

# **Voluntary Usage of Earned Value Management on Projects in Sub-Saharan Africa**

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## **Abstract**

Given the compelling array of benefits that can be derived from the application of earned value management (EVM), it is of great concern that this methodology is not practiced as much as it should be in modern day project management practice in Sub-Saharan Africa.

The vast collection of abandoned projects that adorn the landscape of the construction industry environment speak volumes. The onus lies on the practitioners themselves to help reduce, if not entirely eliminate, this phenomenon by adding to their arsenal the judicious use of the earned value management system.

It is believed that the potential lurking in the conscientious application of EVM in curbing corruption and curtailing Illicit Financial Flows (IFFs) and capital flight in sub-Saharan Africa cannot be overlooked by serious minded project management practitioners and business owners whose activities revolve around project management.

Practitioners need to focus, embrace and implement EVM as a veritable and key part of their toolset for project execution for the greater good – the social value, a noble cause.

Hopefully, this effort will contribute to the growing awareness to fight corruption and IFFs using a well- tested project management methodology, thereby further enhancing EVM practice in the project management space in Sub-Saharan Africa.

*Key words: Earned Value Management, Earned Value, Project Management; Earned Schedule*

## **Introduction**

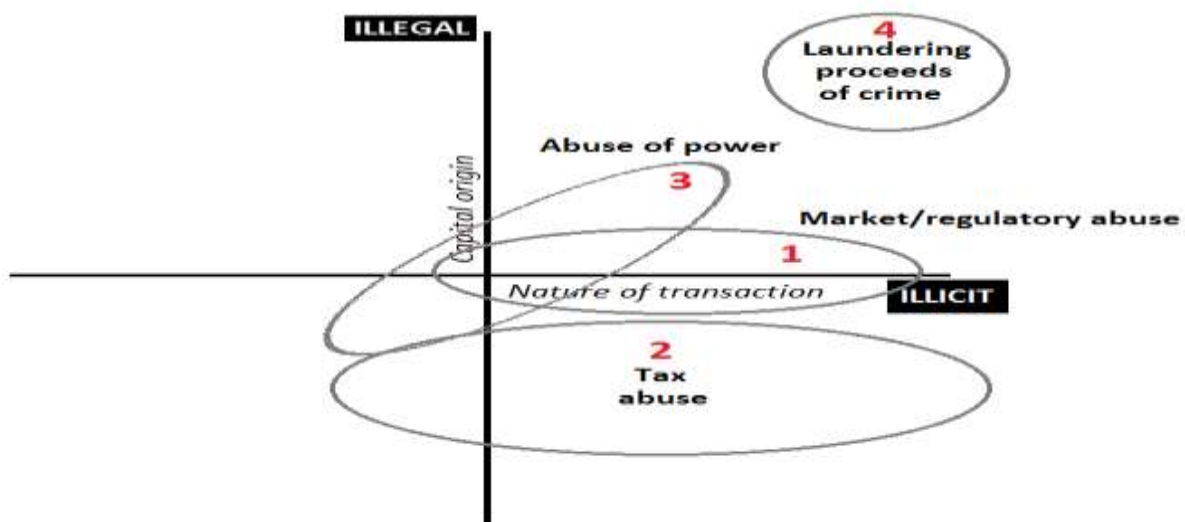
A greater number of influential challenges occur during the execution phase of a project. There appears not to be enough emphasis on the execution phase, though preeminent. According to Lipke, ‘the literature, the training, professional meetings, and conferences do not commit proportionate energy to methods and techniques to prepare project managers for monitoring and reporting performance, neither do these venues for knowledge transference bring focus to addressing performance measures and indicators, or using them for controlling the project’ (Lipke, 2013, p. 2).

This paper examines the challenges to development in Africa, explains how EVM (including the extension, Earned Schedule (ES)) works and the benefits it offers; outlining the challenges that

practitioners face in implementing EVM; providing some insight into how they might meet these challenges; the increased use of EVM around the world, in addition to providing the basis for the call for voluntary usage on projects in Sub-Saharan Africa.

## Challenges to development in Africa

There are a lot of problems that trouble the African continent. Extreme poverty, conflict, water and sanitation issues, food insecurity and terrorism are all concerns that receive attention from funders and NGOs. Corruption, too, has been a major concern for grant making. One niche in the corruption field is Illicit Financial Flows (IFFs), a part of Africa's dirty money problem, where the TrustAfrica's movement against IFFs advocacy effort supported by Ford Foundation among others cannot go unrecognized (Moses, 2014).



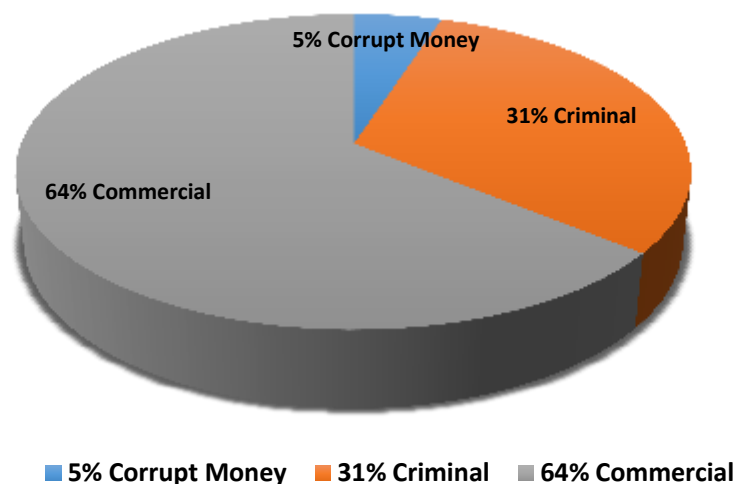
**Figure 1: Major IFF types (Source: Cobham, 2014)**

IFFs is money earned illegally and then transferred to be used somewhere else. A useful typology established by Alex Cobham (2014), distinguishes IFFs into two categories, “Illegal capital” IFFs and “legal capital” IFFs (Figure 1). “Illegal capital” IFFs derive funds from ‘illicit activities such as drug and human trafficking, political corruption through bribes, or theft of state assets.’ “Legal capital” IFFs consist of potentially legal funds taken out the country ‘through illicit transactions achieved through corporate and individual tax abuse, and market abuse through political conflicts of interest and regulatory abuse.’ Both are seen as ‘harmful to domestic development and resource mobilization as well as societal security risk’ (Sahadath, 2015, p. 3).

