Luc De Ceuster

Focus on **Earned Value**

Earned Value Management for Successful Projects

First Edition

APraCom© Project Management

Focus on Earned Value

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First Edition, 2010

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Table of Contents

Figures

Tables

For Franciscus De Ceuster
who left us too early

I want to thank my family and all my friends who have always supported me and were especially there for me at the end of last year when I was infected with H1N1 and had very small chances to recover. Their energy, concerns and help made it possible for me to recover remarkably well and finish this work.

I explicitly want to thank Guy without whom I surely would not be alive anymore. Of course my parents, my brother Steven and my family, Ludo, Dan, Michal, Miluše, Erik and Irena.

A special thank also for the Doctors and Nurses at the FN MOTOL Hospital in Prague for their remarkable persistence, professionalism and creativity for giving me my life back.

Introduction

Once a project starts we move from the planning phase into the execute and control phase. The project team executes the project plan. The project manager will control the plan's execution and compares actual information he/she receives from the project team members with the data that were obtained at the end of the planning phase. The main documents the project manager has at his/her disposal have been generated during the initiation and the planning phases. These are (non limited list):

- Project Charter or other name;
- Work Breakdown Structure (WBS);
- Detailed task descriptions;
- Project precedence diagram and critical path;
- Gantt chart;
- Project resource planning (people and other resources)
- Periodical and Cumulative Project Budget or S-curve;
- Project risk management plan.

Project planning will use these documents as a project baseline and the project team members will give the project manager detailed information related to the tasks for which they are responsible. The information the team members will communicate should contain at a minimum the following data:

- Start and end date of each task;
- Cost incurred during the reporting period in order to work on each task;
- Estimated remaining duration of each task;
- Progress of the work in detail and overall;
- Other information that may be useful.

Using all the information available, the project manager is able to provide project stakeholders with a summary of the project status, and report on important parameters indicative of the financial position and its progress towards completion.

In the classical approach, financial information is only used to compare the actual spending with the time phased budget. Spending equal to the budget at that time in the project would lead to the conclusion that the budget is “on target”.

The main problem with the classical approach is that the financial and scheduling information were looked at separately and the information are not combined to a more sophisticated evaluation and forecasting system. There was no system set up to evaluate project performance using variances, performance parameters or indexes and using it to forecast the outcome of the project.

Project managers are reporting the data without exploiting the hidden information the data contained.

Past experience with complex projects has showed that it is difficult to predict the final outcome of the project. In many cases, management could only get a accurate idea of the total cost of the project *after* it was completed. In some cases, costs could only be accurately evaluated even later, when all accounts had been closed!

Although project success today is not only determined by the total cost of the project, or the time by which the project was late, money and schedule still remain important parameters. In many projects they still remain key elements, and project success may depend on just these two parameters. Just imagine some of the following examples:

- **Timing**: schedule delays may be catastrophic when the objective is to launch a new product or service before the competition does. Launching a product or service too late may have a negative impact on sales and return on the investment (ROI);
- **Cost**: delivering a project that is more expensive than initially estimated may have a serious impact on profitability. Higher initial cost (fixed costs) will move the break-even point to the right, which means that more products have to be sold before it becomes profitable.

The project management community realized over time that better forecasting methods made possible by integrating financial and schedule information should become standard. A good project performance evaluation system would be beneficial for many reasons, some of which some are mentioned below:

- To better allocate budgets;
- Identify budget and planning problems early in the process;
- Improve portfolio management;
- Better manage budgets;
- Know in what direction we are heading;
- ....

The first to use Earned Value Management was the United States Department of Defense (DOD) in the beginning of the 1960s when they started implementing “cold war” projects like the minuteman and Polaris missile. They started looking at project efficiency to know how government money was spent and to be able to predict the total cost of the project as early as possible.

The methodology they decided on was first used at the end of the 19th century, the beginning of industrialization. At that time, engineers started

evaluating the work that was done and measured efficiency of the processes they were monitoring.

The process is in fact relatively simple and, performance can be easily measured using information that is already available. The project manager is monitoring project progress and budget. During weekly reporting, information like work executed, money actually spent and, other parameters, are provided. Therefore, project-wide information is available to the project manager on a weekly basis.

