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Earned value management in a data warehouse project

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Abstract
Purpose – Sets out to examine earned value management (EVM), a project management technique that relates resource planning to schedules, technical costs and schedule requirements.

Design/methodology/approach – Provides an example of how EVM can be implemented in a data warehouse project and how it can be used as a tool to diagnose and solve problems.

Findings – EVM is based on the belief that the value of the project increases as tasks are completed and therefore the earned value of a project is a measure of the real progress of that project.

Originality/value – Offers a significant analysis of EVM, its benefits and pitfalls.

Keywords Value analysis, Project management, Data security

Paper type General review

Introduction
Data warehouse projects are generally expensive, involve many people over a long term and often include complex activities that are unfamiliar to sponsors, end-users and developers. Success in building a data warehouse can be problematic. A survey of 142 companies by the Cutter Consortium in 2003, found that 41 percent had experienced at least one data warehouse project failure (Cutter Consortium Report, 2003). Many data warehouse projects fail due to undetermined metrics, budgets, and deadlines (Paul, 1997). As a result many companies must develop compelling business cases in order to justify data warehouse projects that deliver clean, integrated data and facilitate better business decision-making. While relying heavily on the $7.9 billion storage software market, many data warehouse project managers are under pressure to deliver a solution that returns a favorable return on investment (Sharma, 2005).

While most organizations call for a favorable cost-benefit justification before an information technology (IT) project is authorized, few have required the financial justification of IT projects over the project's entire life-cycle. Earned value management (EVM) offers a cost justification approach that requires the data warehouse project manager to measure both budget and schedule variances continuously throughout the life cycle of the project, including implementation and

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potentially maintenance. In order to take advantage of this project management tool, project managers need to know how to implement and interpret EVM measures about their data warehouse project. The process integrates the project scope, schedule, and cost objectives through a system of metrics that allows a project manager to identify and correct problems and adjusts the project plan accordingly.

Data warehouse projects and issues

According to the Standish Group Chaos study, only 28 percent of all software projects finish within budget, on schedule, and contain all designed functions and features. (Johnson *et al.*, 2001). While data warehouse projects share many of the issues of typical IT projects, they do tend to have certain idiosyncrasies that make them somewhat unique. Extracting, transforming and loading (ETL) data is an important development effort of a data warehouse project. According to Earls (2003), ETL is the most critical part of the data warehouse development process and the most unpredictable. Data warehouses tend to draw upon many sources of data, often deploying advanced information technologies to integrate enterprise systems with the data warehouse (Zeng *et al.*, 2003). The source data for the data warehouse is often inconsistent and contaminated with errors so that many times data migration specialists are needed in the design and implementation process. Multiple platforms are often involved and integration issues can aggravate project costs and budgets. Successful implementation of a data warehouse requires a "proven framework" (Gardner, 1998). According to experts, if the scope is too large and the cost is underestimated, the project could "start to gather dust" and fail (Deck, 1998). The primary message is to start small and help ensure success. Scope creep is a term used to describe the growth of a project's scope after the project has been planned and development begins. "Minimized scope" is ranked as the 5th critical success factor according to the Standish Group Chaos study (Johnson, *et al.*, 2001). In data warehouse projects, it is usually more of a threat due to users changing their minds on capabilities and data modelers want to extract more data than planned from a record. A "formal management methodology" was ranked as the #8 critical success factor and increased success rates by about 16 percent. Gardner (1998) describes the data warehouse building process as iterative, "therefore it is critical that there be multiple entry points into the chosen methodology". This is where EVM has some benefits over other project management control techniques:

- EVM measures actual performance versus budget and schedule at any point in time.
- EVM requires the project manager to track scope creep.
- EVM gives a snapshot to executive management which can be easily understood.
- Historical EVM data can be used for similar projects and improving estimates.

Earned value management background

Today much of the analysis, design and implementation of software applications is done in a "value-neutral setting" where many sources of software project failure are ignored. As a result, there has been a recent call to introduce value-based software engineering, based on the principles of earned value, project monitoring and feedback control (Boehm and Huang, 2003). Others have argued that a "business-led" approach to information systems development that requires the systems developer to better incorporate "a clearer understanding of the organizational, cultural, financial, technical and change management issues" (Maguire, 2000).

