

Monitoring Project Progress: More than a series of feedback loops

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Abstract

Early detection that a program is not producing intended outcomes within planned time scales and budgets is of concern to all managers. The processes of monitoring actual progress against planned progress and the subsequent benefits to program management and its impact are often undervalued in program implementation planning. This paper will explore these processes discussing the value of planning sessions, determining accountability for evaluative decisions and corrective actions using responsibility matrices, and clearly identifying the program's stages or sub projects. It will outline how decision-making flow charts, derived from these responsibility matrices, can provide feedback loops for assessment and corrective action. The implications for establishing these processes for the work of the internal evaluator will be surfaced.

Introduction

Traditionally project success, effectiveness and performance were related to the three principal criteria of attaining target dates, achieving financial plans and controlling the completion of the project to the specified quality. The foundation of this tradition corresponds to the management concept that effectiveness is related to the achievement of goals. In this way the success of a project corresponds to the effectiveness and efficiency of the project. Efficiency in economic terms refers to the maximisation of output for a given level of input or resources. Success represents a level of satisfaction with the achievement of the three criteria of on time, on budget and completion to specified quality.

Today there is an evolution of these concepts. Besides the traditional mechanistic approach, other criteria are being analysed. Freeman and Beale(1992) for example revealed that the evaluation of the success of a project will vary with the type of the project. Belout (1998) lists twelve studies showing that the human factor is an important indicator of project success.

De Wit (1988) distinguished between project success (measured against the objectives of a project) and project management success (measured against the traditional measures of performance against cost, time and quality). A second distinction is also important; it is the difference between success criteria (measures by which success of a project will be judged) and success factors (those inputs that lead directly or indirectly to the success of a project). (Cooke-Davies, 2002)

These developments indicate that evaluation of a project and its success is more than the traditional mechanistic approach. Recognition of this has been incorporated into an Earned Value approach, that links budget and time constraints in project evaluation.

The model in this paper incorporates the technical success factors of schedule, budget and task completion that form part of Earned Value approach. However, this model extends the evaluation to incorporate of the human and risk factors, which are also critical to a project's success. This is done by using a modified version of the Balanced Scorecard evaluation tool. The Balanced Scorecard was developed as a tool of strategic management. With modification, it can become a useful tool of project management.

This model includes the advantages of an Earned Value approach while overcoming its limitations. The Earned Value model becomes one of a series of triggers that can alert managers to review the Balanced Scorecard for project management.

The advantage of developing a Balanced Scorecard approach as a tool to measure project progress is that it focuses on evaluation. Earned value is a useful tool for understanding the relationship between time constraints, budget constraints and milestones for a project. Although it alerts a manager to problems, indicating that a project may be getting off track, it does not direct the manager towards a mindset of evaluating the problems. It is not solution directed. Since a Balanced Scorecard approach was initially developed as a tool for strategic management, it has a strong evaluation focus.

A perceived limitation of both an Earned Value and Balanced Scorecard approach is that these are both static tools. When used properly, these can become dynamic tools, particularly the Balanced Scorecard. Since this is critical to the success of these methods, their use as dynamic management tools is further considered within the paper.

A manager does not simply want to know that a project might not be meeting budget or timeliness targets. Managers need a clear evaluation tool that provides a framework for analysing issues as soon as they occur and implementing the appropriate corrective action. Without a clear and concise approach to evaluation of project success, there is an increased probability that distortions in the managerial process and hence, the quality of management, will occur. Inefficiencies in management inevitably impact on the overall ability to meet outcomes so there is a flow-on or ripple effect that has ramifications for every aspect of a projects successful completion.

Early detection that a project is not meeting its targets is of primary importance to project managers. As part of any project design, processes for detecting and correcting problems should be built in. Yet continual monitoring is often undervalued in management planning, with monitoring only occurring when significant milestones such as progress payments occur. The approach adopted in this paper is that trigger factors will alert a manager to review the fundamental factors for project success. These factors are the lynch-pin of the Balanced Scorecard for project management.