The database that has been built during many years of projects by the DOD is in fact a very valuable treasure. Unlike private companies, military and government agencies tend to keep records of *all* projects including those that were overdue and over budget. Certainly in military history, it has become very important to learn from mistakes and not to conceal, or make them appear better. Military history is still a very important topic in Military Academies worldwide and is still the basis of Military Operations today. Hiding the “bad” experiences would reduce the capability of today’s military commanders to act in the most optimally decisive way.

I had the same experience during my aviation teaching. Some years ago, I met one of my old students flying back from Nice (France) to Brussels (Belgium). All passengers had been waiting impatiently because everybody saw the plane landing, but boarding never seemed to start.

My old student invited me to the cockpit for the flight and I also could invite a friend. When he arrived in the cockpit, the question was obvious: “why did we have to wait so long to board the plane and why did we leave with an important delay while we saw you arrive even before time?” Without any problems, he

explained that his approach was not how it should have been and he decided to make a “go around”[1] and start the approach procedure again.

Hiding mistakes would only lead to unsafe behavior and would not guarantee safe flying conditions. When a pilot makes a mistake in the cockpit, he/she shouldn't hide it but openly speak about it. In fact, the people hiding their mistakes to others in order to appear perfect will finally get into a situation where they do everything wrong. The problem is that in our world around us, many people are posing like “perfect” or are playing the role of the person who made mistakes and learned from it. In fact many of them are hypocrites who only believe in themselves and are hiding their imperfection.

For companies, it may be important to appear perfect to their customers and competitors. In reality, we all know that this is certainly not the case. People should not select companies because they appear to be perfect. We should select a company because we believe in their capabilities to do what we expect from them, and therefore it is more important to know and trust how they manage and solve problems and crises than to assume they will not make any mistakes.

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1 *A “go around” in aviation relates to a landing that is broken off. There are many reasons for which a landing can be cancelled: another plane may still be on the runway, a technical problem that changes the approach parameters, unsafe weather conditions, too much deviation from the glide slope or from the center of the runway and many other reasons. In most cases it is not related to an emergency. For the passengers however, it may be a bit scary. The pilot will first return to a safe position and then explain to the passengers what really happened. During one event, coming back from Rwanda in a DC10, the flaps system showed an alert related to an asymmetry between the left and right flaps. Continuing the landing would be very dangerous and the pilot decided to “go around”, recalculate the approach parameters with a safe flap setting and tested everything at a safe altitude to be sure not to encounter any problems at the final approach. As you may assume, everything ended well!*

If a company wants to hide its errors to the outside world, it should at least be honest to take into account all their experiences, also the worst ones, to set up company statistics. Removing the projects that management does not like will falsify the statistics, which will be using in the future to do business. In fact, this would be like navigating a ship through dangerous waters with the wrong maps! Just tell this to your shareholders when you explain another failure!

Projects are not always done in a perfect way. Many parameters influence what is being done and the experience of the project manager does not relate to the fact he can plan a project perfectly. His or her experiences become really valuable from the moment the project begins and how he or she will handle unforeseen events. Making plans is and remains an important phase of the project and should never be neglected. Preparation will show, already in advance, what can go wrong. In fact, once the project starts it is the ability of the project manager to manage the unforeseen events that will determine the success of the project.

The Japanese company Toyota has built a strong worldwide reputation related to quality and reliability of their products. The company's methodology has been discussed on many occasions. One of the most important elements in their philosophy relates to the fact that nothing is perfect. A production process or a project going on without interruptions or errors cannot exist. Each time an issue or problem show up, it is an opportunity for improvement. Hiding problems only lead to more and larger problems.

The classical tools that project managers use and get trained with relate to planning, estimating, scheduling and others. These focus on the initiation and planning phases of the project. Earned Value Management

(EVM) is in fact an additional tool, that will help the project manager to better manage his/her project during project execution.

EVM has been used by the DOD for more than 40 years and has been applied also by other US government agencies like the Department of Energy (DOE). EVM has also been integrated in Public Offering Procedures in the US. Nevertheless, the EVM is not yet widely in use in the industry. In many cases, financial control and forecasting is in many cases limited to following up spending and comparing it with the budgeted cost. In many cases however, no real financial control is done at all.