The basic concepts of EVM have been used for over 35 years primarily in defense contracting industry the United States (Office of the Under Secretary of Defense for Acquisition, Technology & Logistics, 2005) and Australia (Department of Defence, Defence Materiel Organisation, 2005). EVM was developed by the US Department of Defense (DoD) and called Cost/Schedule Control Systems Criteria (C/SCSC), but the terminology was revised by the DoD in 1996 and accepted as an American National Standards Institute/ Electronic Industry Association (ANSI/EIA) standard #748 in 1998, titled EVMS. The ANSI/EIA standard was ultimately adopted by the DoD in 1999. As recently as July 2004, the National Defense Industrial Association (NDIA) signed an agreement with its counterpart in Great Britain, the Association for Project Management, to recognize the equivalence of their EVMS documents based upon the ANSI/EIA 748 standard, thus building momentum for global acceptance (NDIA, 2004). In Australia, C/SCSC had its beginnings in when the Joint Committee of Public Accounts made a number of recommendations concerning Australian Defence project management in 1986. Arising from this review, C/SCSC is now a contractual requirement for certain significant defense contracts. Today many global companies now are using EVM as a benchmark for best practices project management (Pavyer, 2002; Pracchia, 2004; Solomon, 2002).

While EVMS has its own set of jargon, the concepts are fundamental to project management. Town (1998) describes it as "the financial side needs to run and be seen to run in parallel with the physical work side – the work which creates the *value* of the project." The project has to be divided into a rational set of activities, measured and phased with the financial flow of aligned resources. A sequence of milestones can then be tracked and evaluated based upon a set of integrated metrics including cost and time (the schedule), both budgeted (forecasted or planned) and actual. There are three measures which are ultimately compared: planned work, accomplished or earned work, and actual costs of work accomplished. The metrics can be compared using graphical reports and/or calculated ratios. Tracking these metrics allow a manager to identify problems and then focus upon the cause and hopefully a solution.

Requirements for using EVM

Companies need to meet certain criteria if they want to use EVM as a project management tool. The six listed below give you a general idea of what needs to be in place before using EVM (Fleming and Koppelman, 2000):

(1) An organizational structure is needed to permit both cost and schedule performance to be measured by elements of either, or both, structures.

Example: Accounting Department tracks cost charging through cost control numbers (CCNs).

(2) Schedule the authorized work in a manner that describes the sequence of work and identifies the significant task independencies required to meet the project requirements.

Example: Work breakdown structure, critical path method, control account plans.

(3) Establish and maintain a time-phased budget base line at the control account level, against which project performance can be measured.

Example: Budget work for each task performed on the schedule by a set completion time.

(4) Record direct costs in a manner consistent with the budgets in a formal system controlled by the general book of accounts. There needs to be a process in place for the employee to charge time to the specific project schedule tasks.

Example: Each cost account is assigned to a particular project or task and collects the hours and dollars charged by each employee.

(5) At least on a monthly basis, generate reports that compare the amount of planned budget and the amount of budget earned for work accomplished (schedule variance) and the amount of budget earned and the actual direct costs for the same work (cost variance).

Example: Stoplight charts, monthly variance reports, estimate at completion.

(6) Provide detailed reasons for schedule and cost variances.

Example: Detailed analysis provided with reports mentioned above.

EVM and planning the data warehouse project schedule

Planning for a data warehouse project is the most important step in using EVM to measure performance on the project. Because substantial detail must be present on the schedule in order to use EVM properly, developing a project schedule is perhaps the most difficult task. There are three activities that need to be completed before EVM can be implemented.

Agree upon a schedule methodology and what needs to be measured

Most IT departments have a generic work breakdown structure they use when scheduling systems and/or data warehouse projects. This structure becomes important because many times it is what is used in measuring performance and if standardized, comparing performance across projects. It is important that the scope is as well defined as possible during this activity. The data warehouse project life cycle presented in this paper uses five different major steps based largely on Adelman and Moss (2000): project agreement, develop technology platform, data staging and database development, query and report development, and final production (Figure 1). Note that a CCN is established for each sub-task and is set up by accounting for employees to charge their time. The data warehousing project manager would then measure performance by each individual task (26 total charge numbers). The project manager must determine the level of detail needed. Factors like time, budget, and project scope play an important role in the decision making process. Once this decision has been made, the project planner must include that information in the project schedule to show those charging to the project where to charge their time (Adelman and Moss, 2000). See sample schedule in Figure 2.