Estimates of economic losses incurred due to IFFs vary. An estimated USD1.2 trillion to USD1.4 trillion was lost from Africa over a 30-year period, according the United Nations. The

African Union estimates that the continent loses around USD150 billion annually due to IFFs (Moses, 2014). The African Civil Society Circle, a group of nine civil society organizations and think tanks from Southern Africa reports ‘Africa lost a staggering total of USD528.9 billion in a decade, from 2002 – 2012, to financial leakages’ (GhanaWeb, 2015).

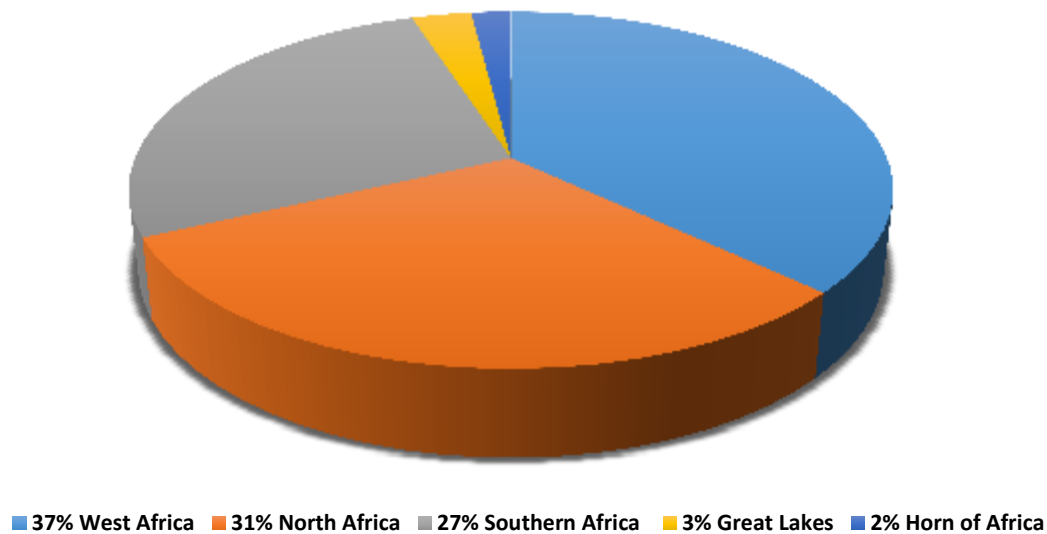
### Illicit Capital Flows from Developing Countries



**Figure 2: Illicit capital flows from developing countries**  
(Source: Adapted from EURODAD, 2008)

Highlighting its effects, Mick Moore writes in the book *Draining Development*, IFFs diminish economic growth, reduce and stagnate state capacity, and ultimately exacerbate income inequality (Moore, 2012). As a further consequence, IFFs have ‘hamstrung the efforts of African states’ to confront the Millennium Development Goals (MDGs) and could continue to act as a barrier in ‘meeting the goals and targets of the Sustainable Development Goals (SDGs) set to replace the MDGs at the end of 2015’ (Sahadath, 2015, p. 2).

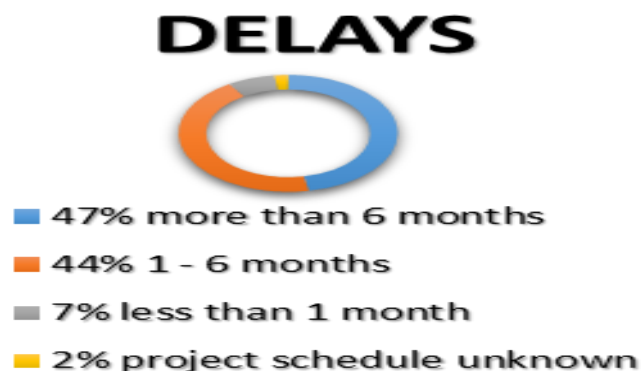
### Illicit Flows in Africa: 1980 -2009



**Figure 3: Illicit flows from Africa: 1980 - 2009**  
(Source: Adapted from UNECA, 2014)

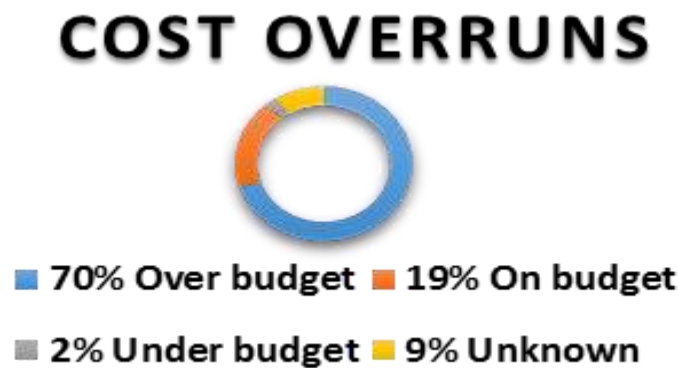
The defense sectors in African countries are especially highly susceptible to corruption and IFFs due to long supply chains which often run through secrecy jurisdictions and anonymous financial vehicles (Justice Africa, 2014).

Project management practice, a vehicle the writer believes can be used to fast track development in Africa, is facing pervasive challenges too in Africa. According to PM Network (April, 2015), 91% share of African executives have experienced delays of at least one month on projects. The average delay experienced in capital projects in year 2014 is shown in figure 4 below.



**Figure 4: Schedule Delays Statistics of projects in Africa**  
[Source: PM Network, April, 2015]

Cost variance is also a major source of concern to project management practitioners in Africa. According the same report, on average 70% of projects are executed over budget (Figure 5).



**Figure 5: Cost Overruns Statistics of projects in Africa**  
[Source: PM Network, April, 2015]

There is no gainsaying that African economies need a transparent and accountable government and an efficient civil service to help meet social needs. Project management best practice and in particular, the earned value management methodology as a part of the broader framework provide an answer.

This paper examines the affirmation and proposes the voluntary adoption of Earned Value Management and its extension, Earned Schedule, as a way forward especially in Sub-Saharan Africa where there is a growing need for rapid development in all spheres of human endeavor.

## **Project Management – A universal skill**

Project management is a complex process that requires an extensive range of skills. Whether one manages projects on a consistent basis or once in a while, the skills learned in project management are pertinent to many managerial and leadership positions. To illustrate: understanding customer needs and meeting their expectations in an apt manner are universal requirements. So are many others. Project challenges are universal, so it makes sense that the skills to use are universal as well. One such skill is the use of earned value methodology, including its earned schedule extension.

