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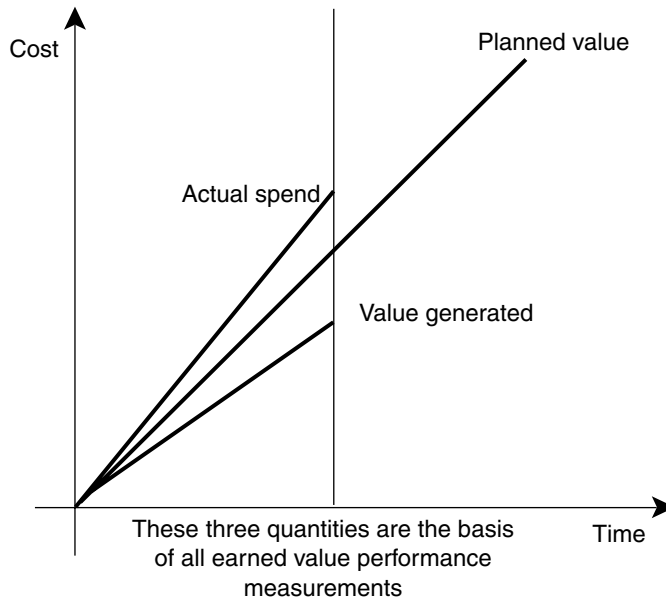
# *Earned Value – What and Why*

There cannot be many who practise in the field of project management who haven't brushed against earned value performance measurement at some point in their careers. For some it will be one of those techniques that was studied as part of a project management course but that was as far as it went, while for others it will be part of their normal project activities. One suspects that the latter group are still in the minority despite the fact that earned value methods have been around for about forty years. The obvious question must be why is it that a technique that has some real advantages for project managers has been largely ignored for so long, even though many in the profession are fully aware of it? Of course the answers are never simple but it cannot be denied that the technique gained a tarnished reputation from its early history and the way that it was first implemented in the United States. The popular view was that it was complex, bureaucratic, costly, peppered with alien terms and acronyms and something that one just wouldn't employ unless forced to do so. Not surprisingly, very little use was made of it outside the USA during its first thirty years but, since 1990, a more enlightened approach has developed along with suitable software tools that have made the technique appealing to a much wider audience.

The earned value principle is not difficult to understand – it comes from a basic concept that goes back to industrial engineering and accounting procedures that were around well before the discipline of project management arrived on the scene. Prior to the introduction of earned value methods, project managers were used to measuring the performance of their projects by reference to Gantt charts and Critical Path Analyses for the scheduling aspect, and the difference between the planned expenditure and the actual costs to see how the money was going. From a time dating back to the 1950s, it was realized that this was not a very satisfactory way of managing projects as there was always the problem of reconciling these two different measures of project progress. Furthermore, some highly influential customer organizations were embarrassed by cost overruns that never seemed to be predicted until it was too late to do anything but swallow hard and pay up. The answer they came up with was perfectly simple: make both a detailed plan and a detailed valuation of all the work in the project before you start, then, as the project progresses, make a note at each reporting point of 1) how much value should have been achieved according to the plan, 2) how much value has been created according to the work done and 3) how much money has actually been spent. These values are shown in Figure 1.1. Those three numbers form the basis of all earned value methods; with a few simple mathematical ratios one can quickly judge the state of progress in terms of both the cost and the schedule. Anyone introduced to this idea for the first time would probably use terms such as 'obvious' or 'elementary' to describe such a basic concept, so it seems all the more baffling that it should not have received a more enthusiastic response. Some of the reasons have already been hinted at but like many good ideas there can be a wide gulf between theory and practice. Although simple in concept, the practice was

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much more complex because it was most often applied to projects that were very complex in themselves.



