

Reduce project risk by integrating Project Management Body of Knowledge (PMBOK) tools and techniques with ASAP

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Regardless of the type or size of a project, problems in the areas of scope, time, budget, and communication are bound to arise, putting the project at risk of failure. The first step to help ward off such problems is to introduce a proven implementation methodology that divides a project into phases with clearly defined deliverables. A solid methodology allows a project manager to focus on phase results and at the same time see the whole project; it also provides direction and goals for team members who need to keep the project on schedule and on budget. And not least, following a specific methodology enables project stakeholders to monitor the ongoing progress of a project and react quickly to any issues that arise.

If you ask what methodology is the best for SAP implementations, my answer is any, as long as it is effective. AcceleratedSAP (ASAP), for example, is the most popular, and proven, implementation methodology in the SAP world. However, ASAP and other implementation methodologies generally do not provide specific tools for actually carrying out the methodology — in fact, the phrase “use of ASAP with separate project management methodologies” appears frequently in the ASAP documentation — and minimizing risks.

The good news is that problems that threaten a project can be efficiently identified and solved by the use of proven project management techniques and methods in connection with ASAP, as well as other implementation methodologies. In this article, I introduce you to a set of tools and techniques from the *Project Management Body of Knowledge* (PMBOK), published by the Project Management Institute (PMI),¹ that you can use together with ASAP to help reduce the risk of project failure due to:²

¹ The Project Management Institute (PMI) is a professional organization for project management. PMI focuses on maintaining project management standards, certification, research, education, and training (for more information, visit www.pmi.org). In 1997, PMI published the first comprehensive set of project management standards, The Project Management Body of Knowledge (PMBOK), which became an ANSI standard (ANSI/PMI 99-001-2004) in 1999. The Third Edition of the PMBOK Guide was published in October 2004.

² See the sidebar on the next page for more on the role project management practices play in project failure.

What causes project failure?

Statistics and reports show that in most IT projects potential risks are not related to the technology itself, but rather to the project management practices in place.

One of the most widely known IT project failure surveys is the landmark CHAOS Report from The Standish Group (first conducted in 1994 and available at www.standishgroup.com/sample_research/chaos_1994_1.php). The sample size for the 1994 survey was 365 respondents representing 8,380 applications in banking, securities, manufacturing, retail, wholesale, health care, insurance, services, and local, state, and federal organizations. The survey results are presented in the following table.

Project impaired factors	% of responses
Incomplete requirements	13.1%
Lack of user involvement	12.4%
Lack of resources	10.6%
Unrealistic expectations	9.9%
Lack of executive support	9.3%
Changing requirements and specifications	8.7%
Lack of planning	8.1%
Didn't need it any longer	7.5%
Lack of IT management	6.2%
Technology illiteracy	4.3%
Other	9.9%
© The Standish Group, The CHAOS Report (1994)	

In short, the report concludes that projects fail because managers:

- Don't understand user needs
- Can't define the project scope properly
- Can't plan the project

As you will see in the article, these failure points are precisely what the Project Management Body of Knowledge (PMBOK) was designed to address and to prevent.

- Inadequately defined project scope
- Missed deadlines
- Exceeded budgets
- Unclear task assignments

- Repeated mistakes

Using an example SAP HR implementation project, I explain how to use the following PMBOK tools and techniques with ASAP to avoid such risks:

- **Work Breakdown Structure (WBS):** Used to

organize and define the scope of a project by “decomposing” (i.e., subdividing) project tasks into individual work package units containing activities and objectives required for each specific task.

- **Critical Path Method (CPM):** Used to calculate the minimum total project duration and determine scheduling flexibility.
- **Earned Value Management (EVM):** Used to integrate scope, schedule, and resources for measuring project performance.
- **Responsibility Assignment Matrix (RAM):** Used to ensure that responsibility for each work package defined in the WBS is assigned to the appropriate person.
- **Lessons Learned (LL):** Used to gain knowledge from the process of performing the project and apply that knowledge to ensure the success of the current project and future projects.

Integrating these PMBOK tools and techniques with ASAP helps you to manage not only ongoing projects, but also the entire process, from planning a project to monitoring that project after it has rolled out. For simplicity, however, the article focuses on a small portion of an implementation project. By the end of this article, you will see the benefits of the PMBOK project management tools and techniques and be able to apply them in other areas and projects, such as system upgrades, business cases, and re-implementations.

Let’s begin by taking a look at PMBOK itself and the ways it can be used with ASAP.

Note!

While this article assumes familiarity with the ASAP implementation methodology, the PMBOK tools and techniques do not require any sophisticated knowledge, nor are they exclusively for use by SAP project managers. These approaches are beneficial to anyone who is part of a project team or who is interested in effective project management.

What is PMBOK and how can it be used with ASAP?

PMBOK is not a methodology, but rather a set of generally accepted techniques and methods that serve as the de facto standard in the world of project management. It includes practices that are well-known and widely applied, like the Work Breakdown Structure (WBS) and Critical Path Method (CPM), as well as practices with more limited use, such as multicriteria decision support methods. PMBOK can be used for any kind of project, from SAP implementation projects, to pharmaceutical product development or construction projects.

The main elements that constitute the PMBOK framework are *processes* (sets of activities for achieving an end result), each of which requires its own “inputs” (what is needed for the process to proceed) and produces its own “outputs” (the process result, which sometimes serves as the input for another process), and the *tools and techniques* that are used to turn inputs into outputs. Let’s take a closer look at each of these elements, how they work together, and how they can be used with ASAP to reduce project risks.

The PMBOK processes

PMBOK describes the lifecycle of a project through 44 project management processes that are organized into five sequential process groups:

1. **Initiating:** Processes performed to authorize and define the scope of a new project or project phase
2. **Planning:** Processes performed to develop the project scope, define the project management plan, and schedule the project activities
3. **Executing:** Processes performed to complete the activities defined in the project management plan and in the project scope
4. **Monitoring and Controlling:** Processes performed to monitor and measure the progress of the project and take corrective action when necessary
5. **Closing:** Processes performed to formally accept and conclude the project or phase

Initiating processes			
• Develop Project Charter	• Develop Preliminary Project Scope Statement		
Planning processes			
• Develop Project Management Plan	• Activity Resource Estimating	• Quality Planning	• Qualitative Risk Analysis
• Scope Planning	• Activity Duration Estimating	• Human Resource Planning	• Quantitative Risk Analysis
• Scope Definition	• Schedule Development	• Communication Planning	• Risk Response Planning
• Create WBS	• Cost Estimating	• Risk Management Planning	• Plan Purchases and Acquisitions
• Activity Definition	• Cost Budgeting	• Risk Identification	• Plan Contracting
• Activity Sequencing			
Executing processes			
• Direct and Manage Project Execution	• Acquire Project Team	• Information Distribution	• Select Sellers
• Perform Quality Assurance	• Develop Project Team	• Request Seller Responses	
Monitoring and Controlling processes			
• Monitor and Control Project Work	• Scope Verification	• Perform Quality Control	• Risk Monitoring and Control
• Integrated Change Control	• Scope Control	• Manage Project Team	• Contract Administration
	• Schedule Control	• Performance Reporting	
	• Cost Control	• Manage Stakeholders	
Closing processes			
• Close Project	• Contract Closure		

Figure 1 The PMBOK project management processes

Note!