Using EVM is in fact not difficult. The necessary parameters can be calculated using very simple mathematical formulas, and predictions of final project costs can be done very quickly. EVM can be used on any project whatever duration or complexity. Of course, the technique and its conclusions become very interesting for complex, high risk and long duration projects.

As we all know, the more detail we want, the more work we ask to be done and the more complex and time consuming the interpretation of the results becomes. Obviously, the rigor and the frequency of application of EVM will increase with project complexity and risk.

Since computing software has become more available to project managers, gathering and consolidating data has also become easier. Many software programs offer functions that allow us to integrate EVM without any supplementary effort. Of course, having the data at hand does not mean that the people will use it.

Statistics held by DOD show that EVM offers a very

useful tool for estimating total project costs after 15 or 20% of the project has been completed. Having this information so early in the project can help management to take the necessary measures to make “good” business decisions.

Unfortunately, sometimes management does not want to know the bad news and they hide their heads in the sand like an ostrich that does not want to see the lion that is ready to attack.

Statistics as set up by DOD will be further used in this publication about Earned Value Management. These data can be used without problems to start EVM in your company. The common factor is a “project”. Whatever the military have been doing for the last 100 years, they were doing projects and projects still remain projects.

It is of course true that some differences may exist between all the projects the military has been doing and still are doing. It may be a surprise for you, but military agencies also do things that are very “normal” to us.

They also construct office buildings, airports, information systems, hotels, BBQ, cinemas and other projects. These statistics of DOD take into account all their projects, in whatever disciplines they may be, however many differences may exist between different disciplines like ICT or Construction, and others when viewed independently. Of course, nothing is withholding the Project Management Office (PMO) to start building their own, industry and company related statistics. This may be part of the lessons-learned sessions held at the closure of each project, and upon which the data are stored in the archives of the PMO.

Chapter I

Project Planning for Earned Value Management

Earned Value Management cannot be introduced without taking precautions and may be different from how you are managing your projects at this moment. In order to use EVM it is important that the Initiation and Planning phases of the life cycle have been done with the future EVM in mind.

Introducing EVM is not changing the general principles of Project Management. The same principles will be applied; nevertheless, it is important to emphasize those principles that are important when you will start applying EVM in your projects.

Earned Value Management can only be done correctly when the 10 steps of the project life cycle are done in a rigorously way. This does not mean that EVM is present in all phases. Nevertheless, all phases are linked, and badly executing one phase will definitely influence the next phase. We give a short overview of the project life cycle and the 10 steps we defined in these phases:

Initiation

- Step 1: Creating the Project Definition Document
  A well-defined “scope of work”, or whatever you may call this document, is the basis for defining the project. “When you don't know where you want to go, it does not matter where you go” as Carol Lewis stated correctly in the fairy tale “Alice in Wonderland”. This does not mean that not knowing where you are going is bad. You may encounter fantastic things, meet great people, and see nice places. It is just NOT about project management. That’s all!
  A well-defined scope, including what is not included, is of course the most important part of the project. All following steps depend on it and a bad job here will make all the following work and information obsolete.

Planning

- Step 2: Creating the Project Work Breakdown Structure (WBS)
  The WBS is a hierarchical representation of the project starting at the project level or level 0. Each subsequent level shows more and more details until the final level or task level is reached. Tasks are independent work packages that generally take one or two weeks to complete. When all the tasks are completed, the project is also completed.
  Each task is described in detail on a "task description sheet" which contains a detailed work description, success criteria, deliverables and skills.

- Step 3: Resources, Effort and Duration Estimates
  Identifying skills, people, responsibilities and effort to complete the tasks will finally lead to the resources assignment matrix (RAM), costs, and duration of the tasks.

- Step 4: Task Precedence, Project Network and Critical Path Analysis
  Once the tasks and their duration have been determined, it is important to determine the logical order in which the tasks have to be completed. In fact for each task the predecessors have to be identified. A task can only start when all preceding tasks have been completed. Once the precedence relationships have been identified, the project network diagram can be drawn. The diagram will identify all possible logical paths through the project and the duration of all paths can be calculated using the Precedence Diagramming (PDM) and Critical Path Method (CPM).
  Finally, the project duration is determined by the path with the longest duration or the critical path. Each project manager wants to know the critical path or paths of his project because each delay of

a critical path task will increase the duration of the project. In addition to the critical path, it is important to know how the non-critical path tasks are positioned relative to the critical path. This is also known as the critical path position of the project.