## **Earned Value Management**

The Project Management Institute (PMI) in the PMBOK (2013, p. 217) defines EVM as a ‘methodology that combines scope, schedule, and resource measurements to assess project performance and progress.’ According to AACEI (2014), EVM ‘integrates scope, schedule, and cost along with budget and performance measurement within a project framework’ and is used

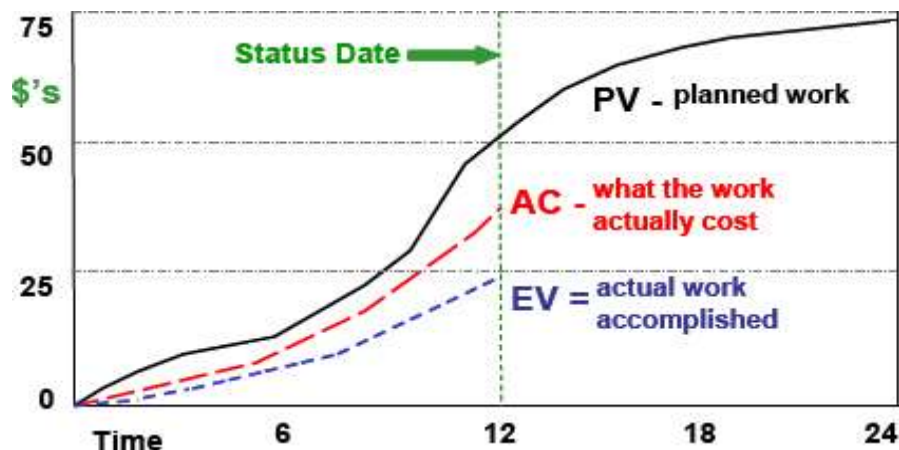
as ‘a method for project progress measurement analysis and control that combines work scope, schedule, and resource evaluation to enable objective comparison of the planned schedule of the project to the work completed along with its actual costs’ (AACEI, 2014, p. 2).

### ***Brief History***

In the 1900’s EVM was used by the Department of Defense (DoD), National Aeronautics and Space Administration (NASA), Department of Energy (DoE), Department of Transportation (DoT), and others in the U.S., providing Cost and Schedule Variances (CV, SV) with which Cost and Schedule Performance Indices (CPI, SPI<sub>s</sub>) and Estimated Cost at Completion (EAC) were derived. During the 21<sup>st</sup> century, improvements to EVM became ubiquitous providing SV in time units and computing SPI<sub>t</sub> based on time units and deriving Estimated Date of Completion, all of which has come to be known as Earned Schedule (Stratton, 2006).

### ***EVM concept – What is it?***

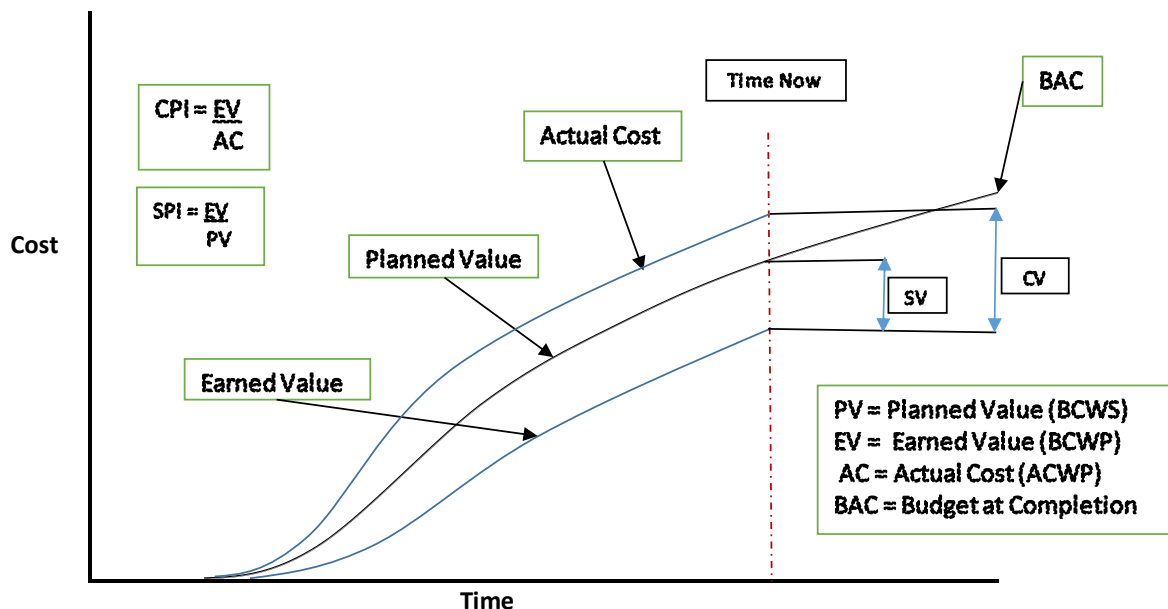
Basic EVM concepts relate the money spent to the work done as it combines schedule status with cost information using common units of measure. The work has value equal to its budget. The three key elements of EVM are Planned Value (PV) – the schedule (plan) to build project equity from zero to the total project value (also called Budgeted Cost of Work Scheduled (BCWS), Actual Cost (AC) – total cost of completed work (also called Actual Cost of Work Performed (ACWP) and Earned Value (EV) – the gain in project equity as a result of completed work regardless of the cost to accomplish the work (also called Budgeted Cost of Work Performed (BCWP) (Stratton, 2006) (Figure 6). In other words, what is achieved for what is expended. The analysis of variances is used to track trend over time as a management tool.