The particular processes used in a project are entirely dependent on the project needs and must be determined by the project team on a project-by-project basis.

Note!

Many processes are iterative. As with determining the processes to be used, the extent of the required repetition of the processes depends on the needs of the project at hand and is determined by the project team.

Figure 1 summarizes the processes included in each process group, as defined in the 2004 edition of the PMBOK Guide.

So how can the PMBOK processes be used with ASAP? The processes are applicable not only to the overall project, but also to any phase, sub-phase, or

ASAP implementation phase	PMBOK processes
Project Preparation	Initiating, Planning , Executing, Monitoring and Controlling, Closing
Business Blueprint	Initiating, Planning , Executing, Monitoring and Controlling, Closing
Realization	Initiating, Planning, Executing, Monitoring and Controlling , Closing
Final Preparation	Initiating, Planning, Executing, Monitoring and Controlling , Closing
Go Live & Support	Initiating, Planning, Executing, Monitoring and Controlling, Closing

Figure 2 Applying PMBOK processes to ASAP implementation phases

Note!

Many processes interact with one another across process groups — for instance, the Develop Project Management Plan process (one of the Planning processes) serves as input for the Executing processes.

activity within a project, which means they can be easily applied to the initiation and completion of each ASAP implementation phase, as shown in **Figure 2** (note that the processes that tend to be particularly extensive in a certain phase are indicated with boldface type).

As an example, let's take a look at how the PMBOK processes can be applied to the ASAP Realization phase:

- **Initiating:** The answer to the question “Shall we continue with this project?” is positive and the phase is initialized — e.g., the project manager is formally authorized by management to begin the ASAP Realization phase.
- **Planning:** With the preceding ASAP Project Preparation and Business Blueprint phases already complete, in the Realization phase the project and its objectives are more fully formed than when the project began, and the project plan can be further fine-tuned. The plan may be updated due to the need for additional work or identified risks (e.g., enhancements defined in the ASAP Project Preparation or

Business Blueprint phase will make the schedule targets impossible).

- **Executing:** People and resources are coordinated to carry out the project plan. The main tasks for the project manager here are quality assurance and information distribution. Re-planning is also possible in this phase, due to changes in resource availability (e.g., team member illnesses) or unanticipated events (e.g., late delivery of a production server), for example. As you can see in Figure 2, the Executing processes are extensive in the ASAP Realization phase.
- **Monitoring and Controlling:** Project activities are monitored and measured, and corrective action is taken where appropriate. As you can see in Figure 2, the Monitoring and Controlling processes are extensive in the ASAP Realization phase. The time and effort involved in monitoring and controlling budgets and deadlines during this phase — due to added enhancements, for example — is often underestimated.
- **Closing:** Once completed (i.e., the system prototype is approved by the project steering committee), the ASAP Realization phase is closed, and the next ASAP phase (Final Preparation) can begin.

The PMBOK tools and techniques

PMBOK defines several tools and techniques that are used to perform the PMBOK processes, and turn process inputs into process outputs. For example, the Critical Path Method (CPM) technique takes output from the Activity Sequencing and Activity Duration Estimating

Tool/technique	Description	
Work Breakdown Structure (WBS)	A WBS is a tool that decomposes (i.e., subdivides) project work into clearly defined work packages (deliverables or project work components). A WBS defines the project scope. It is usually presented as a tree structure that shows a hierarchical decomposition of the work to be done to accomplish the project objectives. Work not included in the WBS is considered outside the scope of the project. The WBS is the most useful of the PMBOK project management tools, and is used in all of the PMBOK process groups.	
Critical Path Method (CPM)	CPM is a technique used to determine the minimum total project duration and the amount of flexibility in the project schedule. Activities that lie along the critical path cannot be delayed without delaying the finish time of the project. Use of the CPM technique usually involves the use of four additional techniques: the Precedence Diagramming Method (PDM), Analogous Estimating, Crashing, and Fast Tracking.	
	Precedence Diagramming Method (PDM)	PDM is a technique for constructing a network diagram with nodes representing project activities and arrows showing dependencies between them. PDM is used during the Activity Sequencing process, which is one of the PMBOK Planning processes.
	Analogous Estimating	Analogous Estimating is a technique for predicting project activity durations using historical information (similar activities from previous projects are compared to activities in current projects). Analogous Estimating can be used during the Activity Duration Estimating process, which is one of the PMBOK Planning processes.
	Crashing	Crashing is a project schedule compression technique where additional resources are added to activities that lie on the critical path to shorten the project duration. Crashing can be used during the Schedule Development process, which is one of the PMBOK Planning processes.
	Fast Tracking	Fast Tracking is a project schedule compression technique where activity relationships are changed (activities that originally would be performed in sequence are performed in parallel). Fast Tracking can be used during the Schedule Development process, which is one of the PMBOK Planning processes.
Earned Value Management (EVM)	EVM is a technique that integrates project scope, schedule, and resources to measure project performance (by comparing the budgeted cost of work performed to the actual cost of the work) and progress (by comparing the budgeted cost of work performed to the budgeted cost of work scheduled).	
Responsibility Assignment Matrix (RAM)	RAM is a tool that is used to connect the WBS with the project organization structure, showing the assignment of each component of the WBS to a responsible person.	
Lessons Learned (LL)	LL is a set of techniques for documenting knowledge gained during the project, usually stored as records in a knowledge base. LLs serve as useful historical information for new projects.	

Figure 3 PMBOK tools and techniques that can be used in almost any SAP project

processes and uses it in the Schedule Development process to produce the project schedule. These tools and techniques can also be used during ASAP implementation projects, as I will demonstrate in this article.

Figure 3 provides an overview of the tools and techniques that can be used in almost any SAP project, and are the ones we will use for our example HR implementation:

- Work Breakdown Structure (WBS)
- Critical Path Method (CPM)
- Earned Value Management (EVM)
- Responsibility Assignment Matrix (RAM)
- Lessons Learned (LL)

Note!

As you can see in Figure 3, the Critical Path Method (CPM) involves the use of some additional PMBOK techniques. I will cover these in the CPM discussion later in the article.

Now that you understand the elements of the PMBOK framework, how they work together, and how they can be used with ASAP, over the course of the rest of this article I use the ASAP Business Blueprint phase of an example SAP HR implementation project to illustrate how the PMBOK tools and techniques can significantly reduce potential SAP project risks when used appropriately and consistently with ASAP. We'll look at the use of these tools and techniques in the context of the following key questions that inevitably face project managers:

- What is the scope of the project?
- How long will the project take?
- What is the status of the project?
- Who is doing what?
- How can we do it better?

Note!

While this article focuses on the PMBOK tools and techniques, some of the tools and techniques require the use of various PMBOK concepts and processes. In these cases, I explain the concept or how to perform the required process in the context of the example SAP HR implementation project.