Set schedule guidelines

This may be the most overlooked best practice when creating a data warehouse project schedule. Many project managers fail to set predetermined rules when creating and managing their schedule. There should be an agreement to the allowed duration for

Task	Cost Control Number (CCN)
Stage 1: Project Agreement	
Determine Project Objectives and Scope	CCN1
Define Business Requirements	CCN2
Develop Data Model	CCN3
Identify Data Sources	CCN4
Assess Technology Architecture	CCN5
Assess Data Architecture	CCN6
Stage 2: Develop Technology Platform	
Define Selection Criteria	CCN7
Select Vendor and/or Product	CCN8
Install and Test Prototype	CCN9
Stage 3: Data Staging and DB Modeling	
Analyze Data Staging Activities	CCN10
Identify Data Access Patterns	CCN11
Design and Develop Databases	CCN12
Finalize Data Staging Specifications	CCN13
Design and Code Data Staging Programs	CCN14
Conduct Acceptance Test	CCN15
Prepare for Implementation	CCN16
Stage 4: Query and Report Development	
Prototype queries and reports	CCN17
Establish Support Infrastructure	CCN18
Review/Revise Project Agreement	CCN19
Provide End-User Training	CCN20
Conduct Acceptance Testing	CCN21
Prepare for Query and Report Implementation	CCN22
Stage 5: Final Production	
Move Programs to Production Libraries	CCN23
Populate Production Databases	CCN24
Train Operations Personnel	CCN25
Close the Project	CCN26

Figure 1.
Data warehouse project: work breakdown structure

each task. The example uses a guideline of no more than four weeks for each sub-task. The same principle applies to costs. Usually costs are measured by direct hours charged to a specific task. The most important thing project managers need to understand is that the hours in your schedule *Must* correlate with the hours in your budget. This is an EVM required one-to-one relationship. Budgets are usually in dollars so it is important to specify different labor rates.

It is also important for the project manager and business analyst to come to agree what dictates a task to be re-baselined. All schedules have tasks that are planned with uncertainty at the beginning of the project. In order to analyze the critical path and the project's milestones, it is necessary to move certain task dates to the right (future). The problem with re-baselining with EVM is that no task date should be moved once that task has started. Figure 3 shows an example of tasks whose end dates are final:

If such a task were re-baselined, it would ultimately appear to have been performed on time. An important aspect of EVM is to document poor performance, which may have occurred for a variety of reasons from planning or forecasting error, to scope-creep, or poor development practice. It is necessary for the project manager and business analyst to determine what dictates an acceptable re-baseline. For instance, it may be a task that will be delayed for two weeks (move end date). Or, it could be a task

% Complete	Task Name	Work (hrs)	CCN	Duration (days)	Start	Finish	Predecessors
32%	**Data Warehouse Project**	**2,400**		**165**	**9/29/04**	**5/14/05**	
96%	**1. Project Agreement**	**290**		**40**	**9/29/04**	11/21/04	
100%	1.1 Determine project objectives/scope	25	CCN1	10	9/29/04	10/10/04	
100%	1.2 Define business requirements	60	CCN2	10	10/13/04	10/24/04	1.1
100%	1.3 Develop data model	30	CCN3	5	10/27/04	10/31/04	1.2
100%	1.4 Identify data sources	15	CCN4	5	11/3/04	11/7/04	1.3
100%	1.5 Assess technology architecture	80	CCN5	10	11/10/04	11/21/04	1.4
80%	1.6 Assess distribution architecture	80	CCN6	10	11/10/04	11/21/04	1.4
82%	**2. Develop Technology Platform**	**210**		**35**	**10/13/04**	**11/28/04**	
100%	2.1 Define selection criteria	20	CCN7	5	10/13/04	10/17/04	1.1
95%	2.2 Select vendor/product	150	CCN8	25	10/20/04	11/21/04	2.1
0%	2.3 Install and test prototype	40	CCN9	5	11/24/04	11/28/04	2.2
0%	**3. Data Staging and DB Development**	**890**		**70**	**12/1/04**	**3/5/05**	
0%	3.1 Analyze data staging activities	40	CCN10	5	12/1/04	12/5/04	2.2
0%	3.2 Identify access patterns	80	CCN11	10	12/8/04	12/19/04	3.1
0%	3.3 Design and develop databases	120	CCN12	15	12/22/04	1/9/05	3.2
0%	3.4 Finalize data staging specifications	40	CCN13	5	1/12/05	1/16/05	3.3
0%	3.5 Design/code data staging programs	300	CCN14	15	1/19/05	2/6/05	3.4
0%	3.6 Conduct acceptance test	300	CCN15	20	2/9/05	3/5/05	3.5
0%	3.7 Prepare for implementation	10	CCN16	0	3/5/05	3/5/05	3.6
27%	**4. Query and Report Development**	**570**		**115**	**10/20/04**	**3/26/05**	
100%	4.1 Prototype queries and reports	80	CCN17	10	10/20/04	10/31/04	2.1
100%	4.2 Establish support infrastructure	40	CCN18	5	11/3/04	11/7/04	4.1
0%	4.3 Review/revise project agreement	20	CCN19	5	11/10/04	11/14/04	4.2
0%	4.4 Provide end-user training	120	CCN20	15	3/8/05	3/26/05	3.7
0%	4.5 Conduct acceptance testing	300	CCN21	20	2/9/05	3/5/05	4.3
0%	4.6 Prepare for implementation	10	CCN22	0	3/5/05	3/5/05	4.3
0%	**5. Production**	**440**		**40**	**3/8/05**	**4/30/05**	
0%	5.1 Move programs to production	300	CCN23	20	3/8/05	4/2/05	3.7, 4.6
0%	5.2 Populate production databases	80	CCN24	10	4/5/05	4/16/05	5.1
0%	5.3 Train operations personnel	40	CCN25	5	4/19/05	4/23/05	5.2
0%	5.4 Close project	20	CCN26	5	4/26/05	4/30/05	5.3