**Figure 6: Typical Graph Showing PV, EV, and AC**  
[Source: **Lukas, 2012**]

The key acronyms and calculations are as follows (Figure 7):

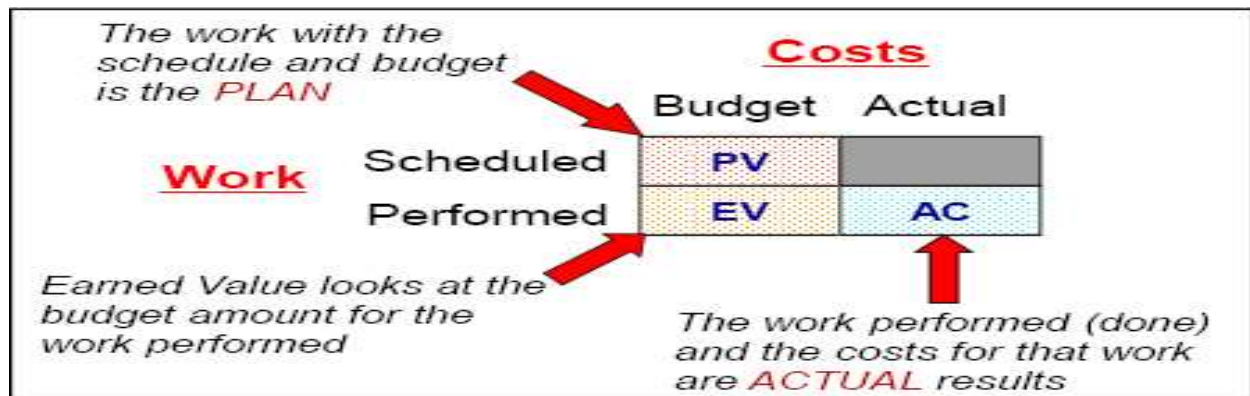
- EV = Earned Value = percent complete x corresponding budget
- BCWS = Budgeted Cost of Work Scheduled, now more properly known as the Planned Value (PV)
- ACWP = Actual Cost of Work Performed, i.e. the actual cost
- BCWP = Budgeted Cost of Work Performed, now more properly known as the Earned Value (EV)
- CV = Cost Variance = earned minus actual = BCWP-ACWP
- SV = Schedule Variance = earned minus budget = BCWP-BCWS  
BCWS-ACWP = Spending Variance = budget minus actual
- BAC = Budget At Completion
- EAC = Estimated (cost) At Completion  
EAC = variance at completion
- CPI = Cost Performance Index = BCWP/ACWP
- SPI = Schedule Performance Index = BCWP/BCWS  
Combined cost-schedule index = CPI x SPI



**Figure 7: Earned Value Measures and indicators**  
[Adapted from: **Lipke, 2012**]



An effective way to express the relationship of EV, AV and PV is shown in figure 8 below.



**Figure 8: Relationship of Earned Value Terms**  
[Source: Lukas, 2012]

### **Progressing Techniques**

Though it can be difficult to determine realistic progress for Work Packages (WP) on projects, it is nonetheless essential for a meaningful and accurate EVA. However, measuring progress at the WP level, as estimates, tend to nullify inherent errors when rolled up to the project level (Lukas, 2012). There are three types of progressing techniques in practice – quantitative (objective measures), qualitative (subjective measures), and miscellaneous (either quantitative and/or qualitative).

Quantitative progressing techniques include Units completed, Incremental milestones and Start-Finish; Qualitative progressing techniques include Level of effort (LOE) and individual judgement and the miscellaneous progressing techniques include combination methods and apportioned relationship (Lukas, 2012, p. 4).

### **Forecasting using EV**

Extrapolating performance to date to calculate the EAC is done as follows (PMI, 2013, P.223) (Figures 9 & 10):

$EAC_1 = AC + (BAC - EV)$ . Most Optimistic EAC.

$EAC_2 = BAC / CPI$ . Most Likely EAC.

$EAC_3 = AC + \{(BAC - EV) / (CPI \times SPI)\}$  or  $= BAC / (CPI \times SPI)$ . Most Pessimistic EAC.

Estimate to Complete (ETC) =  $EAC - AC$

To Complete Performance Index (TCPI) is the forecast of the required performance level to accomplish the remaining work in order to meet the project's financial goal. The two formulas are (PMI, 2013, p. 223):

$TCPI_{(BAC)} = (BAC - EV) / (BAC - AC)$



$$TCPI_{(EAC)} = (BAC - EV) / (EAC - AC)$$

### *Forecasting using ES*

To Complete Schedule Performance Index (TSPI)(t) = (PD – ES)/ (PD – AT)

$$= (PD - ES) / (ED - AT)$$

Independent Estimate at Completion (IEAC(t)) = PD/SPI(t)

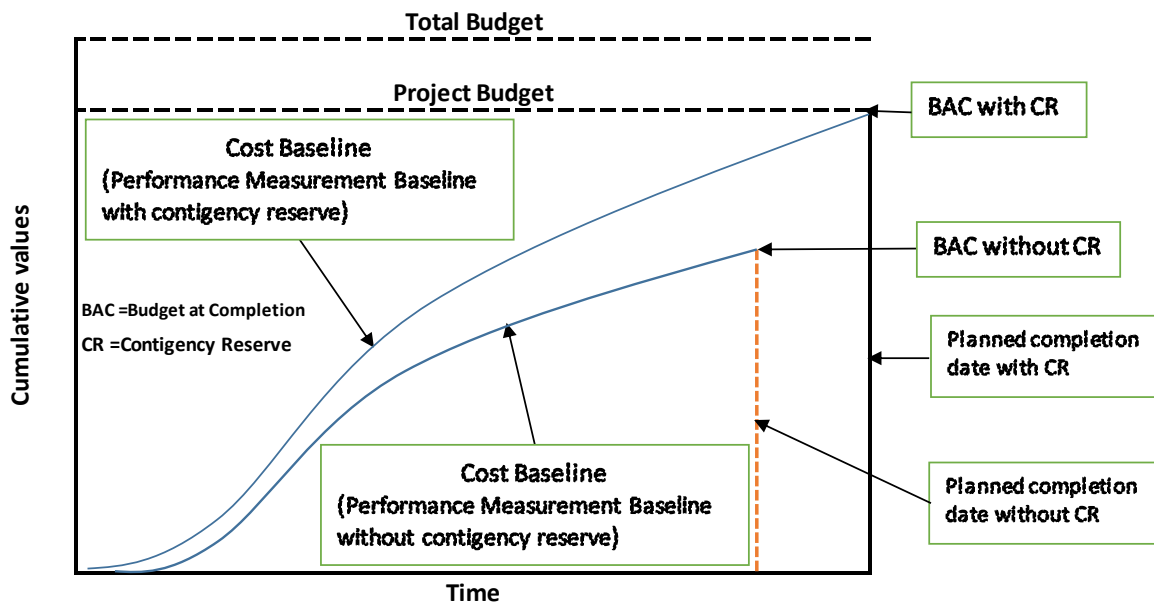
$$= AT + (PD - ES)/PF \text{ (Henderson, 2012, p. 33)}$$

33)