What is the scope of the project? Using the Work Breakdown Structure (WBS)

According to the PMBOK, one of the characteristics of any project is its “progressive elaboration”; in other words, the ongoing clarification of the project scope as the project objectives become clearer. For example, in the ASAP Project Preparation phase the goal of an SAP payroll re-implementation project may initially be defined as *reduce the time of SAP payroll evaluation to 2 days*. As the project progresses and enters the Business Blueprint phase, the definition becomes more precise — e.g., *configure the automatic payroll posting to reduce the time needed to post payroll results from 4 hours to 30 minutes*. Defining a Work Breakdown Structure (WBS), which is itself one of the PMBOK Planning processes (Create WBS), not only helps to facilitate the progressive elaboration of a project, it also helps project managers control the project — it organizes and defines the scope of the project, so that each piece of work can be managed, scheduled, and monitored:

- It shows what has to be done.
- It effectively communicates project work to the stakeholders.
- It serves as the basis for the project manager's cost and staffing decisions during the project.
- It provides the input for the Activity Definition, which is the first step in defining the project schedule.
- It serves as a valuable source of information for future projects.

In the context of the PMBOK, the WBS provides the input for many other Planning processes — e.g., Activity Definition, Cost Estimating, Cost Budgeting (see Figure 1) — which means that it is the most extensively used planning tool in PMBOK-based project management.

The method for creating a WBS is a “decomposition” (i.e., subdivision) of the project scope into manageable components known as “work packages” or “deliverables,” each of which contains the activities (i.e., processes) and objectives required to complete the work package. The decomposition involves the following steps:

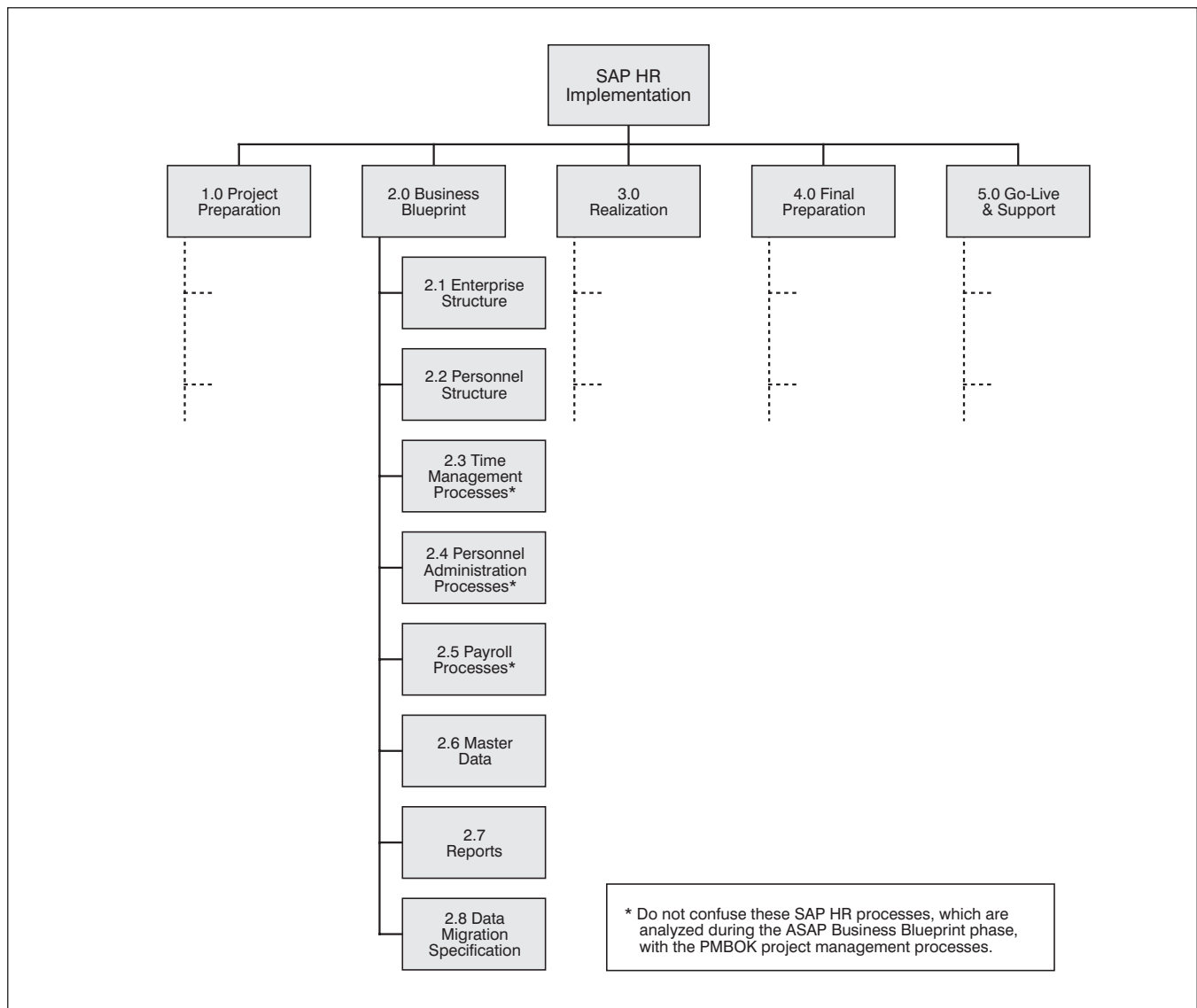


Figure 4 Partial work package decomposition for the example SAP HR implementation project

1. Identify the major deliverables of the project. For example, according to the ASAP Project Preparation phase, the deliverables could be High-Level Business Requirements, Project Charter, Project Procedures and Standards, Project Team Training Plan, Project Team Kick-off Meeting, and so on. The deliverables should always be defined in terms of how the project will actually be organized. For example, the ASAP phase of the SAP project lifecycle may be used as the first level of decomposition, with the project deliverables at the second level.
2. Decide if adequate cost and duration estimates can be determined for each deliverable. For example, in the ASAP Project Preparation phase, deliverables like Project Charter and Project Team Training Plan can be adequately estimated as far as cost and timing are concerned. For each deliverable, skip to step 4 if there is adequate detail; if not, the deliverable is not yet properly decomposed and you must proceed to step 3.
3. Identify the activities involved in the deliverables, and

describe them in terms of tangible, verifiable results to facilitate performance measurement. Repeat step 2 for each activity until there is adequate detail.

4. Verify the correctness of the decomposition:

- Verify that the deliverables are clearly defined and that each WBS item is an aggregation of all subordinate elements (i.e., that it contains all required work and no unnecessary work).
- Verify that you can prepare a schedule, budget, and organizational assignment for each WBS item.

Note!

Do not rely completely on the WBS defined by the ASAP Roadmap. The ASAP-defined WBS should be treated rather as a template for defining the PMBOK-based WBS dedicated to your particular project.

Figure 4 shows a small portion of a WBS created for our example SAP HR implementation project. This WBS is organized according to the five ASAP phases (see Figure 2), which represent the top decomposition level of the WBS. As you can see, the second ASAP phase (Business Blueprint) has been decomposed into eight work packages. Work not included in the WBS is considered outside the scope of the project.

Note!

There is no limit to the number of sublevels a WBS can have, though an excessive number can create an unwieldy project scope, so be judicious with your decomposition.