Traditional Finance-based Evaluations

The sooner managers can detect that their projects are not producing intended outcomes, the sooner they can implement corrective action. The three main areas in which projects fail to meet outcomes relate to:

- Cost – where there are budget over-runs and costs exceed budget
- Time – where the project is delayed and timeliness for completion of sub-goals are missed
- Production – where goods or services do not meet specifications.

Traditionally, managers compared budgeted to actual figures to determine cost over-runs. If actual figures exceeded budgeted figures, then it was assumed that there had been a cost over-run and costs were cut back.

This simplistic approach to budgeting is not accurate when the problem is not with the actual figures but with the budget estimates that are unduly low. This is a particular issue in jobs that are being sought by competitive tender, because a proposal with lower costs will always look more attractive than an equivalent proposal with higher costs. At other times, the budgeted figures might have been exceeded due to unforeseen circumstances.

Traditional Schedule Evaluations

Traditionally, managers maintained time-flow data concerning a project's milestones and when they could reasonably be expected to be met. Actual times were compared with estimates.

Once again, a project that appeared to be running behind time may not necessarily have been a project that is going badly. The time-line estimates may have been unrealistic or the delays may be unforeseen. Delays are not always due to poor project work; contractors will often face situations where job specifications change leading to time blow-outs.

Time is closely linked to production. Time and money are wasted if a job does not meet specifications, whether it is because the specifications were not made clear or because they were not interpreted properly. Part of the quality control processes in selecting a project management team should involve examining their capability to

meet specifications by reference to other projects they have successfully completed. This is a human factor that is not incorporated in the basic scheduling evaluations based on time estimates.

Earned Value Management

One attempt to overcome the limitations of traditional finance based evaluation and traditional schedule evaluations is the Earned Value approach. Earned Value is a project management tool that integrates the technical, schedules and cost parameters of a project or program.

Under the traditional approaches, finance and scheduling were considered separately. There was no attempt to link the budget constraints with the scheduling constraints. Earned value overcame this limitation by providing a simple and effective means of quantifying progress using a finance based and scheduling based approach simultaneously.

The method compares the work scheduled or planned with the actual work completed. Added to this is an evaluation of whether the work (planned and actual) matches the expected or planned time and budget estimates. Thus Earned Value is an evaluation tool monitoring the financial and timely progress of actual outcomes of any project. Because it provides an oversight of performance, resources and time it is seen as a more encompassing evaluation tool than the traditional finance or scheduling only options.

The planned value, earned value and actual cost measurements provide an objective measurement of performance, allowing for monetary evaluations of the initial budget estimate within all layers of a project. Similarly planned and actual time schedules are compared. The combination of linking the estimated and actual costs with estimated scheduling and actual work to date is the key benefit of Earned Value. Thus the key use of Earned Value is to use it as a factual information monitor of the health of projects.

The secondary and much less practised use of Earned Value is its predictive powers. The problem is that Earned Value uses past facts to predict the future performance of any project. Using the past as a future predictor is always problematic; it is only useful to the extent that the past is replicated in the future. Uncertainty about the future could explain the disinterest by managers in using an Earned Value approach for predictive purposes.

Clients and managers most want a reliable forecast of when work will be completed and how much it will cost. If there will be additional costs involved, then estimates of future time and financial needs to complete the task are required. Earned Value enables such forecasts. Earned Value provides the information about how much work has actually been completed (be it within or beyond budget and schedule). From the initial estimates this actual is subtracted to give a true indication of how much work remains to completion. Fresh calculations can occur and be used to forecast the eventual cost and completion date of the work. These forecasts can take into account past performance rates and provide indications of required extra performance rates if a deadline needs to be reached. The major benefit of the Earned Value technique is to provide an accurate milestone of the output completed.

Benefits accrue from the focused planning needed for implementation, the objectivity inherent in Earned Value measurements and the consequent availability of robust data for management decisions. Specific benefits include:

1. Objective measurements of cost and time performance;
2. Objective forecasting of future performance, schedules and budgets based on past performance; and
3. Objective metrics for comparison of project performance across an organisation and between organisations.

The evaluation information that an Earned Value approach provides includes: cost and schedule performance indices, basic progress indices, analytical formulae showing forecasts based on past performance as well as analytical formulae expressing performance required to achieve 'at completion' conditions.