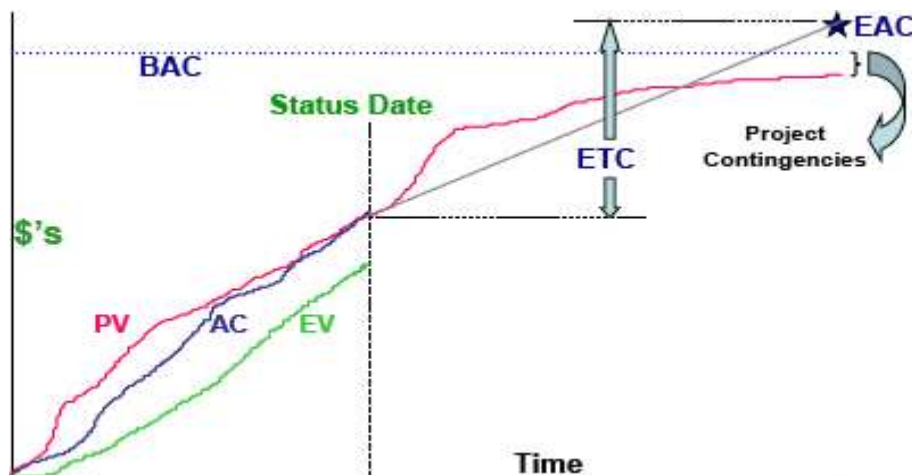
### *EVM Application*

EVM can be employed in its simplest form on all projects, large or small, cost type, fixed-price, no matter the type of contract (Fleming and Koppelman, 2002).

An equally valuable metrics is the Earned Schedule (ES) which is an extension to EVM. By determining the time at which the amount of earned value accrued should have been earned, time-based indicators can be formulated to provide schedule variance and performance efficiency management information thus reinforcing the predictive ability of schedule indicators (Lipke, 2014).



**Figure 9: Accounting for both time and cost in reserve planning**  
[Adapted from: **Parish, 2009**]



**Figure 10: Displaying ETC, EAC, and BAC on the EV graph**  
[Source: Lukas, 2012]

### *Why difficult to apply? - What to do*

The most pervasive challenges facing EVM practitioners include lack of management buy-in, length of time spent reporting, lack of adequately qualified people, difficulty to integrating cost and schedule, and inconsistency across programs (Bell, 2009). Suggested remedies are presented in the table below:

Challenge	Aspect	Suggested Remedies
Lack of management buy-in	<ul style="list-style-type: none"> <li>• Lack of executive understanding</li> <li>• Challenge getting PMs to accept EVM</li> <li>• Inability to prove the value of EVM to management</li> <li>• EVM is viewed as a stepchild</li> </ul>	<ul style="list-style-type: none"> <li>• Conduct executive training (bring in peers)</li> <li>• Demonstrate success (choose a pilot project; measure current progress and report on it)</li> <li>• Create best practices (create EV council; focus on how to act on information, not just create it)</li> <li>• Compensation tied to performance (pay, EVM status tied to successful use of EVM)</li> </ul>
Time spent reporting	<ul style="list-style-type: none"> <li>• Takes too long to provide reports</li> <li>• Another custom report required</li> <li>• More time spent producing reports than measuring performance</li> <li>• Too many reports</li> </ul>	<ul style="list-style-type: none"> <li>• Standardize report (build consensus with management on the key set of reports)</li> <li>• Exploit high value areas of program controls</li> <li>• Automate everything (leverage earned value analytics solutions, let dashboard inform teams – not just other program controls professionals)</li> </ul>
Lack of qualified people	<ul style="list-style-type: none"> <li>• Retiring workforce</li> <li>• Unmotivated employees</li> <li>• Inability to find qualified</li> </ul>	<ul style="list-style-type: none"> <li>• Advertise (use trade magazines, recruit at industry conferences etc.)</li> </ul>

	<ul style="list-style-type: none"> <li>people when needed</li> <li>Lack of qualified people to implement EVM</li> </ul>	<ul style="list-style-type: none"> <li>Network with colleagues (LinkedIn, Twitter, Facebook etc.)</li> <li>Staff augmentation (staff augmentation firms)</li> <li>Groom internal candidates (train and retrain the one you have, give retention bonus – it costs less)</li> </ul>
Difficulty integrating cost and schedule	<ul style="list-style-type: none"> <li>Lack of tool integration</li> <li>Hard to integrate cost estimates with EVM</li> <li>Simple and reliable EVM tool</li> <li>Compatible WBS structures for estimates, schedules and EVM reporting</li> </ul>	<ul style="list-style-type: none"> <li>Converge the cost and schedule people into one (cross train, comingle personnel)</li> <li>Integrate the capture and delivery teams (EV focal points must consult and advice during the proposal phase, not after the fact)</li> <li>Make the cost and schedule tools one application (ask for dashboard solutions)</li> <li>Standardize structures and codes (prepare estimates that agree with project WBS, use a single program structure)</li> </ul>
Inconsistency across programs	<ul style="list-style-type: none"> <li>Hard time getting co-workers to follow process</li> <li>Friction between cost and schedule communities</li> <li>Different approach by different divisions</li> <li>Conflicting contract requirements</li> </ul>	<ul style="list-style-type: none"> <li>Standardize processes ( write it down, and share it; use SOPs; create Center of Excellence)</li> <li>Gain management support (Find a VP/GM champion, create a single set of standardized management report)</li> <li>Influence government to standardize (create regional advocacy groups, join forces with international agencies)</li> <li>Use standard tools (consolidate to make it easier, create data warehouses and dashboards to pull data and display consistently)</li> </ul>

**Table 1: Challenges Facing EVM practitioners and Suggested Remedies**  
[Source: Bell, 2009]

### ***Critical Success Factors***

Lukas (2012), listed Ten (10) top items that must be done on projects to ensure a successful Earned Value Analysis (EVA). They are as follows:

- **Project requirements** – completely captured and accurately reflect what is needed to meet the project's objectives.
- **Work Breakdown Structure** - key project plan document; checked against project requirements to ensure none is missing.
- **Change management process** – Must exist and being used to capture both scope changes and deviations that occur.
- **Integrated project plan** – project schedule tasks and estimates must relate back to the WBS to create a project plan that gives the required cost and schedule integration.
- **Correct schedule and budget** – quality control process in place to ensure correct schedule logic and work package estimates; use contingency fund to handle cost and schedule deviations.
- **Schedule and budget Contingency** – create both cost contingency (allowance for 'known unknowns') and schedule contingency (buffer for changes to the completion date).
- **Contingency management** – indicates how much cost and schedule contingency remains on the project.
- **Cost collection system** – obtain accurate actual costs for the project; use 'adjusted actual cost' to minimize the effect of accruals; frequency and method of cost collection should be in the project plan.
- **Accurate reported progress** – minimize use of subjective progress techniques
- **Management support** – Resist management pressure to influence the reported results.