Figure 2.
Data warehouse project schedule

% Complete	Task Name	Work (hrs)	CCN	Duration (days)	Start	Finish	Predecessors
100%	1.3 Develop Data Model	30	CCN3	5	10/27/04	10/31/04	1.2
100%	1.4 Identify Data Sources	15	CCN4	5	11/3/04	11/7/04	1.3
100%	1.5 Assess Technology Architecture	80	CCN5	10	11/10/04	11/21/04	1.4

Figure 3.
Example: EVM tasks

that requires 4 more resources, therefore maintain the end date but increase the duration in hours. However, as stated previously, in EVM modeling, a requirement is to maintain a one-to-one relationship between schedule hours and the budgeted costs. If re-baselining is required by adding hours to an established schedule, one must find other tasks in the schedule from which to draw, if the budget remains constant. This is an important concept and ensures that the EVM metrics are valid. If a steering committee agrees to increase or decrease a budget, then overall schedule hours could be changed accordingly.

Agree to a determined schedule base line
It is important for executive steering committee, project manager, and business analyst to come to an agreement on the baseline cost, schedule, and scope of a project. Once agreed upon, the analyst can begin to show planned performance versus actual performance and determine where variances exist, and ultimately, why variances exist.

EVM metrics
The use of metrics is important in EVM project management. Figure 4 shows EVM metrics using the three primary concepts of planned, accomplished and actual work, which are integrated measures of time (schedule) and costs.

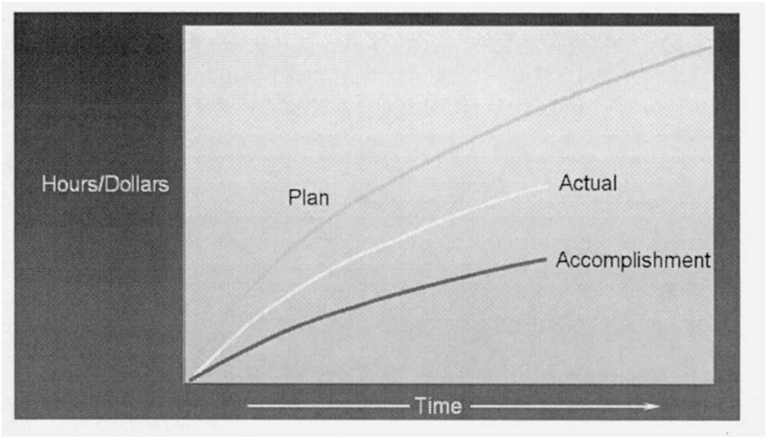

Figure 4.
EVM primary concepts

Plan metric
Budgeted cost for work scheduled (BCWS) – The total planned cost for a task or sub-task to be achieved by a given point in time.

Accomplishment metric
Budgeted cost for work performed (BCWP) – The total planned cost associated with completed work on a task or sub-task at a point in time. This directly relates to the concept of earned value.