- Step 5: Gantt Chart
  Once the start and finish dates of each task have been determined, the sequence of the tasks can be represented in the Gantt diagram. This diagram was first introduced by Gantt at the end of the 19th century and was used to schedule resources over time. Although the method as designed by Gantt, only allowed scheduling tasks in sequence, the design of the chart is still used today together with the PDM.
  The chart is generally used in the project management arena to graphically represent the project schedule, the critical path, and the critical path position of the non-critical tasks.

- Step 6: Resource Loading and Leveling
  The resources needed for each task can be represented on the Gantt chart and can be analyzed by the project manager and his or hers team. It allows them to identify problem areas and find solutions by resource leveling. Resource leveling can be done by moving non-critical path tasks into their float, adding resources, moving resources or other techniques. Once an acceptable solution has been reached, the final project plan can be determined.

- Step 7: Project Budget and S-curve
  Adding the costs for each task to the Gantt chart following the task sequence gives us the time-based project budget. This indicates how much money will be spent during each reporting period, every week or month, For example. In the same

way it is possible to calculate the cumulative cost for the project (S-curve). The name S-curve refers to the curve form has which is typical for many projects

- Step 8: Risk and contingency planning
  Risks, threats, or opportunities, may occur during the project and an in-depth risk qualification and quantification is done to determine the possible impacts on the project. Where necessary, a contingency plan will be set up.
  The occurrence of risk events during the project may influence the project plan and budget. Funds to deal with risks will be provisioned in a special budget.

Execution and Control

- Step 9: Project Status and Follow-up
  During this phase, you will collect data related to project progress and actual spending, a task that becomes even more important since you will use the gathered data to make some predictions related to the project outcome. Gathering the data should be well thought out during the planning phase. The project manager and team leaders should be well instructed as to what data is to be collected, how to collect them and at what frequency (in most of the cases weekly).

Close-out

- Step 10: Project Completion and Project History Documentation
  During the close-out phase we collect lessons learned. One of the elements we will collect is the data related to the EVM we calculated and interpreted during the life span of the project. These data will, after some time, give us more information about our industry and company

specific parameters, and will also give us information about how we are growing into maturity while executing projects. It is also important that also our “catastrophes” are taken into account. Although we may not like the outcome and want to hide the results to the world outside, we should always stay honest with ourselves and learn from the mistakes we made in the past. These mistakes may teach us in what fields we are not performing well, and we can then learn lessons on how to improve in those areas or just withdraw and focus more on our strong areas. Isn't portfolio management also about identifying the projects we will be successful in?

In the basic concept of Earned Value Management, there is no reference to a scheduling system that has to be used in combination with the EVM calculations. Using the parameters we will determine in the following chapters without referring to a schedule may also lead to the wrong conclusions. It is therefore important that a formal scheduling technique is used.

Those of you who are already more experienced and followed some courses before, or who already obtained the PMP certification, will know that there are different scheduling techniques available. Today, the most commonly used is the “Precedence Diagramming Method” or PDM. (In some cases also wrongly referred to as “PERT”). In addition, with the PDM, project planning is typically represented in a Gantt chart, showing dependencies, start & stop dates, and slack.

While EVM will give you indications related to the efficiency of use of time and money, the PDM and Gantt chart will show how the project is evolving time wise. Adding the Gantt and the PDM will help you to improve your judgment and forecasting precision. The

PDM and Gantt will also show clearly what the projects critical path position is or how the non-critical path tasks are scheduled compared to the critical path tasks. Are they starting at their “early start” (ES) or “late start” (LS) dates, or at an intermediate date?

1 Tools for preparing EVM

EVM can only be successful when project preparation has been done as described in the previous reference work regarding tools and techniques. More detailed information can also be found in the references mentioned in the bibliography at the end of this publication.