## **Earned Schedule – Extending EVM**

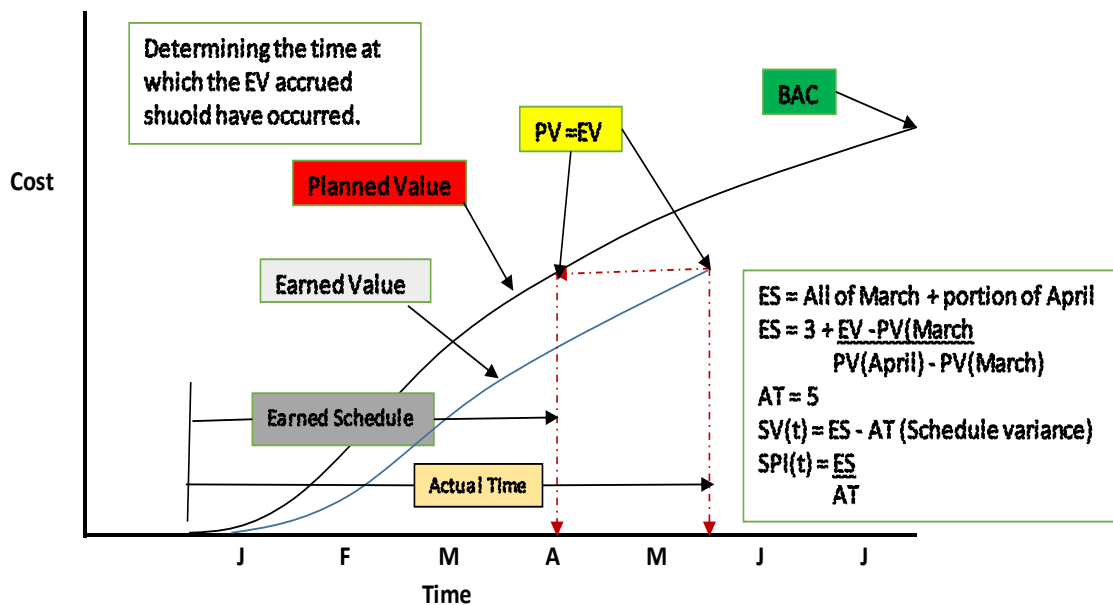
### ***Brief History***

Earned Schedule (ES), first introduced in 2003, is a schedule analysis method extending the benefits of EVM, using the same EVM data. The ES method has grown in popularity in recent times, being taught in universities; subject of graduate level research and included in PMI Practice standard for Earned Value Management (Lipke, 2012).

### ***ES Concept – What is it?***

The ES concept allows EVM metrics to be transformed to time or duration metrics to enhance the evaluation of project schedule performance and to forecast the duration needed to complete the project. When combined with appropriate schedule analysis, this approach can enhance the project manager's understanding of the time estimate at completion of the project, and provide further insights for making better decisions about project schedule and other related parameters.

The fundamental concept of ES is to ascertain the time at which the EV accrued should have occurred; the point where PV equals EV on the PMB. The associated schedule indicators display reliable behaviors throughout the entire period of project performance making the ES concept particularly significant (Lipke, 2012). A graphical illustration of the ES concept is shown in figure 11 below.



**Figure 11: Earned Schedule Concept**  
[Adapted from: Lipke, 2012]

## Voluntary Usage of EVM – Why important and necessary

The following are compelling reasons for considering voluntary usage of EVM without compulsion in Africa:

### EVM – Social Value

EVM ensure value for money as well as create a culture of openness, trust and honesty (Figure 12). In this regard, EVM has great social value - which should touch practitioners at a deep emotional level – that transcends profitability and the bottom line. It is this emotional connection with the large cause that would release a powerful flow of passion, pride, perseverance, and productivity among project management practitioners in the African continent to embrace and utilize EVM. The revolutionary EVM spirit, maniacal focus, missionary zeal, and upbeat attitudes would make our project management environment feel more like crusades within businesses. Practitioners benefit from improved public confidence by being more accountable with project progress. The social value aspect of EVM becomes more compelling especially as it relates to its inherent potential in curbing corruption and IFFs that bedevil the continent.

## **EVM – Usefulness not in doubt**

Scholars and practitioners contest the structural rigidity of EVM with respect to its practicality from an implementation point of view. It is these same pre-requisites for successful EVM adoption that accentuates its choice as one of the standard methods for controlling performance. Nevertheless, it is edifying to note that though most objections to EVM question its applicability and cost/benefits but not its usefulness, including the prediction ability (Padalkar & Gopinath, 2014). Research has shown that early warning triggers have been found to be reliable as early as 15% into a project (Anbari, 2003). It is puzzling that a methodology that offers a very useful feature which is not contested gets disregarded in practice.

## **EVM – Competitive Edge**

True, EVM is a lot more difficult to do in practice, as is evidenced by the number of projects that fail to contain costs, and it also involves a significant amount of work, but that is what project managers are hired for, you will agree (Wideman, 2005). This hard work pays off in the contribution to the competitive advantage as well as enhancing the project management performance improvement initiative of the adopting firm (Randolph, 2010).

Recent trends indicate that project managers who are yet to learn the value of project performance measurement systems are ‘finding themselves at a considerable disadvantage, not only in dealing with internal and external competition for increasing scarce resources but also in satisfying the needs of increasingly knowledgeable customers.’ (Kemps, 2011, p. ix)

## **EVM - Main Driver for Integrating Project Management**

According to the PMBOK guide (2013), a complete project management capability involves aptitude in the following process areas: integration, scope, time (schedule), cost, risk, quality, human resources, communication and procurement. An EVM system *integrates* the scope, schedule, cost, quality, human resources, communications, risk, and procurement capabilities once the components of a basic EVM system are in place (Hatfield & Post, 2002). Overall project management, team integration and communication improve because of the up-front planning, monitoring and discipline that EVM requires.

## **EVM – Performance Improvement Initiative**

A recent report shows that ‘nearly 80% of projects fail to meet their planned objectives as a result of gaps in good practice. Most alarmingly, only 4% rated project planning and review as excellent; while 14% said it was either poor or absent from their last project’(McVean, 2015).

