graphical and tabular view of a WBS. When do you use one format versus the other? It depends upon the audience, the complexity of the WBS, and the medium that you are using to represent the WBS. The graphical format is often preferred but can be hard to follow once you get past several hundred deliverables and sub-deliverables, and it often requires a large format printer (36” wide or wider) to be able print in its entirety. The tabular format can be printed on regular letter sized paper (often many pages), but may not show the relationship between the deliverables as clearly.

Figure 4-11 shows a WBS in both graphical and tabular views for a project to create a new patient sign-in kiosk for a small physician practice. The title of the project is Kiosk Project, shown in the top box or level 1 of the WBS, and the level 2 deliverables are location, patient kiosk, staff training, and marketing. Level 3 deliverables are also included.

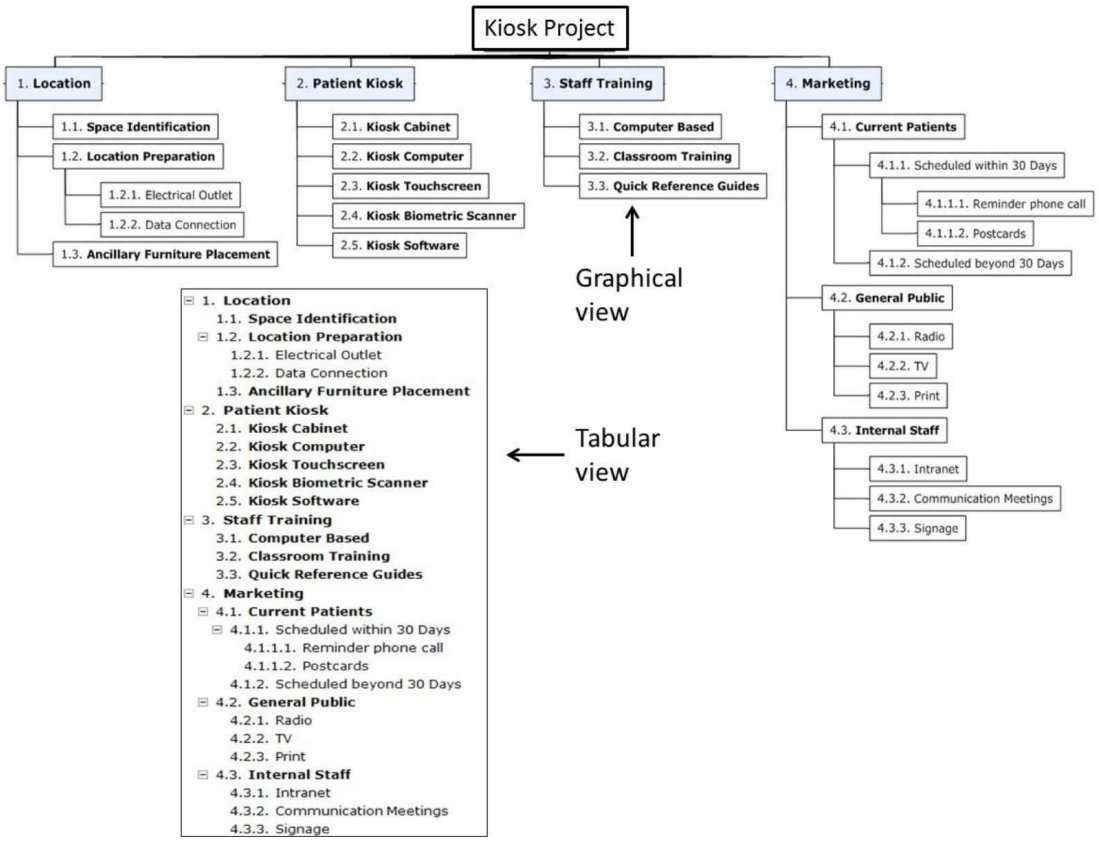


Figure 4-11. WBS for a kiosk project showing graphical and tabular formats

Notice that both of these formats in Figure 4-11 show the same information. Many documents, such as contracts, use the tabular format. Project scheduling software also uses this format, although there often are options to provide graphical formatting, if desired. Also note that work packages exist on different levels, depending on which deliverable thread you follow downward. For example, under the "2. Patient Kiosk" deliverable, the work packages are all listed at the next level as 2.1, 2.2, 2.3, 2.4, and 2.5. However, Marketing is decomposed down to a fourth level for "Current Patients" that are "Scheduled within 30 Days." For this thread the work packages are numbered 4.1.1.1 and 4.1.1.2. Remember, work packages are the lowest level deliverable or sub-deliverable for a given thread, and each deliverable thread can decompose to the level required to manage the project work without regard for how deep the other deliverables are decomposed. The depth at which you decompose a deliverable is based