Actual metric
Actual cost of work performed (ACWP) – The total expenditure for a task or sub-task at any point in time.

Consider an example of an IT consulting project as an activity. If the contract on the IT project is for $100,000, then BCWS = $100,000. When the consultant has spent half of the funds, the ACWP = $50,000. But let's say the consultant disappears and it is determined it will take $70,000 to complete the IT project, therefore the BCWP = $30,000.

There are two primary ratios project managers track when using EVM to manage their project:

Cost performance index (CPI)
BCWP/ACWP:

- If CPI $>$ 1.0, the activity is under budget.
- If CPI $<$ 1.0, the activity is over budget.

Schedule performance index (SPI)
BCWP/BCWS

- If SPI $>$ 1.0, the activity is ahead of schedule.
- If SPI $<$ 1.0, the activity is behind schedule.

The CPI measures the rate at which value is earned for the actual costs incurred or a measure of the cost efficiency of the work accomplished, while the SPI is the rate of progress against the original schedule with respect to time, or a measure of schedule efficiency of the work accomplished. In the example above for the IT consulting project, the CPI = $30,000/$50,000 = 0.60 or an indication the activity is over budget. The SPI = $30,000/$100,000 = 0.30 indicating that the activity is behind schedule.

Additional EVM summary metrics may include:

Estimate at completion (EAC)
The sum of all actual costs at a point in time plus all remaining costs to complete a task or project.

Budget at completion (BAC)
The sum of all planned project costs plus any contingency for management reserve.

EVM data warehouse application metrics example

This example also shows the project manager for this data warehouse project where the variance occurs – assess distribution architecture. Consider the following "earned value" on the second line (CCN6) through November 21st in Figure 5.

The SPI = $6,400 (BCWP)/$8,000 (BCWS) = 0.80.

If we assume costing the work at $100/hour, the BCWP for CCN6 was calculated by taking the percentage of the earned value of work performed = $8,000*80 percent = $6,400. For this particular task, $4,500 was charged into this CCN account as shown in Figure 6.

The cost performance index (CPI) = $6,400 (BCWP)/$4,500 (ACWP) = 1.42.

Therefore, this particular task is under budget but behind schedule. Such calculations allow managers and analysts to make decisions regarding the performance of a project by tying budget with schedule.

Aggregated activities could also be analyzed. For example, if a project manager wanted to view the EVM for the develop technology platform stage (CCN7 + CCN8)

$$\text{CPI} = \frac{\$2,000 + \$14,300}{\$700 + \$6,600} = \frac{\$16,300}{\$7,300} = 2.23$$

$$\text{SPI} = \frac{\$2,000 + \$14,300}{\$2,000 + \$15,000} = \frac{\$16,300}{\$17,000} = 0.96$$

This tells the project manager that although the develop technology platform stage is somewhat behind schedule, and they have experienced significant cost efficiency in performing these tasks.

Benefits of implementing EVM to a data warehouse project

Using EVM to directly tie the budget with the schedule
The EVM metrics integrate cost and scheduling therefore evaluation is integrated as well. The integration of scope, schedule and cost objectives into a baseline plan provides a sound basis for problem identification, problem analysis and change control (Schulte, 2004).

Figure 5.
Sample EVM activity

% Complete	Task Name	Work (hrs)	CCN	Duration (days)	Start	Finish	Predecessors
100%	1.5 Assess Technology Architecture	80	CCN5	10	11/10/04	11/21/04	1.4
80%	1.6 Assess Distribution Architecture	80	CCN6	10	11/10/04	11/21/04	1.4
82%	**2. Develop Technology Platform**	**210**		**35**	**10/13/04**	**11/28/04**	