Scores of organizations around the globe are embarking on project management improvement initiatives. One key element of such initiatives is the adoption of the EVM methodology as a performance measurement approach. The application of the basic tenets of EVM facilitates good project management practice which contributes significantly to the likelihood of project and

program success (Marshall et al., 2008). EVM helps to inspire improved estimating and planning.

### **EVM – Compliance with International Best Practice and Customer Driven**

Arguably, the desire to comply with international guidelines such as ANSI 748B Standard for Earned Value Management and PMI Global Practice Standard, is beginning to attract attention as items in the overall project management improvement initiative among savvy practitioners in the African continent. Additionally, customers are beginning to demand the use of EVM which now appear in the contract clauses as a requirement. This trend, too, is expected to gain footing in contract administration in the near future in Sub-Saharan Africa, the author believes.

### **EVM - Increased Use around the world**

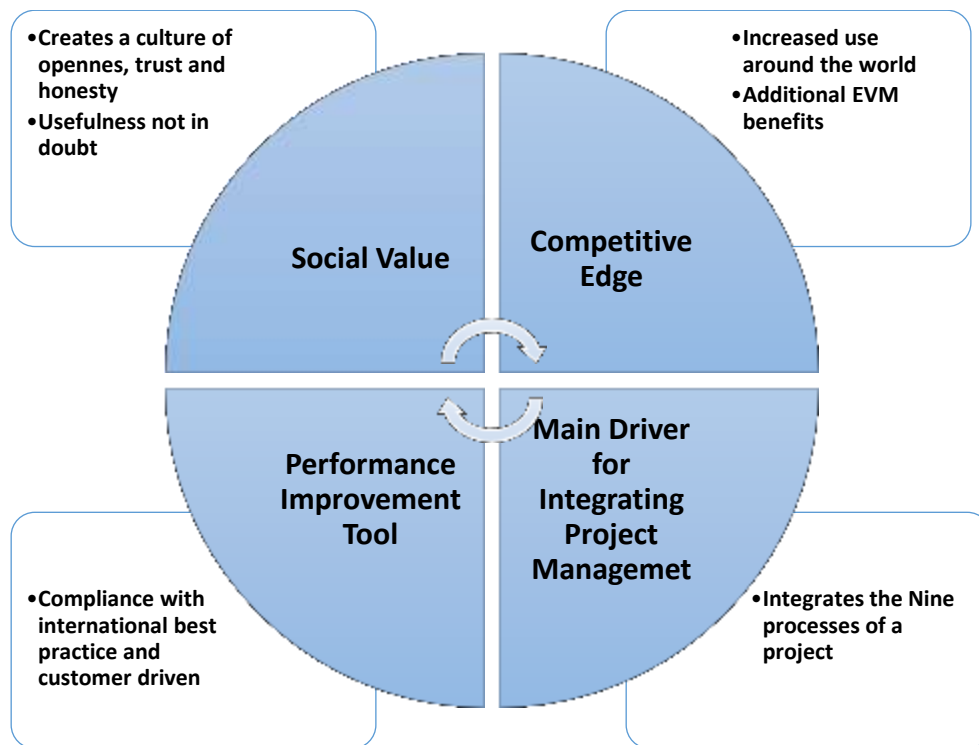
Over the years, project performance measurement has grown in popularity among construction, research and development, energy and manufacturing industry communities. The focus has shifted to how best to use the data from established performance measurement systems as against erstwhile arguments on whether it could be done.

Governments around the world including Australia, Canada, Europe, Sweden, United Kingdom and Japan among others have shown considerable interest in establishing performance measurement standards; the trend indicates that these Countries are surpassing the United States in the quality of implementation of those standards.

In response to market pressure to do a better job of managing projects, the private sector businesses are equally adopting performance measurement systems for themselves. Government agencies in some countries that are seeking to lighten the strict discipline associated with Cost/Schedule planning and controls continue to recognize the value of performance measurement systems in meeting their goals (Kemps, 2011, p. x).

While the rest of the world are taking giant strides in embracing performance measurement systems, so much is left to be desired in the African continent. Is it surprising that the African continent is so poor yet so rich? The popular axiom ‘what gets measured gets done’ can never be so true in the context of African affairs (Edjenekpo, 2015).





**Figure 12: Benefits from the Voluntary use of EVM**  
[Source: Author]

## Benefits of EVM (and its extension, ES)

### *Benefits of EVM - Contractor and Customer Benefits*

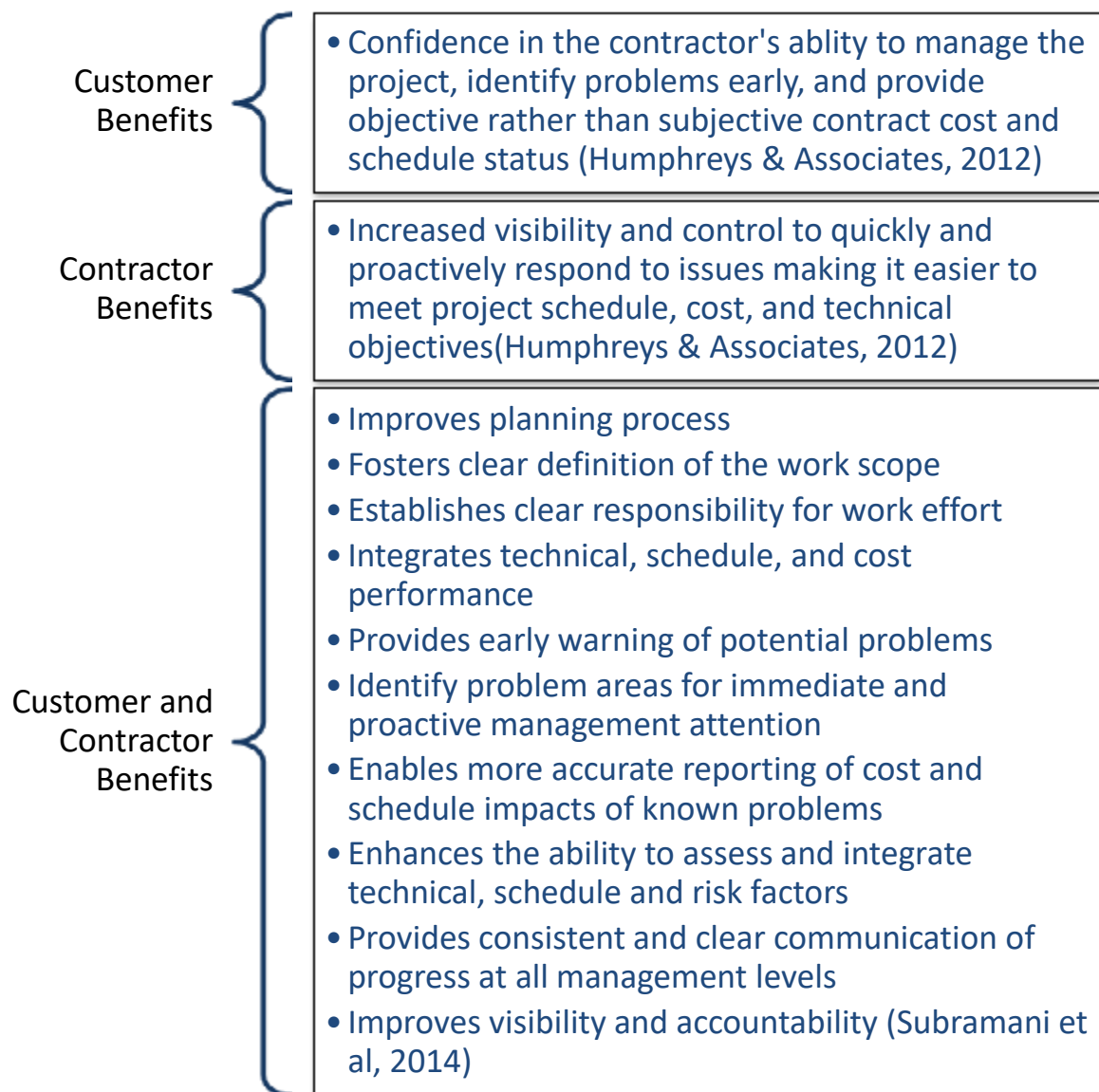
Contractor benefits include ‘increased visibility and control to quickly and proactively respond to issues which makes it easier to meet project schedule, cost, and technical objectives. Customer benefits include confidence in the contractor’s ability to manage the project, identify problems early, and provide objective, rather than subjective, contract cost and schedule status’ (Humphreys & Associates, 2012, p.1) (Figure 13).