A WBS helps project teams keep the project on track and avoid risks such as missed deadlines and increased costs due to changes in the project scope. I remember my

first SAP project, when I wanted to give the customer more functionality than what was defined in the scope. I didn't need much time to understand that this would introduce risks such as changing deadlines, inadequate human resources, and increased project costs. Generally, changes other than those resulting from progressive elaboration should only be made with solid justification, careful consideration among all project stakeholders, and a formal addition to the project scope.

Tips for using the Work Breakdown Structure (WBS)

- Creating a WBS is not just the job of the project manager — the best WBS is the result of collaboration among the members of a project team. In my experience, the most popular method of collaboration is brainstorming, where the project team, sometimes supported by multidisciplinary experts, construct the WBS under the leadership of a project manager.
- As often as possible, I use WBS templates taken from previous projects as guides for a current project. It not only increases the chances of success for the project at hand, it also helps to propagate best practices in the organization.
- Keep your project files up to date — they will be the historical knowledge base from which you can draw later to repeat best practices.
- I find a WBS to be a good tool for presenting the project scope during steering committee meetings. The WBS helps stakeholders understand the project goals and the interconnection between deliverables they might be responsible for, and provides the level of detail required to answer the question, “Where are we at this point in time?” (i.e., “What has been done and what are the goals for the near future?”). Keep in mind that sometimes it's better to focus on the higher levels of the WBS than the lower-level work packages, to keep the scope clear to the stakeholders.
- Always keep the end deliverable in mind to avoid defining unnecessary work. Just ask yourself the simple question, “Does this activity contribute to the deliverable?”

- Always keep integration aspects in mind — group WBS elements involving integration work under their own higher level component.

How long will the project take? Using the Critical Path Method (CPM)

Once you've created a WBS, you can start thinking about project scheduling. The Critical Path Method (CPM) is a schedule analysis technique that the project manager (with project team help) can use to calculate the minimum total project duration and determine the scheduling flexibility of the project. This information is crucial for project time management because the effects that tasks that are completed late can have on project deadlines vary depending on the task's place in the path of dependencies.

Before using the CPM technique, we must complete the following PMBOK time management processes (see Figure 1):

1. **Activity Definition:** A Planning process used to identify the activities that must be performed to produce the deliverables defined in the WBS.
2. **Activity Sequencing:** A Planning process used to identify and document the logical relationships between activities in order to create a project network diagram using the PMBOK Precedence Diagramming Method (PDM). A project network diagram is a schematic display of the project activities and the dependencies among them.
3. **Activity Duration Estimating:** A Planning process that estimates the duration of activities and calculates schedules using information from the project scope and details on available resources (people, equipment, materials). The Analogous Estimating technique can be used to estimate the duration of activities performed in previous projects.

Using the output from these three processes, we then use the CPM technique in the Schedule Development process, which is a Planning process used to determine the start and finish date for project activities, how long

the project will take, and which tasks have no margin for delay.

Step 1: Activity Definition

Activity Definition involves identifying and documenting the activities that must be performed to produce the deliverables defined in the WBS. This process often also results in updates to the WBS — the team may find that deliverables are missing or that changes to a deliverable definition are required.³

To produce the deliverables identified in the WBS for our example SAP HR implementation project (refer back to Figure 4), the activities outlined in **Figure 5** must be performed.

Note!

Note that while the example work packages (Figure 4) and activities (Figure 5) have the same names, this is not always the case. In practice, they will generally have different names because work packages often consist of several different activities. I use the same names in the examples throughout the article for simplicity, and differentiate between the two using numbers (2.1, 2.2, 2.3, etc.) to identify the work packages and letters (A, B, C, etc.) to identify the activities.

Step 2: Activity Sequencing

Activity Sequencing involves identifying the relationships between tasks, usually using a diagramming method. When sequencing tasks, keep mandatory, discretionary, and external dependencies in mind. Mandatory dependencies are defined by the nature of the work (e.g., the data migration cannot be performed before the interfaces are prepared and the legacy data is generated). Discretionary dependencies are defined by the project team (e.g., train the team at the beginning of the Business

³ These updates are called "refinements" and are not to be confused with changing the project scope. Refinements often occur in projects involving a new technology (system upgrades, new SAP product implementations, etc.).

Activity ID	Activity
A	Define Enterprise Structure
B	Define Personnel Structure
C	Define Time Management Processes
D	Define Personnel Administration Processes
E	Define Payroll Processes
F	Define Master Data
G	Define Reports
H	Prepare Data Migration Specification

Figure 5 Activity definitions for the example SAP HR implementation project

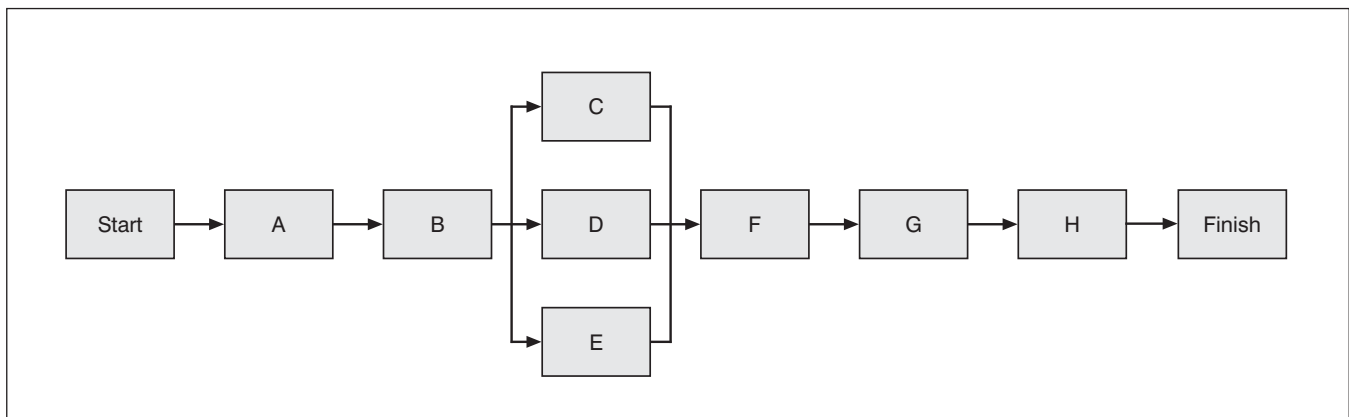


Figure 6 Precedence diagram for the example SAP HR implementation project

Blueprint phase). External dependencies are defined by events outside the project (e.g., interface preparation may be dependent on the delivery of an external time recording system). The activity list (Figure 5) is the main input to the Activity Sequencing process. All dependencies should be identified during this process.

To identify and document the logical relationships between activities, we use the Precedence Diagramming Method (PDM), also known as activity on node (AON). PDM uses four types of logical relationships to determine the dependencies between activities. They are:

- The **finish to start relationship**, where Activity B cannot start until Activity A is completed.
- The **start to finish relationship**, where Activity B cannot finish until Activity A has started.

- The **finish to finish relationship**, where Activity B cannot be completed until Activity A is completed.
- The **start to start relationship**, where Activity B cannot start until Activity A starts.

In a precedence diagram, the nodes depict the activities and the arrows depict the dependency. For our example SAP HR implementation project, we will use only the “finish to start relationship,” as illustrated in **Figure 6**. In my experience, the other relationships are only rarely used.