During the project preparation and planning phases of the project life-cycle, a number of interesting documents have been prepared that will be used by the project manager during the execution and control phase, and which of course will also be available for EVM.

The most important documents are:

- Project Scope as described in the “project charter” which included the “triple constraint”;
- Detailed WBS in tree and table form, up to the task level;
- Detailed task descriptions including a detailed list and cost of resources needed to complete each task successfully;
- Time-based project periodical and cumulative budget (S-curve);
- Project Baseline;
- Risk Management Process;
- Change Management Process;
- Project Reporting Process.

Without carefully preparing these documents and/or procedures it is NOT possible to set up and maintain a reliable EVM system!

1.1 Scope the project and create the WBS

Defining the final goal of the project including all

important elements is done in the Project Charter. In some cases different names are used like “Project Definition Document” or PDD, “Project Charter”, “Business Case”, or many other possibilities. It is of course not the goal to summarize all possibilities here. This would be a waste of time since your company may have defined its own name.

From the definition, the projects WBS is created starting at level 0 (=project) down to the task level. A typical example of a WBS is given in figure 1. The WBS has to be set up in such a way that when all tasks have been executed the project is completed. In case some tasks are still open, then the project is not yet complete!

As a result of the detailed WBS, a number of discrete independent tasks has been identified, and for each task a detailed description of the deliverables and success criteria is available. In addition, the task description sheets also contain information related to the tasks that have to be completed before the task can start (interdependencies related to other tasks), the effort needed to complete the task, and the necessary resources (people and other).

Preparing a detailed WBS and detailed task descriptions will help the project manager to manage the project in a more efficient way and will help task leaders and team members to better follow the instructions. They will be guided to complete each task as originally intended and scope creep should be reduced to a minimum.

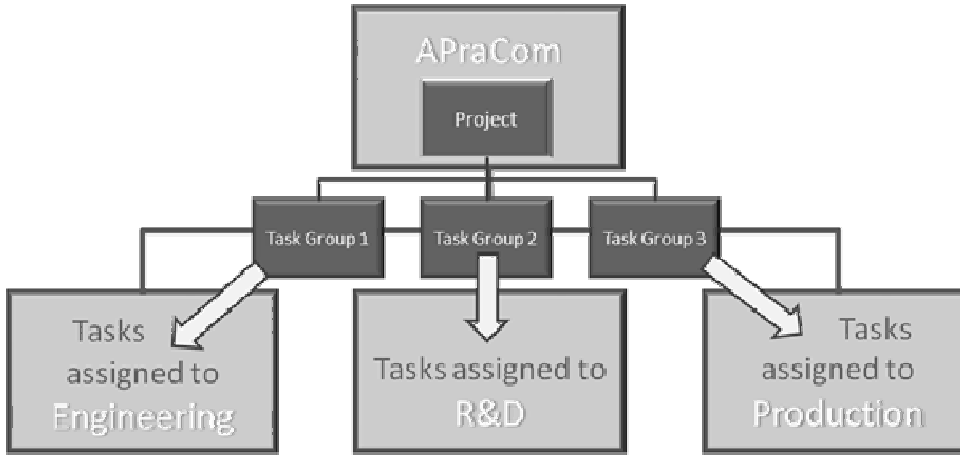


Figure 1: WBS and OBS showing allocation of project tasks to organizational units.

Once the WBS has been completed, the project organization can be integrated into it and the individual tasks can be assigned to specified organizational entities within the organization. Starting from the WBS, tasks or task groups will be assigned to specific people or teams that each have their own position in the company as defined in the organizational chart.

When we combine the elements from the WBS with the organizational chart, we refer to it as the Organizational Breakdown Structure or OBS. An example of WBS and OBS is given in the figure 1.

1.2 Planning and Scheduling

Once the WBS has been completed and all tasks have been identified including their dependencies, it becomes possible to create a preliminary project network diagram that later may be changed to accommodate scheduling and use of resources. The process itself is in most cases iterative but in all cases it should lead to the final network diagram in which each task is identified by its

duration, early start and finish, late start and finish, slack, and of course, the critical path and important milestones. Finally the information obtained in the PDM is represented in a Gantt chart.