Despite being an improvement on the traditional finance and schedule based approaches to project management, the Earned Value approach has some limitations. One difficulty is that project management is multi-dimensional and Earned Value approaches are generally represented by a two dimensional graph. While more sophisticated graphing techniques are available, the method used should not be so complicated that the manager does not use it. A method that is simple and straightforward, taking minimal time to prepare and interpret will inevitably have a higher chance of usage.

The Earned Value approach ignores two critical success factors in any project. It ignores the human factor and risk analysis. The fundamental weakness of any method that leaves out these two critical factors is that by doing so, it makes them invisible. What is invisible cannot be included for decision-making purposes.

1. The Human Factor

Projects are implemented by people. Leaving the human factor out of any project management evaluative technique is a fundamental weakness because without a good project team whose goals meet the project goals, and the expectations of clients and stakeholders, a project will fail or at the least, be less successful than it would otherwise have been.

There are a number of aspects to the human side of project management including:

- Expertise of management of project
- Expertise of program team
- Ability of program managers to relate to clients
- Ability of clients to succinctly express needs
- Team dynamics within program team

Some of these factors can be controlled in the initial selection of the project team. However, in the process of working with clients and stakeholders over an extended period, a working relationship will be developed. As this occurs, group dynamics within the project team and in the relationship between team members and the clients or stakeholders will change. A project manager can use these changes to secure a better outcome, if the manager is aware of the changes and is sensitive to the altered dynamics.

2. The Risk Factor

The Earned Value approach does not incorporate any ongoing risk analysis of the program. For long-term projects or those with a high level of sensitivity, risk profiles may alter considerably over the life of the project. Although risk management is important for any project, it is of particular concern in government procurement where there is a high level of accountability and spending decisions are open to scrutiny before Senates Estimates Committees and the Joint Committee on Public Accounts and Audit.

A toolkit that can be adapted for specific situations and which assists in identifying risk and developing risk minimisation strategies is provided by the *Australian and New Zealand Standard on Risk Management 4360:1999*.

The focus of an Earned Value approach is on using past data to identify the current status of a project and, if the past is seen as a good indicator of the future, by using the past trends as a predictor of the future time and scheduling abilities of a project. While this is a strength over traditional approaches, it is also the weakness of the Earned Value method. It is a negative approach. If a project is behind time or over budget for unexplainable reasons, the relationship between project managers and clients can be jeopardised, impacting on both the human and risk elements of the project. This is particularly so if there is a specific deadline involved and the strategic focus changes as delays prevent initial strategies from being achieved.

A New Approach to Project Management

A method that captures the past and gives a way of moving the project forward by showing what is working and how the project can be kept on target is of greater benefit to both managers and clients. This is particularly important in areas where the project specifications require ongoing maintenance, education or other dealings with the client after completion of the initial project.

Earned Value is a useful tool. It has enabled project managers to shift their thinking from one-dimensional relationships to a more complex analysis. Managers are able to appreciate that a project may be on time but exceed budget or may be within budget but be behind in time. However, Earned Value does not assist a manager to move to the next level of analysis, which is to develop strategies that overcome any problems that have been identified. Management is not only about identifying that there is a problem; it extends to evaluation of the problem so that corrective action can be put in place.

By focusing on financial and time areas only, Earned Value makes other areas of project management invisible. When invisible areas include two of the most important areas in any project, the people and the risks, the method needs to be reviewed, revised or, as we propose, extended.

A Balanced Scorecard Approach to Project Management

One approach to simplifying the complexity of project management is to use an adaptation of the Balanced Scorecard approach.

The Balanced Scorecard was developed as a tool of strategic management initially by Kaplan in 1992 and espoused in the Harvard Business Review in 1996. The aim is to assist firms to focus on all aspects that comprised their financial performance. It recognises that for a business to implement cycles of continuous improvement, it must consider four aspects of the business:

- Learning and growth, including the quality of information systems and the degree of alignment of staff with organisational goals.
- Business processes, which are the key business processes at which the organisation must excel to produce its goods or services, meet profit or service objectives and satisfy customers.
- Customer/client, which includes customer satisfaction with quality, delivery and service.
- Financial – which includes meeting profit targets in the private sector, and efficiency and effectiveness goals in the public sector.