**Figure 1.1** Adding the value generated as time passes gives a greater insight into the project than simply comparing the planned and actual values. The worth in financial terms associated with the value generated is termed the 'earned value'

Earned value methods had something of an unfortunate start that has never helped the process gain wide acceptance. In those early days, earned value was not seen as a performance measurement system in its own right to be used and adapted as required; instead it was introduced as part of a much larger and highly prescriptive government initiative. In the first instance, this was the US Department of Defense's PERT/Cost system which proved to be a significant failure; that experience alone coloured the next thirty years' contracting practice. Next it was used more successfully on the Minuteman programme and finally it was incorporated in a US DoD project management specification that detailed the Cost/Schedule Control Systems Criteria. This important document made a provision for earned value measurement and reporting but it was wrapped up in a logical but bureaucratic management process that was designed to meet the particular needs of the DoD. The fact was that few people made the distinction between the earned value accounting and measurement principles and the total system in which it was contained. As the principal market for earned value methods was among the contractors to the DoD and the only documents that explained the procedure were the government specifications, the perception spread that this was the 'right', 'official' or 'only' way that earned value could be applied. It is perhaps not surprising that the rest of the world viewed it as a quirk of US business practice and took little notice.

It might just have remained that way if it had not been for the PC revolution of the 1990s when a new breed of project planning software burst onto the market. A break from the stand-alone systems of earlier generations, the new software allowed integration with other company systems and also contained earned value calculations. These systems were not

based on government requirements but instead recognized that earned value performance measurement is actually a process that springs from the integration of a planning system with an accounting system. Freed from the US government-inspired approach to total project control, project managers using suitable project planning software packages could begin to use earned value performance measurement as a valuable project control tool but in ways that suited themselves. It was at this point that earned value finally 'came of age'.

## What sort of projects suit earned value methods?

Any project with a structured plan of work, a cost structure and a suitable data-gathering system can make use of earned value methods but it would be unreasonable to suggest that the approach is equally applicable to all types of project. In general, projects that are well suited to earned value methods are those which have most or all of the following characteristics:

- a clearly defined objective
- a clearly perceived route to the goal
- work taking place over an extended period
- a high labour content
- tasks of a creative nature
- a formalized management structure
- cost and time limitations.

An ideal application is engineering development work and it was on projects of that type that the first use of earned value was made.

Without a clearly defined objective no one can say what route the project might take or where it might end up; it may at some point focus on an objective, in which case effort will be concentrated upon it or it may lose sight of any real objective and be terminated. Projects of this type cannot be controlled in any formal sense; what plans are made are likely to be short-term or subject to constant variation and no proper performance measurement is possible even though data may be gathered about expenditure and work.

All performance measurement relies on the idea of a clearly perceived plan that takes the project from inception to the attainment of the goal. Some projects cannot be planned in detail because the route contains many uncertainties that can only be resolved at the time they are confronted. This can occur with projects that contain a large research element where the outcome of any experiments cannot be known in advance and the outcome may determine what new lines of enquiry are pursued. It can also apply in an opportunistic situation where the project strategy might include taking advantage of what opportunities arise, for example, where sales to third parties, or the involvement of outside parties, is involved. Without a stable plan in which all can have confidence, earned value performance measurement is not suitable.

Performance measurement demands a planning, a monitoring and a data-gathering process. In practice, data gathering and processing take time; in large companies or large projects, the time-scales can run into weeks or even months before accurate data becomes available. Projects looking to use earned value methods for control and forecasting should take note of the actual reporting time-scales; if the projects are of short duration with respect

to the reporting cycle, the performance measurement data may be of little use for actual control although it may have some historical and statistical value. With short-duration projects, more direct control techniques may be more suitable.

Earned value was conceived as a method of valuing work done. Although purchased items or materials are not excluded from the earned value approach, this aspect was not the principal focus. If a project is to consist primarily of purchases with very little labour (for example, a project that consists of the purchase of a suite of standard equipment amounting to 90 per cent of the project value, with the only labour element being the installation and commissioning) then earned value methods would have little real impact as a control mechanism. In a case such as this, control would be much better exercised through the pricing agreement with the supplier, which might include discounts, incentives or liquidated damages for late delivery.