Additionally, an EVM ‘improves the planning process, fosters a clear definition of the work scope, establishes clear responsibility for work effort, integrates technical, schedule, and cost performance, provides early warning of potential problems, identifies problem areas for immediate and proactive management attention, enables more accurate reporting of cost and schedule impacts of known problems, enhances the ability to assess and integrate technical, schedule, cost, and risk factors, provides consistent and clear communication of progress at all management levels, and improves project visibility and accountability’ (Subramani et al, 2014, p. 146).

Earned value methods create room for the gathering of objective information. Project upheavals can be seen ahead of time and corrective actions can be taken to put them out. Realistic goals

can be set, and the business owner would have the right information before him, so the facts are flawless and terse (Buntrock, 2003).

Combined with an effort driven by schedule, the performance data derived from an earned value measurement system can quickly quantify the efforts necessary to mitigate schedule impacts.



**Figure 13: Benefits of EVM** [Source: Author, 2015]

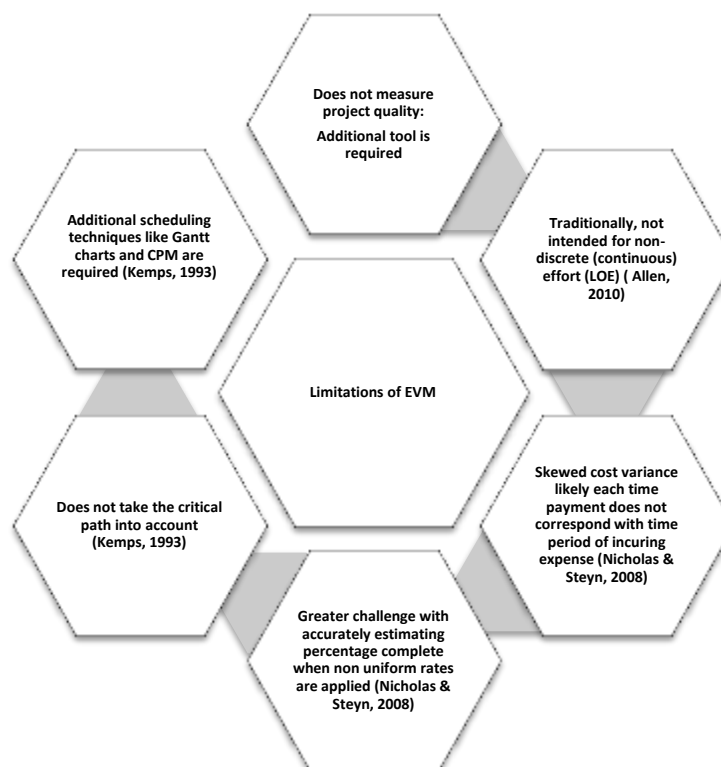
### ***Limitations of EVM***

EVM does not measure project quality. The danger exists that EVM could indicate that a project's scope is fully executed under budget and ahead of schedule but still have unhappy

clients and unsuccessful results. Also, traditional EVM is not intended for non-discrete (continuous) effort called “Level of Effort” (LOE) (Allen, 2010) (Figure 14).

Each time payments are made in periods other than when expenses are incurred or budgeted, the cost variance (CV) is skewed (Nicholas & Steyn 2008, p 428). As a result, individual cost sources should be examined to identify the reasons for variances. While it is easier to estimate percentage complete when work can be measured in uniform unit rates, there is the challenge of accurately estimating percentage complete when uniform rates cannot be applied (Nicholas & Steyn, 2008, p. 429).

The EV method does not take the critical path into account; the likelihood of indicating that a project is ahead of schedule exists if many non-critical activities are ahead of schedule and just one critical activity is late. As a result, most companies have to use additional scheduling techniques like Gantt charts and CPM (critical path method) since schedule variance is not related to the critical path (Kemps (1993) in Kim (2000, p. 69)).



**Figure 14:** Limitations of EVM [Source: Author, 2015]

## Conclusion

Earned value can be based on a variety of commodities, making it ideal for gathering data in a variety of methods, and converting it back to the plan. Earned value can be reported in terms of money, work hours, volume, weight, area and length.

It is important to realize that progress is not percent money spent or percent work hours or percent time spent. Rather, it is the actual percent of work that has physically been completed based on original quantities. In other words, one must be able to physically see what work has actually been completed. This is the best part, and herein resides the panacea for reducing corruption that is endemic in project execution in industries in Africa.

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