So, according to our diagram, Activity F cannot start until Activities C, D, and E are complete. For our example SAP HR implementation project, this means that the SAP HR processes must be defined before the master data is defined. Activities C, D, and E cannot start

Activity ID	Activity	Duration estimate
A	Define Enterprise Structure	1 day
B	Define Personnel Structure	1 day
C	Define Time Management Processes	10 days
D	Define Personnel Administration Processes	5 days
E	Define Payroll Processes	15 days
F	Define Master Data	4 days
G	Define Reports	6 days
H	Prepare Data Migration Specification	8 days

Figure 7 Activity duration estimations for the example SAP HR implementation project

until Activity B is complete (i.e., the personnel structure must be defined before the SAP HR processes). Also note that Activities C, D, and E can be performed in parallel. These are examples of discretionary dependencies based on best practices within the SAP HR area — other sequences that work better for your particular project are also acceptable.

Step 3: Activity Duration Estimating

Estimating the duration of an activity involves using information from the project scope and details on available resources (people, equipment, materials) to calculate the approximate amount of time needed to complete an activity. Usually the input data is provided by subject matter experts guided by historical information from similar activities in previous projects.

Let's assume that our activity duration estimations for the example SAP HR implementation project produces the results shown in **Figure 7**.

In the case of activities that have already been estimated for previous projects and are similar to the activities in your current project, you can use the Analogous Estimating technique to predict their duration. You simply compare the current project conditions to the previous project conditions, and if they are similar you can use the same activity duration estimation for the corresponding activities in your current project, saving you the time you would otherwise spend estimating their duration.

Note!

When estimating the activity durations, you also must take into account the availability of particular people. Team members are rarely 100% dedicated to the project; 50% at most is more realistic, a reality that must be acknowledged and factored into the duration estimate.

Schedule Development

With the activities defined, the logical relationships between them established, and their durations estimated, we can now use the CPM technique to schedule the activities and determine the flexibility of the schedule.

Determining the critical path. When scheduling the activities, we must determine the *critical path*, which is the path through the project that cannot have any delays. The critical path has no float (i.e., “slack time”), which is the amount of time you can delay the earliest start of the project without affecting the planned finish date.

The critical path is not always obvious, especially with complex precedence diagrams, which are often the case with SAP projects. The tasks on the critical path should be carefully managed — if even one of them slips, the end date of the project can slip, which can have disastrous implications. To determine the critical path through your project, all you need to do is perform

Note!

There can be more than one critical path in a project!

forward pass, backward pass, and float calculations for each activity in your precedence diagram (Figure 6). I'll take you through each of these calculations in turn.

A *forward pass* calculation determines the early start (ES) and early finish (EF) dates for each activity. Using the activity duration estimates in Figure 7, let's calculate some of the ES and EF dates for our example SAP HR implementation project:

- The earliest time Activity A can start is day 0 (ES = 0). Add the duration estimated for Activity A (1 day) to its ES (0) to calculate its EF, which in our example is 1 (0 + 1).
- The earliest time Activity B can start is day 1 (ES = 1). Add the duration of Activity B (1 day) to its ES (1), resulting in an EF of 2 (1 + 1).
- The earliest time Activity F can start is day 17 (ES = 17). Add the duration of Activity F (4 days), and the EF is 21 (17 + 4).

Adding the remaining start times and duration estimates for our example SAP HR implementation project should produce the results shown in **Figure 8**.

A *backward pass* determines the late start (LS) and late finish (LF) dates for each activity. To calculate the backward pass, start with the last activity and work backward, using the EF calculated in Figure 8 to determine the latest time an activity can finish, and the duration estimated in Figure 7 to determine the latest time an activity can start:

- The latest time Activity H can finish is day 35, which is the LF for this activity, and in this case, the entire precedence diagram. Subtract the duration estimated for Activity H (8 days) from its LF (day 35) to calculate the latest time Activity H can start (its LS), which in this case is day 27 (35 - 8).
- The latest time Activity G can start is day 27, which

Activity ID	Early Start (ES)	Early Finish (EF)
A	0	1
B	1	2
C	2	12
D	2	7
E	2	17
F	17	21
G	21	27
H	27	35

Figure 8 Forward pass calculations for the example SAP HR implementation project

Activity ID	Late Start (LS)	Late Finish (LF)
A	0	1
B	1	2
C	7	17
D	12	17
E	2	17
F	17	21
G	21	27
H	27	35

Figure 9 Backward pass calculations for the example SAP HR implementation project

is the LF for this activity. Subtract the duration estimated for Activity G (6 days) from its LF (day 27) to calculate the latest time Activity G can start (its LS), which is day 21 (27 - 6) in this case.

- The latest time Activity B can start is day 2, which is the LF for this activity. Subtract the duration estimated for Activity B (1 day) from its LF (day 2) to calculate the latest time Activity B can start (its LS), which is day 1 (2 - 1).

The remaining backward pass results for our example SAP HR implementation project are shown in **Figure 9**.

The *float* is the amount of “slack time” available for a given activity — i.e., the amount of time the completion of the activity can be delayed without affecting the project finish date. The float is calculated by subtracting

Activity ID	LS - ES	LF - EF	Float
A	0 - 0	1 - 1	0
B	1 - 1	2 - 2	0
C	7 - 2	17 - 12	5
D	12 - 2	17 - 7	10
E	2 - 2	17 - 17	0
F	17 - 17	21 - 21	0
G	21 - 21	27 - 27	0
H	27 - 27	35 - 35	0

Figure 10 Float calculation for the example SAP HR implementation project

either the ES from the LS, or the EF from the LF for each activity.

The results for our example SAP HR implementation project are shown in **Figure 10**.

Note!

As you can see in Figure 10, the float calculation is the same whether you subtract the ES from the LS, or the EF from the LF. The method you choose is purely a matter of personal preference.

At this point, we have now determined our example project's critical path. The critical path for our example SAP HR project is Activity A → B → E → F → G → H — each of these activities has zero float, as shown in Figure 10. These tasks should be carefully managed, as any lateness on this path will make the entire project late. As you can see in Figure 10, Activity C can be delayed at most 5 days without delaying the whole project, and Activity D has a flexibility of 10 days; all other activities, however, cannot be late in order to meet the deadline.

But what do you do if, despite your best efforts, an activity on the critical path is delayed? This is hardly a rare occurrence, as you probably know all too well. In cases like these, the project manager can try to shorten

the other activities on critical path. I show you how to do this next.

Schedule compression. If project duration must be reduced due to delays on the critical path, you can use two techniques from the Schedule Development process for reducing the duration of activities: Crashing and Fast Tracking.

With the *Crashing* technique, the project manager analyzes the critical path (or paths) and determines what can be done to shorten it. Cost and schedule tradeoffs must be analyzed as well. Crashing may result in a shorter schedule, but also can push the project's budget beyond the acceptable range. To balance the potential tradeoffs and still reduce a project's critical paths, the project manager needs to look for opportunities to:

- Change or modify the activity sequencing to shorten the critical path
- Increase the number of team members to shorten the activity durations
- Reduce the scope of the project and subsequently its critical path tasks

However, each opportunity brings some risks, of course, so be sure to keep the following in mind:

- Changing the activity sequence often contradicts best practices (e.g., beginning an SAP configuration before the Business Blueprint phase is closed is very risky,

as subsequent changes to the blueprint may require reconfiguration).