The first applications of earned value methods were on major defence engineering development projects. As such, these projects contain a high degree of innovation involving problems which demand a creative solution. These kind of projects are among the most risky and are prone to schedule and cost overruns. Earned value methods were devised to deal with such problems, in particular, to generate some objective measures of progress in a somewhat unstable project situation. Whereas there is no absolute reason why earned value methods cannot be used on routine projects with little creative demand, the question becomes: is it really worth doing? In situations that are largely repeats of earlier well-understood projects, in which there is little risk at the start, or are mostly repetitive production-type operations, then earned value methods are not likely to be of great benefit. Control might be better exercised through simple progress recording and fixed price contracting arrangements which should be easy to agree if things are well known at the start.

Without a formalized management structure, there is not much point in attempting performance measurement unless one is only interested in statistics. Earned value management implies not only a well-defined plan against which performance can be measured, but that someone is going to take responsibility for implementing the plan, take note of the performance measurement results and carry out whatever actions are indicated. If no proper management structure exists or the relationships are only vaguely defined, it may prove impossible to obtain objective information about progress, as well as getting anyone to be responsible for achievement. It may be possible to implement an earned value system of sorts if the planning and data-gathering aspects exist, but the results will have little practical value in terms of the influence they exert over progress.

Another name for earned value management is 'integrated cost and schedule control', because it brings together a way of measuring achievement against both time and cost goals. If a project has neither of these limitations within the control horizon or the cost limit cannot be tied to any particular work or outcome, then earned value methods are not appropriate. Examples of projects of this type are found in long-term research and development, for example, finding a cure for certain types of cancer: it could take five years or it might take ten – and nobody knows.

The case for implementing earned value methods is no different from the case for implementing any other management technique: it is quite simply an economic one. There is always a cost associated with obtaining any information on a project and the issue is one of deciding whether the costs are going to bring the required benefits. In fact, it is not possible to answer that question as the decision must be made before the project starts and no one can say what extra costs might be incurred on the project or what overruns might occur if earned

value is not employed. So it becomes a question of what type of project is most suitable, and the answer is given above: if a project does not fit a substantial part of this profile then other methods might be more suitable, and some suggestions about what to use have been made.

## How sophisticated do we have to be?

Earned value methods were first embodied in some highly detailed US government specifications that appeared in the 1960s. Since then, earned value has been applied across a range of industries and in different ways; Figure 1.2 shows a contemporary US view. Some of the terms shown in the diagram may be unfamiliar and more explanation is given in later chapters but the overall view is clear. Figure 1.2 makes an important point: far from being a prescriptive process that can only be done in one way, earned value management should be adapted to needs as determined by the scale of the project and the organization undertaking it. At the left-hand end, we have small organizations and comparatively simple projects, in this case the core earned value accounting principles and simple reports will be sufficient. At the extreme right-hand end, we have very large projects that are the province of the US government departments such as the Department of Defense and here compliance will be required with a national standard for earned value management, incorporating 32 criteria that define the process. Whereas this situation is not directly applicable to the United Kingdom, as no UK government department demands compliance with a US national standard, the principle remains the same. Simpler projects can use a simplified approach, while more costly and complex projects need a more rigorous procedure.

Where	Commercial or Defence		US Government organic	Major contractors to the US DoD
	Small companies	Larger companies		
When	As required	Corporate policy	DoD non-major contracts (>12 months) >\$6.3m	DoD major contracts > \$73, TDT&E >\$315m Prod
Reports	Streamlined, simple	Tailored to needs	Simplified C/SSR	Detailed CPR
Method	Core EV principles	Tailored applications	Full compliance with ANSI/EIA-748-1999 All \$values Fiscal Year 2000	

**Figure 1.2** The range of application of earned value principles as seen in the USA. Note that only the largest defence contract would be viewed as requiring the full rigours of ANSI/EIA-748-1998 criteria compliance (Source: Eleanor Haupt)