Developments of the Balanced Scorecard approach have led to double loop feedback. In addition to getting feedback about each of the four aspects of business, an additional feedback loop that moves from an outputs to an outcomes focus was added (Kaplan 2001).

Since it is not possible to manage what cannot be measured, users of the balanced scorecard, such as the Commonwealth government, have developed performance indicators that give feedback on each aspect within the scorecard.

In project management, four aspects of management that must be considered are:

- Financial – whether the project meets budget targets set for it
- Human – whether relationships with the project team and stakeholders continue to work effectively and whether there is internal harmony within the project team itself.
- Risk – whether the risk profile of the project is increasing or decreasing.
- Time – whether the project meets time-lines set for it and the appropriateness of the time-lines that have been established.

The Balanced Scorecard for strategic management is generally represented diagrammatically (see Appendix 1).

In project management, this can be recast to include the four critical success factors in project management of meeting financial constraints, meeting time constraints, managing the human factor and risk management (see Appendix 2).

Under the Balanced Scorecard for project management, the project manager continually asks four questions relating to the four dimensions that are crucial to the sound management.

The Balanced Scorecard approach does not indicate that all four areas will receive equal weighting or are of equal importance at any given time. The manager must use professional judgement to identify the appropriate balance of emphasis between the four dimensions.

1. Financial Constraints

To succeed financially, what can we do to meet appropriately set budget constraints?

Financial success is defined as completing a project on or under budget. But this is only possible if the budget targets are realistic and achievable. Budget targets may be set too high or too low to be realistically workable. If unrealistic budget estimates occur, a good project manager should draw this to the attention of the stakeholders at as soon as possible and explain that the budget targets need to be revisited.

It may seem tempting for a project manager to keep silent about a project that will come in well under budget and then take the credit for sound financial management of that project. However, this is not good management. Budget targets are set to give guidelines for the project. They are intended to provide financial constraints but are also used as a communication device to explain the goals of the project to those involved with it in a specific way, and they are used as a feedback tool for the project team, its managers, its clients and other stakeholders.

When a client is paying for a project and for its sound management, part of the professional responsibility of a manager is to manage using all the tools available, and that includes using all dimensions of budget targets. While most managers will notify clients immediately if the budget targets are too low, there may be more reluctance to say when they are too high. Yet by not being truthful about this, a manager cannot manage effectively and efficiently because one of the crucial management tools, financial forecasting, no longer serves its purpose.

Once the budget targets are appropriately set, the manager should monitor budget versus actual figures and explain variances.

The setting of budget targets may happen more than once in the life cycle of a project. Budget figures that appear appropriate at one point in time may prove inappropriate as circumstances change. Rather than letting actual figures exceed budget figures, a good manager should be able to identify when the budget figures need to be re-assessed and should advise the client and any other stakeholders with this information. This gives clients and stakeholders early warning of an altered financial situation that maximises the time available to the clients or stakeholders to choose alternative strategies.

It is not bad management to identify that previous budget estimates are no longer appropriate and need to be revised. It is bad management to be unaware that budget targets are inappropriate and continue to manage a project in accordance with those inappropriate targets.

2. The Human Factor

To achieve our targets, how should we manage relationships within the project team and with our clients and stakeholders?

Historically, arising from the engineering basis, projects were managed as technical systems. With this emphasis, the human side of project management becomes unimportant. This ethos is apparent in the Earned value approach to project management. The human factor is a dimension that is not included in an Earned Value approach.

The Earned Value approach emphasises the technical systems instead of behavioural systems. The human resource function is seen as one of the most crucial elements for a project's success (Kerzner, 1979, Freeman and Beale 1992). Although research by Pinto and Prescott (1988) concluded the surprising result of their survey that showed that the personnel factor was the only factor that was not significant at any of the four life cycle stages. Their results have since been found flawed by Belout (1998).

If relationships within the team responsible for a project and between the team and its clients and stakeholders are working well, the project is more likely to work well. This is particularly important when the project is in difficulty because that is a time when relationships may become strained, clients and stakeholders may look for scapegoats and members of a team may become stressed.