- Increasing the number of team members causes increased communication and training effort.
- Reducing the project scope may lead to unsatisfactory project results.

With the *Fast Tracking* technique, the project manager looks for opportunities to complete critical path activities in parallel instead of sequentially. However, as with the Crashing technique, Fast Tracking can raise risks and costs beyond the acceptable range, and often results in rework, which nullifies the saved time.

CPM is a valuable time management tool that you can use to calculate the minimum total project duration and to determine the project's scheduling flexibility. Taking into consideration activity definitions, activity sequencing, and activity durations, coupled with determining when activities must start and finish and controlling changes to the schedule, you will be able to handle unexpected problems and delays.

Tips for project scheduling and using the Critical Path Method (CPM)

- Each completed project I have worked on convinces me that people and time are not interchangeable. If you think that increasing the number of team members for a given activity from one to two persons can reduce its duration twice, you are most likely wrong. The more people involved in the project, the greater effort is needed for communication and training. Adding new people to handle overdue tasks usually makes the tasks more overdue.
- If you are not sure about activity duration while scheduling, search your historical project records for an analogous activity in a similar project. This is another example of the benefits of keeping historical records.
- Decreasing the critical path time is the only way to shorten the entire project.
- The float for each activity is useful information for the project manager — this is the time an activity can be delayed without affecting the project finish date.

What is the status of the project? Using Earned Value Management (EVM)

With a clearly defined project scope and schedule in hand, you are well on your way to a successfully managed project. But other project stakeholders, such as executives, consultants, and customers, usually expect information about the project performance not only at the end of the project, but also *while the project is in progress*. To address this need, one of the main goals of ASAP is to divide a project into phases with well-defined milestones, which help to evaluate the intermediate results. There are, however, always open questions during the project that ASAP alone cannot answer:

- Is the project under or over budget?
- Is the project ahead of or behind schedule?
- Will the project finish under or over budget?
- How effectively is the project using its resources?
- How effectively is time being used?
- How should the remaining resources be used?
- When is the project likely to be completed?
- What are the remaining tasks likely to cost?
- What is the entire project likely to cost?

The PMBOK Earned Value Management (EVM) tool provides you with the information you need to answer such questions via a detailed performance analysis and forecasting report on future cost and schedule variances. The cornerstones of EVM are the following PMBOK-defined values:

- **Planned Value (PV):** The PV is the budget baseline against which progress is measured. In other words, the PV, which is also called the Budgeted Cost for Work Scheduled (BCWS), is the budgeted work scheduled to be performed. The total PV for a project is called the Budget at Completion (BAC).
- **Earned Value (EV):** The EV is the value of the work accomplished at a given point in time — that is, the

Measuring Earned Value (EV)

Using criteria established by PMI in the PMBOK, you can distinguish between two kinds of work, depending on its attributes:

- Work that results in distinct and tangible products that can be measured directly, referred to as *discrete effort*
- Work measured indirectly as a function of either discrete efforts or time consumed:
 - If linked to discrete effort, referred to as apportioned work
 - If measured by elapsed time, referred to as level of effort (LOE)

Tip!

Whichever type of work you choose should be decided in the first ASAP phase, Project Preparation.

Discrete effort is usually measured using various methods (even within the same project):

- **Fixed formulas:**
 - 50/50 method: 50% of the work is credited as complete for the period in which the work begins, and the remaining 50% is credited at the completion. This technique is preferably used on short-duration tasks.
 - 0/100 method: 100% is credited at work completion.
- **Weighted milestone:** The work is divided into milestones with assigned values (when the milestone is achieved, the value is credited).
- **Percent complete:** The project manager, SAP consultant, or customer estimates the percentage of the work complete (the easiest but most subjective technique).

Work that has no tangible results is usually measured using its LOE. SAP implementation projects always have some LOE activities: project office work or project management activities. Each LOE task is described by Planned Value (PV) for each measurement period, and at the end of the period, PV is automatically credited to the Earned Value (EV). In the example SAP HR implementation project referenced in the article, we use the *percent complete* technique and, for simplicity, no LOE tasks are included.

budgeted amount for that work. The EV is also known as the Budgeted Cost for Work Performed (BCWP). See the sidebar above for more on measuring EV.

- **Actual Cost (AC):** The AC is the actual amount of money spent on work performed up to a given date. The AC is also called the Actual Cost of Work Performed (ACWP).

Let's explore how to apply EVM using our example

SAP HR implementation project. Suppose the data in **Figure 11** has been provided by the project manager, using the information from the precedence diagram and the duration estimates and applying the information to calendar days. Let's also assume that the costs were estimated according to consultancy and internal rates.

Now let's assume that progress on the activities is checked on day 17 (August 17), which is also the EF for Activity E (refer back to the float calculation in

Activity ID	Duration estimate	Planned duration*	Cost (PV)**
A	1 day	Aug 31 - Sep 1	\$1,000
B	1 day	Aug 1 - Sep 2	\$1,000
C	10 days	Aug 2 - Sep 12	\$15,000
D	5 days	Aug 2 - Sep 7	\$9,000
E	15 days	Aug 2 - Sep 17	\$20,000
F	4 days	Aug 17 - Sep 21	\$5,000
G	6 days	Aug 21 - Sep 27	\$4,000
H	8 days	Aug 27 - Sep 5	\$10,000
Budget at Completion (BAC)			\$65,000
* Weekends are treated as working days for simplicity.			
** Values are only for example purposes.			

Figure 11 Planned duration and activity cost for the example SAP HR implementation

Activity ID	Duration estimate	Planned duration*	% complete	Cost (EV)	Cost (AC)
A	1 day	Aug 31 - Sep 1	100%	\$1,000	\$1,000
B	1 day	Aug 1 - Sep 2	100%	\$1,000	\$1,000
C	10 days	Aug 2 - Sep 12	70%	\$10,500	\$18,000
D	5 days	Aug 2 - Sep 7	100%	\$9,000	\$9,000
E	15 days	Aug 2 - Sep 17	80%	\$16,000	\$26,000
Actual Cost of Work Performed (ACWP)				\$37,500	\$55,000
* Weekends are treated as working days for simplicity.					

Figure 12 The EV and AC of activities on day 17 of the example SAP HR implementation project

Figure 8). The project manager gets status reports from those responsible for each activity (or from team leaders) with such data as: % complete for the day August 17 and

actual cost (or days of consultancy that can be easily converted into cost), and then constructs the table in **Figure 12**. Multiplying the % complete column values and the PV defined for each activity in Figure 12 produces the EV for each activity.

Note!

The cost of activities can be presented in various resource units, but monetary value of resources is most common. The project manager must measure work performance periodically. The frequency should fit the project specifics, scope, and length.