In case the initial calculated project completion date does not comply with the triple constraint (figure 2), the planning has to be adjusted using one or more compression techniques like task crashing, fast tracking, and/or other methods used until the final plan is compliant with the triple constraint and approved by the project client.

Figure 2: Triple Constraint

Other problems to resolve may be the allocation of resources to the different tasks, and the availability of these resources. Lack of resources may push the project manager to change the schedule or to re-arrange resources in order to obtain an acceptable solution. Finally, probably after some iteration, the project manager will finalize the PDM and will draw the final project schedule on the Gantt. This Gantt chart will be further used during the project execution and control phase.

At the end of the planning and scheduling phase, the project manager will have a clear overview of how the project should be executed. In addition, he will have gathered a lot of information about the project even before the start and can build detailed project documentation in the project workbook.

Elements to include in the workbook are:

- task description with effort and duration estimates;
- task success factors;
- task progress measurement system;
- human and other resources;
- detailed task budgets;
- task interdependencies and relationships;
- Precedence Diagram with ES, EF, LS, LF, slack and critical path;
- Gantt Charts.

Let us consider the following project “LDC” which is composed by the 10 tasks from A to J as summarized in table 1.

Task	Duration	Predecessor
A	1	-
B	2	A
C	4	A
D	3	B, C
E	3	D
F	5	D
G	4	D
H	5	E, F
I	3	G
J	2	H, I

Table 1: Project “LDC” - Task Duration and Predecessor

The complete network diagram with calculation of Early Start (ES), Early Finish (EF), Late Start (LS), Late Finish (LF), and Slack is given in appendix 1.

Figure 3 represents a simpler version of the network diagram.

The critical path is indicated on the network diagram by the gray color of the task boxes and the thick connection lines. The total duration of the project following the critical path A-C-D-F-H-J is 20 weeks. The calculation details are summarized in table 2.

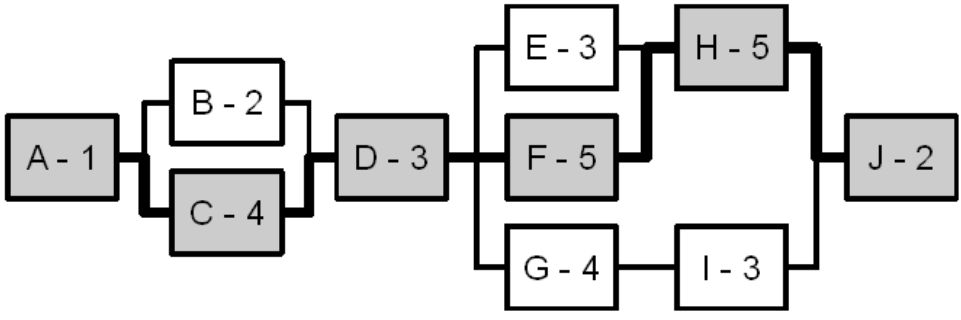


Figure 3: Project "LDC" - PDM Diagram

The tasks with corresponding information in ***bold italic*** indicate the projects critical path. The critical path tasks are of course the tasks with slack equal to zero!

With this information, we can draw the project schedule in the Gantt chart as shown in figure 4. The critical path tasks are represented by dark rectangles, the non-critical path tasks by light rectangles, and the slack by striped rectangles. The Gantt chart gives a clear graphical overview of the project tasks and their planning. It will also be used to add information related to resource planning and budgeting.

Task	Duration	Predecessor	Timing				
			ES	EF	LS	LF	Slack
A	***1***	***-***	***1***	***1***	***1***	***1***	***0***
B	2	A	2	3	4	5	2
C	***4***	***A***	***2***	***5***	***2***	***5***	***0***
D	*3*	*B, C*	*6*	*8*	*6*	*8*	*0*
E	3	D	9	11	11	13	2
F	***5***	***D***	***9***	***13***	***9***	***13***	***0***
G	4	D	9	12	12	15	3
H	***5***	***E, F***	***14***	***18***	***14***	***18***	***0***
I	3	G	13	15	16	18	3
J	***2***	***H, I***	***19***	***20***	***19***	***20***	***0***

Table 2: Project "LDC" - Project Task, Precedence, ES, EF, LS, LF, Slack and Critical path.