Good management of these relationships will involve good channels of communication. A good manager should be identifying weaknesses in the various relationships involved and identifying strategies to fix them.

Individual performance appraisals, clear work statements and responsibilities matrices need to be planned and implemented.

3. Risk Analysis

To achieve our targets, how can we minimise risk?

Risk management is an integral part of good management practice. The *Australian and New Zealand Standard on Risk Management 4360:1999* defines risk as "the chance of something happening that will have an impact on objectives." Risk is not explicitly covered in the Earned Value approach. The estimates that are used for measuring Earned Value performance incorporate risk factors but it is an indirect recognition.

In project management, the manager is trying to ensure that outputs meet desired outcomes. This should be done with minimum risk to the clients, stakeholders and project team. Risk is contextual so the particular risks of

specific projects will vary, but once risks have been identified, it is the responsibility of the project manager to ensure that processes that are put in place seek to manage risk. Risk management strategies will vary according to circumstances, and may range from accepting the risk to avoiding it by choosing not to continue with the project.

Risk is not a static concept. Levels of risk change over time so risk evaluations should be made regularly to determine whether previous risk analyses are still appropriate. This is especially true when an Earned Value analysis indicates that actual targets have not met estimated targets.

One simple way of thinking about risk is to use a matrix approach. The financial consequences associated with the identified risks are compared with the non-financial consequences. These are the consequences after any initial risk minimisation strategies have been put in place.

At the start of a project, when a thorough risk analysis is performed, a project will be identified by a combination of having low or high financial consequences and low or high non-financial consequences if identified risks occur. Financial consequences refers to increased project costs that were anticipated or previously unanticipated. Non-financial costs include political fall-out and social consequences, such as bad publicity from extensive environmental damage unexpectedly caused by a project (see Appendix 3).

Ideally, projects will be structured so that they start with low financial and low non-financial consequences. In other words, on completion of a risk analysis, strategies should have been put in place to minimise risks. Where a program has been contracted out, these should form part of the contract provisions, as should regular review of them. If a project starts with high financial consequences should the identified risks eventuate and low non-financial consequences, or low financial consequences and high non-financial consequences, judgements about the efficacy of continuing with the project will need to be made. Very good justification for a project that starts with high financial and non-financial consequences would be required.

Good project managers should identify whether the risks of a project are changing so that a project is moving closer towards the bottom right hand corner of the matrix, to high financial and non-financial consequences. If the risk profile is changing to make the project riskier in either a financial or non-financial sense, a good manager should be implementing new risk minimisation strategies to shift the project back towards the top left-hand corner. Here the financial and non-financial consequences are low. The manager should be discussing the changed risk profile with clients and stakeholders.

It is at this juncture that an Earned Value approach will become a feedback loop for the risk strategy evaluations.

4. Time Constraints

To meet time constraints, what processes must we excel at?

Clients and stakeholders will often have strict time constraints on the life of a project, often determined by funding constraints. Project managers must meet these constraints. Scheduling is often an art form. It can rely on bottom up developed work break down structures. The aggregate project plan is a combination of a series of different sections of the project team estimating how long given tasks will take.

To meet stringent schedules means that the project team must be efficient and effective in its operations. A good project manager will identify the key processes for efficiency and effectiveness in any operation and will manage resources to ensure that these processes are not under-resourced. Sound resource management, including the management of human and non-human resources, is crucial. This may include identifying training needs or areas where outside expertise should be used.

Work break down structures, project action plans and responsibility matrices incorporate the human resources in the project plan. These resources are indirectly evaluated by Earned Value measurements.

Using the Balanced Scorecard Approach to Project Management

Identifying the critical success factors of a project is not enough. These factors must form the basis of an evaluation that leads to better project management and improved project outcomes.

The Balanced Scorecard can be used by project managers for their own evaluations of a project and whether it is progressing as planned towards successfully meeting outcomes. Perhaps more importantly, the Balanced Scorecard can be used by managers as a communications and feedback tool to project staff, clients and stakeholders. It is a simple and useful way of explaining what is and what is not working.