According to Figure 11, as of day 17 the PV should be equal to \$46,000, which is the total cost for Activities A-E assuming they have completed on time. However, according to Figure 12, Activity C is only 70% complete and Activity E is only 80% complete; therefore, the EV is actually \$37,500 [$1,000 + 1,000 + (15,000 * 70\%) + 9,000 + (20,000 * 80\%)$]. When you compare the EV to the PV, the difference indicates that *less work* than

Performance Measure	Formula	Value (as of day 17)*
Cost Variance (CV)	$CV = EV - AC$	-17,500
Schedule Variance (SV)	$SV = EV - PV$	-8,500
Cost Performance Index (CPI)	$CPI = EV / AC$	0.68
Schedule Performance Index (SPI)	$SPI = EV / PV$	0.82
To-Complete Performance Index (TCPI)	$TCPI = (BAC - EV) / (BAC - AC)$	2.75
Estimate at Completion (EAC)	$EAC = BAC / CPI$	95,588.24
Variance at Completion (VAC)	$VAC = BAC - EAC$	-30,588.24
Time Estimate at Completion (EAC_t)	$EAC_t = (BAC / SPI) / (BAC / \text{planned_duration}^{**})$	42,68
Estimate to Complete (ETC)	$ETC = (BAC - EV) / CPI$	40,441.18
* Where PV = \$46,000, BAC = \$65,000, EV = \$37,500, AC = \$55,000 (according to Figures 11-12).		
** Originally estimated completion time. In our example, days are used as time units (planned 35 days).		

Figure 13 Performance measures calculated for day 17 of the example SAP HR implementation project

planned has been done. For demonstration purposes, let's also say that according to information in the activity status reports submitted to the project manager, the AC of Activities A-E is equal to \$55,000, which indicates that more money than planned has been spent on the project to date. There can be different reasons for this — the planned values may have been estimated wrong or there are task execution problems (e.g., lack of resources or competence).

Using PV, EV and AC values to prepare a performance analysis and forecasting report

Once you have determined the PV, EV, and AC values, it's time to pull all the information together using some additional PMBOK performance measures, so you can prepare a performance analysis and forecasting report for stakeholders that answers the project management questions posed earlier. These measures, which are part of the PMBOK Monitoring and Controlling processes Cost Control, Schedule Control, and Performance Reporting, include:

- Cost Variance (CV)
- Schedule Variance (SV)
- Cost Performance Index (CPI)

- Schedule Performance Index (SPI)
- To-Complete Performance Index (TCPI)
- Estimate at Completion (EAC)
- Variance at Completion (VAC)
- Time Estimate at Completion (EAC_t)
- Estimate to Complete (ETC)

Each measure is calculated using a simple formula that leverages the EVM values. **Figure 13** shows the formulas and their results for our example SAP HR implementation project.

Using the performance measure results in Figure 13, we can answer the earlier project management questions and prepare a performance analysis and forecasting report for our example SAP HR implementation project:

- **Is the project under or over budget?** The CV is equal to -17,500. But what does that mean in terms of the overall project? To more accurately evaluate what this number means, calculate the CV percentage ($CV\%$) by dividing the CV by the EV multiplied by 100 ($CV / EV * 100 = CV\%$):

$$-17,500 / 37,500 * 100 = -46.7\%$$

This means that the cost to date (day 17) for the example project is 46.7% over budget for the activities completed to date, clearly not a favorable amount.

- **Is the project ahead of or behind schedule?** The SV is equal to -8,500. Again, to more accurately evaluate this number, calculate the schedule variance percentage (SV%) by dividing the SV by the PV multiplied by 100 ($SV / PV * 100\% = SV\%$):

$$-8,500 / 46,000 * 100 = -18.5\%$$

This means that our example project is 18.5% behind schedule.

- **Will the project finish under or over budget?** The VAC is equal to -30,588.24. This means that with current trends, the project will cost \$30,588.24 more than planned. To calculate the variance at completion percentage (VAC%), divide the VAC by the BAC multiplied by 100:

$$-30,588.24 / 65,000 * 100 = -47.1\%$$

This means that the cost of the project will be 47.1% higher than planned.

- **How effectively is the project using its resources?** The CPI for our project is equal to 0.68, which is unfavorable. This means that for every dollar spent on the project the results are only worth \$0.68.
- **How effectively is time being used?** The SPI for our project 0.82. This too is an unfavorable value. It means that for every working day only part of it (82%) is productive. Such efficiency is not a good sign for the project manager.
- **How should the remaining resources be used?** The TCPI provides information on the level of efficiency that needs to be achieved in order to meet the BAC. Our example SAP HR implementation project has a TCPI of 2.75, which means that performance needs to increase from a CPI of 0.68 to a TCPI of 2.75 for the remaining activities. There is much work to be done!
- **When is the project likely to be completed?** If current trends continue, according to EAC_t 8 days must be added to the planned 35 days to complete the project ($EAC_t = 43$ days). This estimate should be

analyzed together with the schedule. There is always a possibility that even though the project is behind schedule, the EVM shows no schedule variance (because activities planned for the future are completed before activities on the critical path are completed, for example).

- **What are the remaining tasks likely to cost?** The ETC for our example project is equal to \$40,441.18, which again indicates that the costs of the project will run over.
- **What is the entire project likely to cost?** The EAC for our example SAP HR implementation project is equal to \$95,588.24, if current trends continue. The planned budget was \$65,000. Not very good news!

Note!

When calculating the EAC for our example, we assume that the CPI adequately shows the performance that will continue to the end of the project. But there are alternative ways of calculating the EAC. For example, the formula $EAC = AC + [(BAC - EV) / (CPI * SPI)]$ can be used when the future cost performance will be influenced by past schedule performance (SPI observed). Multiplying CPI by SPI models this influence.

Note!

Don't be afraid of the formulas covered here. All you have to do is prepare a spreadsheet that will become your template for all new projects.

In addition to providing you with the information you need to prepare a performance analysis and forecasting report, the information in Figure 13 also provides you with a clear checklist of any problems you need to address, and where to start looking for solutions.

Tips for using Earned Value Management (EVM)

- The PMBOK recommends using EVM in “management by exception” scenarios, where the project manager focuses on project execution and only performance exceptions trigger control actions. In the early planning stages (e.g., during the ASAP Project Preparation phase), the project sponsor can establish acceptable levels of performance (acceptable ranges of cost or schedule variances, such as +/-8%, for example). A negative variance is usually a problem, whereas a positive variance can be an opportunity.
- Performance indices (like CPI) should be monitored together with trends — if they are getting close to the threshold for a given period of time, the project manager should use the WBS to identify any problematic areas.
- EVM is also a good resource for presenting project performance to stakeholders. The most popular methods are tables, bar charts, and S-curves. S-curves, like the ones shown in **Figure 14**, are useful for presenting project trends. An S-curve is typically presented on an X-Y axis, where X is time and Y is cost (or resources). The name is derived from the S-like shape of the curve produced on a project (ASAP projects usually have a slow start, then acceleration in the second and third phases, and then slower in the fourth and fifth phases). The measures usually displayed are PV, EV, and AC.