The Gantt chart will also be a valuable tool to report, monitor, and control progress and predict the project completion date. It will also show clearly the critical path position of all tasks of the project and will give an early warning about slippage of non-critical path tasks and critical path convergence. It is of course obvious that it will display valuable information for the project manager and the project team about the critical path tasks and the duration of the project.

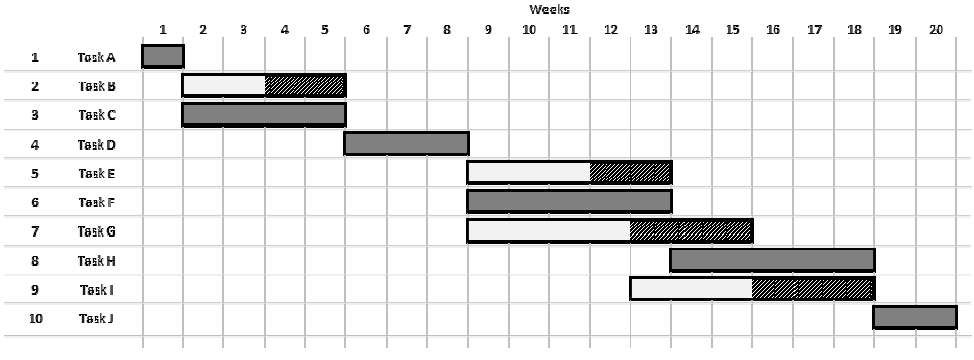


Figure 4: Project "LDC" – Gantt chart with indication of the critical path and slack.

In our day and age with the unconditional use of computer technology to perform even the simplest calculation, it is clearly understandable that even people working today in project management don't even know the term “critical path”, or in the best case, they heard about the term but don't really understand its real meaning and importance. It is important when working as a project manager or project team member, to know how the non-critical tasks are positioned relative to the critical path. This is also referred to as the “critical path position” of the project.

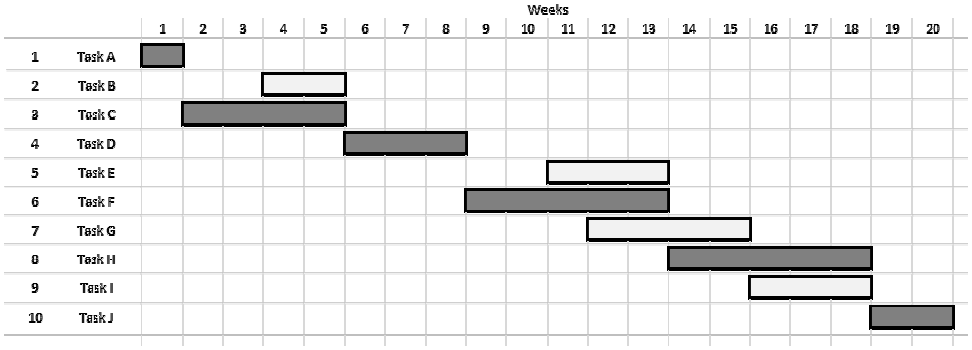


Figure 5: Project “LDC” - Gantt with non-critical path tasks in LS position

In figure 4, it is clear that all the non-critical tasks have been scheduled at their “Early Start” dates so that all the slack occurs at the end of the tasks. This means that a non-critical path task may slip for a time equal to the slack before a problem occurs. In case the non-critical path tasks would have been scheduled at their “Late Start” date as shown in figure 5, they all are on the critical path and any slippage will influence the duration of the project!

In addition, the position of the non-critical path tasks will also influence the time-scheduled budgeting of the project. In reality, however, some non-critical path tasks will start on their ES

position while some others will start on their LS position, and others will start somewhere in between. All depends on the way the project manager resolved the problems he encountered during the planning phase.

It is obvious that during project execution, the position of the non-critical path tasks may change following the weekly status reports and the actions taken by the team members, the project manager, the project client, and eventually other stakeholders.

1.3 Project Budget

Once the details of each task are known and the final position related to resources and other costs is known, a detailed cost overview including the timing of the costs during the task execution can be determined.