For staff, it can lead to identifying weaknesses in the project's operations, which may lead to notice about where extra resources should be placed. It can also lead to identifying parts of a project that are over-resourced. Individual staff performance can be assessed in relationship to overall project performance, if suitable performance indicators have been put in place.

For clients and stakeholders, it may signal a revision to the strategic direction underlying the project or to review the prioritisation of the project compared to other work objectives.

The danger with the Balanced Scorecard approach is that it may become a static tool of management if not used properly. One of the limitations of the Earned Value approach was that it is a static tool, isolated in time at the point where the evaluation of time and financial constraints was made.

The Balanced Scorecard needs to be regularly reviewed to be useful during the life of a project. Project managers must be sensitive to the triggers that will lead to review of the Balanced Scorecard. These triggers may be internal or external (see Appendix 4).

Internal factors are changes to one or more the four dimensions of the Balanced Scorecard: financial constraints, time constraints, the people undertaking the project or the clients and stakeholder base driving the project, and the risk profile of the project. External factors relate to the project's external environment including social or political changes, changes to suppliers, supply chains or distribution channels, and changes to the prioritisation of the project. Some internal and external changes may lead to a review of the strategic direction of the project. All changes will lead a re-evaluation of the Balanced Scorecard for project management. There is considerable scope for further research to examine how these trigger factors impact on the model.

The Importance of Evaluation in Project Management

The need to evaluate in an all-encompassing manner is becoming more imperative in project management. Sound decision making in rapidly changing business environments is becoming more difficult. The speed of change is creating greater risks and strategies need to be lean as well as agile to keep competitive. Evaluation is seen as the key to good management in these environments. Evaluations that include the major aspects of the project environment are more useful than narrow focused tools such as Earned Value methods.

Evaluation is crucial in project management because projects often change over time as circumstances change and the project life cycle matures. Without proper (ie all-encompassing) evaluation, these changes will not be handled properly.

Our paper is based on the premise that one cannot manage in a dynamic situation with a static tool (ie earned value). Our model adds the dynamic dimension to evaluation. Any evaluation involves trying to "second guess" the future – You need an evaluation tool that helps you identify the areas in the future that may potentially cause trouble.

If used properly, the Balanced Scorecard can be an evaluation tool for project management. However, a manager must review it regularly through the life of the project; using it as a static evaluation tool at the start of the project and not re-visiting it during the project, as circumstances change, is to limit its usefulness and predictive power.

One of the important features of the Balanced Scorecard approach is that it provides a simple method for identifying and categorising the problems that may arise during the life of any project. By focussing on whether the problem is financial, relates to scheduling and time constraints, the human factor, or a changed risk profile, the manager can isolate possible solutions, targeting them to the correct problem area.

Conclusion

The Balanced Scorecard for program management is an evaluation tool. It encourages project managers to ask whether a problem has occurred, why it might have occurred and to move towards developing a corrective strategy. It is therefore more robust than the Earned Value approach, which can only assist a manager to identify that a problem has occurred and which has limited predictive capabilities.

Good management involves continual evaluation. A project manager should view information received about a project in a series of feedback loops because projects are rarely static but are developed, altered or refined as circumstances change or as they move from infancy through their maturity cycle.

Evaluation of a project is a dynamic process and it is one that focuses on the future. Data for management purposes is only useful if it assists with future improvements. The problem with the Earned Value approach is that it is rarely used as a predictive tool and it is not a corrective tool. It does not allow for the evaluation that is an essential part of any project management and project development.

The Balanced Scorecard approach is a tool that has been used with success in strategic management. The concerns of a project manager are not completely synergistic with those of managers at the organisational level where strategic direction is set, even though there is a strategic element to project management. However, the Balanced Scorecard adapts well for project management because a project manager must take a strategic approach to some extent, although the framework of this approach will differ from the framework at an organisational level. This different framework for a project manager has been recognised in the four dimensions of financial, time, human and risk factors.

However, there is considerable work to be done in looking closely at these dimensions of project management to increase the robustness of this model and ensure that project managers use it as a dynamic and not a static evaluation tool.

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