## What can we expect from earned value?

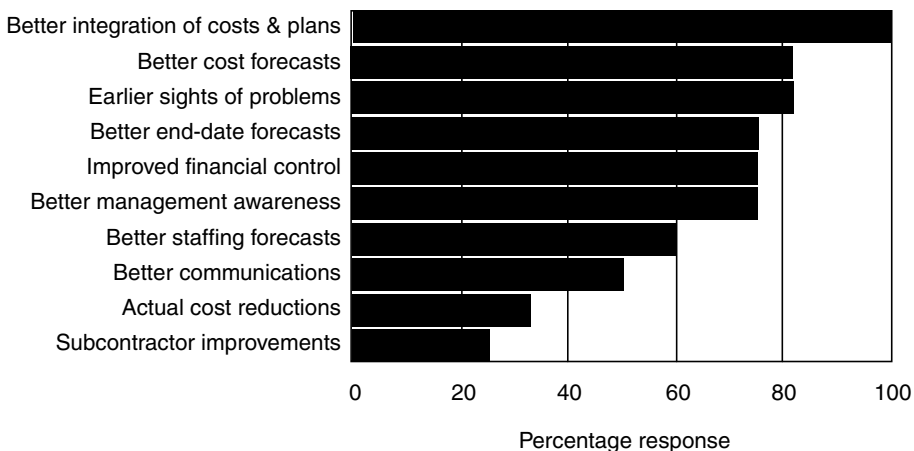
When earned value was first introduced there is no doubt that the sponsors were looking for a much better insight into the progress of their projects from both a cost and a schedule

standpoint than they had before. In particular they did not want any nasty surprises from contractors making sudden demands for more money and increased time without any clear warning that the project situation was deteriorating. That situation has not altered; it is as important today as it was forty years ago to have a clear view of how well a project is doing and where it is heading. Its importance appears in a number of ways:

- Early warning of a deteriorating situation creates an opportunity to do something about it before it is too late.
- Accurate forecasting allows better decisions to be made about the course of the project.
- Accurate forecasting allows better decisions to be made about matters outside the project which may be influenced by the progress of the project.
- An open and verifiable view of progress improves sponsor confidence.

These are all good reasons why earned value performance measurement is an important project management technique but there can be additional benefits. Earned value methods demand effective planning, costing and monitoring systems; the emphasis placed on these aspects can improve overall project management through the discipline they bring. Furthermore, management using earned value techniques requires a proper system of controls with the appropriate allocation of responsibility for achievement.

In 1994, a survey was carried out in the United Kingdom among users of earned value methods; one question was what benefits have users experienced through the implementation of this approach? The response is shown in Figure 1.3. The most striking feature is the broad range of benefits that are claimed and the high incidence among the respondents for some of the most important features. Not surprisingly, all claimed to have seen much better integration of costs and plans but over 80 per cent also saw improved cost forecasting and earlier sight of problems, both of which are important benefits in their own right. Two-thirds noted better financial control and, most importantly, better overall management awareness of the project situation. As to actually making a reduction in the overall project cost through the use of earned value, only one-third claimed to have seen any evidence of this but this is a difficult issue as it is not possible to say what costs might have arisen if earned value methods had not been used.



**Figure 1.3** Benefits associated with earned value methods as seen in a British survey

Earned value methods come at a price; there is no doubt that introducing them in a project environment can be a significant complication compared to running a project without them. They can call for changes to operating practices that go well beyond producing a few new reports as they can demand much greater discipline within the planning process, much greater emphasis on objective reporting, improved integration between the planning systems and the accounting systems, and they might even require new software to be installed. Inevitably there can be problems when a new approach is introduced, particularly when it can demand changes such as those mentioned, but the benefits are well worth having. It is a significant fact that of the companies surveyed, none was contemplating abandoning the practice; once the initial problems had been overcome, the experience encouraged some of the organizations to make more widespread use of the technique.