Task	Total Work ($'s)	BCWS	BCWP	ACWP
CCN1	$ 2,500	$ 2,500	$ 2,500	$ 1,800
CCN2	$ 6,000	$ 6,000	$ 6,000	$ 6,000
CCN3	$ 3,000	$ 3,000	$ 3,000	$ 4,300
CCN4	$ 1,500	$ 1,500	$ 1,500	$ 2,100
CCN5	$ 8,000	$ 8,000	$ 8,000	$ 2,300
CCN6	$ 8,000	$ 8,000	$ 6,400	$ 4,500
CCN7	$ 2,000	$ 2,000	$ 2,000	$ 700
CCN8	$ 15,000	$15,000	$14,300	$ 6,600
CCN9	$ 4,000	$ -	$ -	$ -
CCN10	$ 4,000	$ -	$ -	$17,600
CCN11	$ 8,000	$ -	$ -	$ -
CCN12	$ 12,000	$ -	$ -	$ -
CCN13	$ 4,000	$ -	$ -	$ -
CCN14	$ 30,000	$ -	$ -	$ -
CCN15	$ 30,000	$ -	$ -	$ -
CCN16	$ 1,000	$ -	$ -	$ -
CCN17	$ 8,000	$ 8,000	$ 8,000	$ 7,900
CCN18	$ 4,000	$ 4,000	$ 4,000	$ -
CCN19	$ 2,000	$ 2,000	$ -	$ -
CCN20	$ 12,000	$ -	$ -	$ -
CCN21	$ 30,000	$ -	$ -	$ 2,000
CCN22	$ 1,000	$ -	$ -	$ 6,500
CCN23	$ 30,000	$ -	$ -	$ -
CCN24	$ 8,000	$ -	$ -	$ -
CCN25	$ 4,000	$ -	$ -	$ -
CCN26	$ 2,000	$ -	$ -	$ -
Total	**$ 240,000**	**$60,000**	**$55,700**	**$62,300**

Note: BCWS reflects the Budget of Work Scheduled for a particular task at a point in time during the project.

Figure 6.
EVM metrics calculated (assuming cost of $100/h)

Using EVM to help ensure a meaningful schedule
Many times project managers cut and paste a schedule together just to have something to manage to during the development stage of the product. Since EVM forces managers to budget hours for each task, additional effort goes into developing a schedule. Because of the one-to-one relationship between budget and schedule, it was explained earlier that scheduled resources can be moved to re-baseline a schedule, but additional budget resources must be added to the entire project in order to expand the work product. Because of this, project managers who use EVM also tend to overestimate the task duration and work budgeted. Data warehouse schedules do generally slip due to unknowns, especially ETL or due to scope creep (Earls, 2003).

Using EVM to assign manager/team responsibility and improve communication
In today's business environment, it is not unusual for a project team to be dispersed across multiple locations. Project managers face the daunting task of managing multiple teams from multiple locations. At times, it is difficult for managers to determine the performance of the various teams due to the inability to be in constant communication. However, by

assigning different CCNs to each project team, EVM can be taken on performance by each virtual team. This data can give the project manager a quick glance on performance from each team. Virtual teams can be closely managed and held accountable for their performance. If the teams are underachieving, they can take corrective actions to get back on schedule or/and budget. The EVM metrics and schedule can be used as a focal point and tool to improve communication. It can be used to build stronger relationships with sponsors and partners as well (Pavyer, 2002).

Using EVM to forecast final project results

Earned value provides an early warning for projects that need a corrective action. It can be said that EVM can forecast final results as early as the 15 percent completion point. One formula that is widely accepted combines both CPI and SPI.

Forecast CPI = Actual costs + (Remaining work/Cumulative CPI × SPI)

(Where Remaining work = Budget at complete − Earned value)

Consider this formula to predict final costs for our project:

Actual costs = \$62,300

Remaining work = \$240,000 − \$55,700 = \$184,300

Cumulative CPI = \$55,700/\$62,300 = 0.894

Cumulative SPI = \$55,700/\$60,000 = 0.928

Forecast CPI = \$62,300 + (\$184,300/(0.894 × 0.928)) = \$284,447

Final costs for such a data warehouse project would be equivalent to \$284,447 charged to the project. Since the original budget was \$240,000, the project manager should request an additional budget of about \$45,000 (the delta). Again, this formula is considered useful after the project is 15 percent complete and gives the manager the opportunity to request additional funds if needed.

Using EVM to support effective and efficient management of multiple projects

EVM results can be easily communicated to upper management for decision-making purposes. Upper management will determine the difference between a project that needs mitigation and a project that needs a recovery plan (Johnson *et al.*, 2001). Consider the report and legend of a multiple project scenario (Figure 7).

EVM can give the *CIO* a snapshot view of how the teams (projects) are performing and how they may want to allocate resources and budget. Project 4 currently is in need of an effective recovery plan due to the CPI being extremely low compared to the other projects. Managers should pay more attention to CPI than SPI because SPI eventually will perform to 1.0.