Elements related to costs and timing may relate to the scheduling of people working on the task, goods that have to be delivered at a certain time, work that is done which will result in costs later in the task, value of work completed at a specific time, or other specific rules that determine the scheduling of costs over the lifespan of the task.

Tasks can be classified according to different criteria like duration or the outcome of the task. In general tasks are divided in “short” or “long” duration tasks. “Short” duration tasks in general refer to tasks that take one to two planning periods (weeks or months) to complete.”Long” duration tasks take longer than two planning periods to complete.

A second classification is related to the outcome

of the task which can be a tangible deliverable like a manual, number of lines of software code or a product or service. On the other hand, some tasks may have intangibles as deliverable or not really a deliverable at all. These tasks for example relate to the project management effort that is delivered during the total lifespan of the project. The task starts when the project starts, and finishes when the project finishes. In this case there is no specific deliverable.

In the “Tools and Techniques” program, we already considered different types of loading the budget. Some were called “even” loading or fixed loading. At that time we did not specify in which circumstances these types of loading would be used. Of course, in the EVM we have to carefully define the cost budgeting, and we will do this in more detail in the following points.

Tangible Deliverables

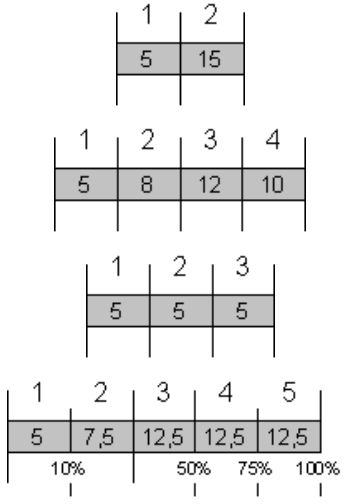
Tangible tasks are as specified before, tasks that have a deliverable at completion. Most tasks of the project should fall in this category.

Tangible tasks will be budgeted according to the length of the task. Tasks taking up to 2 planning or reporting periods are classified as “short duration” tasks, while tasks that take longer will be considered as “long duration” tasks.

Both tasks will be treated differently depending on the budgeting of the costs over the lifespan of the task. An overview of the different possibilities is shown in table 3 and 4.

Duration	Type	Comment
Short	Fixed Formula	A fixed cost will be budgeted at the start of the task and the remaining portion will be budgeted at the end of the task. Some typical examples are: 0/100 – 25/75 – 50/50 – 75/25 – 100/0.
Long	Weighted Milestones	With each planning period corresponds a specific cost.
	Percentage Complete	The costs are spread equally over the duration of the task.
	Percentage with Milestone gates	Combining “subjective” percentage complete with performance milestones. Milestones can only be crossed when clearly defined milestones are met.

Table 3: Budgeting for tasks with tangible deliverables



Short 2 period task with 25/75 fixed formula loading

Long 4 period task with weighted milestone loading

Long 3 period task with percentage complete loading

Long 5 period task with percentage complete and milestone gates

Table 4: Examples of Task Cost Schedule for tangible tasks

Intangible Deliverables

While most of the tasks and, of course, the completed project, will have tangible deliverables, it is also possible to have intangible deliverables associated with specific tasks with tangible deliverables, and tasks with only intangible deliverables.

Intangible deliverables refer to supporting activities like quality assurance and quality control. These intangible deliverables mostly are budgeted as a proportion of the cost of the tangible deliverables. In most cases, the percentage is limited to a maximum of 10% of the total cost of the task. The “Apportioned” costs will be estimated to be in proportion of the value earned during the reporting period.

Another case of intangible deliverables are the so-called “Level of Effort” (LOE) tasks. These are general supporting tasks, like project management, that start when the project begins and end at the completion of the project. The problem with LOE tasks is that their Earned Value is always equal to the Planned Value while the Real Value depends on the actual costs incurred to conduct this supporting activity.

Level of Effort tasks should be identified and removed from the Earned Value analysis because they can influence the performance parameters related to project’s cost in both a negative and positive way, and it is important that we have a clear view of how the project is performing as such.

Level of Effort activities will influence the total project budget and of course have to be included in the final budget estimate once the Earned Value analysis has been completed. LOE activities however will NEVER be taken into account to calculate schedule and cost variances and performance indexes.