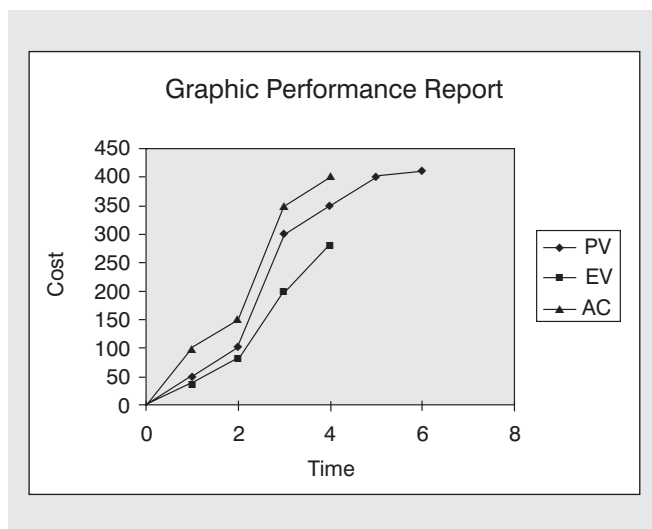


Figure 14 Sample S-curves

Who is doing what? Using the Responsibility Assignment Matrix (RAM)

One of the crucial issues in SAP implementation projects is the clarity of stakeholder roles and responsibilities. Even if you have the best of the best consultants on your team, for example, your project will fail if you don't have a good work distribution plan. PMBOK provides the Responsibility Assignment Matrix (RAM) for this purpose, which is an easy method of illustrating who will accomplish what on a WBS-based project.

A RAM can be created at various levels of the WBS. A high-level RAM can define what organizational unit is responsible for each component of the WBS, merging an organization breakdown structure with a work breakdown structure. In practice, however, the most useful RAMs are lower-level ones that describe the responsibilities of team members for specific activities (preferably at the lowest level of the WBS, where work can be easily managed, scheduled, and monitored). Using a table structure for RAMs makes it easy for each project stakeholder to see all the people associated with a given activity, and vice versa.

Preparing a RAM is an easy task:

1. List the deliverables from a given level of the WBS in the table columns.
2. List the project team members in the table rows.
3. Assign the roles to the people involved:
 - **R:** Responsible (the “doer,” such as an implementation team member or expert, for example)
 - **A:** Accountable or Approver (the team leader or a manager, for example)
 - **C:** Consult (people, preferably experts, who should be consulted to obtain acceptance of the results)
 - **I:** Informed (people, such as managers and users, who are affected by the project and should know what is happening)

Figure 15 shows the RAM for the WBS we created for our example SAP HR implementation project (refer

Stakeholder	Title	WBS component in example SAP HR implementation project							
		2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8
Sandy Anderson	SAP HR Project Manager	I	I	I	I	I	C	C	I
Tom Smith	HR Consultant	I	I	I	I	C	C	C	C
Julie White	HR Consultant	C	C	C	C	I	I	I	I
Michael Thompson	HR Specialist	R	R	R	R	I	I	I	I
Monica Martinez	HR Specialist	I	I	I	I	R	R	R	R
Eva Campbell	HR Manager	AI	AI	ACI	AI	AI	ACI	AI	ACI

Figure 15 RAM for the example SAP HR implementation project

back to Figure 4). Note that people can be assigned more than one role.

Creating a RAM should be a part of each SAP implementation project plan. It assures coverage of work defined in the WBS, provides direction for the project team, and helps to identify stakeholders (whose interests could be affected by the project, who should be involved in the implementation, etc.) and necessary communication channels (who needs what information). And anyone involved in the project can easily use the RAM to find his or her role according to the WBS, and get answers to questions like: What work packages am I responsible for? Who will consult me about what? Which WBS components should I be informed about? The RAM should be constructed by the project manager together with the rest of the project team, and will likely be progressively elaborated during the project as tasks and goals evolve.

Tips for using the Responsibility Assignment Matrix (RAM)

- You can develop the RAM on various levels of the WBS: higher levels are suitable for distributing tasks among project teams, lower levels for assigning tasks to individual team members. This method of working with the RAM is preferable for big projects.

- Don't delegate crucial tasks to only one person. Be sure there is someone else who is trained to complete the task, or at the very least ensure that clear documentation of the task is available. Although knowledge transfer and preparing technical documentation are time-consuming tasks, they are crucial — if something fails, and the only person who can perform the task is unavailable, you are in trouble.
- When defining the RAM on higher WBS levels, you can show people as teams or organizational units, which is helpful for presenting work distribution among project teams (especially during cross-module meetings).

How can we do it better? Using Lessons Learned (LL)

Experienced SAP project managers know that the basic structures of SAP projects are essentially the same — i.e., they follow the overall structure of the ASAP-defined phases and deliverables — and they use the knowledge gained from experience to repeat desirable outcomes and avoid undesirable ones. The knowledge learned during a project should be part of a knowledge base that will help the organization to manage future projects with a reduced

risk of failure, a tool the PMBOK defines as Lessons Learned (LL).

These lessons may be identified at any point. I recommend that project managers organize LL brainstorming meetings with the project team throughout the project lifecycle (e.g., at the end of each ASAP phase) to collect knowledge gained, and also distribute questionnaires at least twice over the course of the project lifecycle for the same purpose. The results of LL meetings and questionnaires become the historical database for future projects — the same mistakes and bad decisions shouldn't be repeated, and good practices should be followed.

LL can be both general and specific information, and can focus on different project areas, such as technology, organization, procedures, and communication. Our example SAP HR implementation project could have resulted in the following LL, for instance:

- The most effective SAP HR project team includes at most five members. Bigger teams, even with high competence, become less effective.
- Strict division of analytic and ABAP programmer roles is not a good solution; the programmer should be partly involved in the analysis.
- In big projects where many results approvers are identified in the RAM, it should be distributed in an electronic rather than printed form.
- If possible, the functional manager should be defined as the team leader in the organizational structure, which makes the delegation of project tasks to his or her subordinates much easier.
- Use of the Fast Tracking time compression method should be avoided — it brings a lot of risks.

Tips for using Lessons Learned (LL)

- The project manager should capture LL from a project while they're fresh in team members' minds. There are many templates available on the Internet for collecting LL, but nothing is better than brainstorming with those who have lived through the project.

- The very first moment to convince the team about the importance of LL is kick-off. The project manager should emphasize the role of LL in her or his presentation.
- Lessons learned are not only for future projects — team members can see the positive influence of knowledge gathered over the course of the project, which will encourage them to share their observations in the future LL sessions.

Conclusion

This article showed you how problems that threaten a project can be avoided by using proven project management tools and techniques from the Project Management Body of Knowledge (PMBOK) together with the ASAP implementation methodology.

Through the example implementation project used in the article, you learned how the Work Breakdown Structure (WBS) can be used to define the scope of a project, how the Critical Path Method (CPM) can be used to calculate the project schedule flexibility, how Earned Value Management (EVM) can be used to measure project performance and progress, how the Responsibility Assignment Matrix (RAM) can be used to assign project tasks appropriately, and how Lessons Learned (LL) can be used to ensure the success of the current project as well as future projects. My hope is that you also have come to see that the PMBOK tools and techniques do not require any sophisticated knowledge, and that together with ASAP they can be applied to almost any other area or project you can think of.

This article covered the PMBOK tools and techniques that can apply to almost any SAP project, and only briefly touched upon how PMBOK processes can be used with ASAP implementation phases. There are numerous additional tools and techniques and a wealth of opportunity in using the PMBOK processes themselves with your project. Get yourself a copy of the PMBOK Guide and discover even more ways you can complement ASAP with the PMBOK tools, techniques, and processes to minimize the risk and maximize the success of your SAP projects.