Using EVM to allow managers to quantify lessons learned

Many times at the closing of a project, managers will gather their team leads and document the lessons learned on the project for future project managers on similar projects. EVM allows managers to document how much was actually spent on a specific phase of a project. For instance, looking at our project schedule, the project manager would document 210 hours spent of 290 hours budgeted in the project agreement phase of the data warehouse project (ACWP shown in Figure 8).

	Current CPI			Current SPI			CUM	CUM			
	Week ending			Week ending			Month	Month	%	$M	$M
	3/29	4/5	4/12	3/29	4/5	4/12	CPI	SPI	Comp	BAC	EAC
Team 1	100.0	128.2	999.9	89.6	134.9	99.7	1.047	0.997	99%	242.7	227.7
Team 2	65.3	81.9	718.6	109.5	116.6	102.2	1.017	0.998	89%	271.5	264.8
Team 3	106.6	99.1	184.9	141.8	136.6	115.9	0.939	0.986	77%	254.0	254/0
Team 4	77.1	88.1	91.0	99.2	102.9	101.1	0.931	0.945	38%	303.4	306.6

Note:

■ Indicating the project needs a recovery plan.

□ Indicating the project needs a mitigation plan.

■ Indicating the project is performing ahead of plan.

A coloured original of this diagram was supplied.

Figure 7.
Sample EVM multiple project report

% Complete	Task Name	Work (hrs)	CCN	Duration (days)	Start	Finish	Predecessors
32%	**Data Warehouse Project**	**2,660**		**165**	**9/29/04**	**5/14/05**	
96%	**1. Project Agreement**	**290**		**40**	**9/29/04**	11/21/04	
100%	1.1 Determine Project Scope/Objectives	25	CCN1	10	9/29/04	10/10/04	
100%	1.2 Define Business Requirements	60	CCN2	10	10/13/04	10/24/04	1.1
100%	1.3 Develop Data Model	30	CCN3	5	10/27/04	10/31/04	1.2
100%	1.4 Identify Data Sources	15	CCN4	5	11/3/04	11/7/04	1.3
100%	1.5 Assess Technology Architecture	80	CCN5	10	11/10/04	11/21/04	1.4
80%	1.6 Assess Distribution Architecture	80	CCN6	10	11/10/04	11/21/04	1.4

Figure 8.
Project agreement phase activity

If EVM on similar projects shows a similar trend, future project managers could budget fewer hours in that particular area and use those hours somewhere else within the schedule. The more data history that is available to the project manager, the more accurate project managers can become when base lining their schedule.

Pitfalls of using EVM

The results are invalid because of inexperienced project planners

Some project managers do not trust EVM calculations because the project planner is not experienced in constructing a schedule to use EVM. Many times the schedule will not include dependencies for a critical path or accurate hours budgeted for each task. The result is usually a negative attitude towards EVM because the project manager will begin to be scrutinized for something he/she feels was never validated.

Solution. The project planners must take training to familiarize themselves with the techniques of project management and the use of earned value measurements. Without the basic understanding of these principles, they cannot be expected to properly base line a schedule for performance measurements. Certifications are available through the project management institute and are widely recognized by the project management profession.

Project managers do not know how to interpret EVM results

It is important to note that EVM alone does not determine the health of a project. Other project management tools must be used to properly manage a data warehouse project.

Many times a project manager may communicate their project is in good shape based solely on their SPI/CPI being >1.0.

Solution. It is important for project managers to use EVM with other project management tools such as the critical path, various system performance metrics, and a balanced scorecard to get a true indicator of performance.

EVM is commonly used for labor only

EVM takes performance of direct labor charged to your data warehouse project. EVM does not measure travel dollars, vendor payments, capital hardware, or software expenses. These items can make up a significant portion of the project's budget and deserve attention. Some project managers have tried to incorporate EVM to certain payment milestones or procurement cycles, but doing so has not proven effective.

Solution. Project managers must separate their business case into labor and non-labor categories and manage them separately. This separation will allow managers to focus on the different areas of the budget and determine which management tools are necessary for each category.

Conclusion

EVM provides data warehouse projects an opportunity to measure performance during the life cycle of the project. This project management tool is especially effective in managing scope creep by tracking it and measures actual performance versus budget and schedule at any point in time, not only at milestones. Upper-level management can compare multiple projects and historical data can be used to improve future data warehouse projects. With data warehousing projects becoming more difficult and expensive, any tool that provides a sound project methodology should be given consideration, and EVM is growing in use.

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Further reading

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