

# **EARNED VALUE ANALYSIS IN THE CONTROL OF PROJECTS: SUCCESS OR FAILURE?**

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## **ABSTRACT**

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The objective of this paper is to present and discuss the main obstacles and benefits of the use of the Earned Value Analysis in projects, including factors to be improved and implemented during the project plan and actions to be taken while the project is accomplished and controlled. Also, through a real case study in civil construction field, the applicability of the technique is faced with a theoretical reference, in order to identify aspects of the applicability of the tool tested in case study. The results to be presented and discussed are subdivided in two parts:

The first one is about the different features of each business and its contribution for the success or failure in the implementation of the Earned Value Analysis, and the second is about the characteristics of similarity found in all businesses that together favor or not the use of the tool.

## **EARNED VALUE ANALYSIS AS A CONTROL TECHNIQUE**

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Many studies about the applicability of the Earned Value Analysis have been made. THAMHAIN (1998) tried to evaluate the popularity of different practices of project management. Surveys were made with 400 professionals who work with projects (managers, directors, people in charge) in 180 projects in Fortune-1000 companies. They were asked about the popularity and value of different techniques of performance evaluation. As a result, he could see that the Earned Value Analysis is used by 41% of people who work with projects. It is more used than critical path method, QFD (quality function deployment) and Crashing, among others. The Earned Value Analysis is almost as popular as the net PERT/CPM.

Concerning the value of the technique, the results found for Earned Value Analysis are fitted in a layer of little value, staying below practically all techniques analyzed, what infers that the popularity of the technique doesn't seem to show its applicability or value.

Trying to justify the low value proved by researchers, THAMHAIN (1998) states that little applicability found as a result in the studies made, can be attributed to different barriers, either being internal or from the environment. They are

- lack of comprehension of how the technique works;
- anxiety concerning the adequate use of the tool;
- use of the tool requiring a lot of work and time consumption;
- tools trimming creativity in the use of other strategies;
- inconsistency of the tool in managerial procedures / businesses processes;
- method of control as threat, concerning the freedom of the team;
- vague and inaccurate purpose and its benefit;

- high cost of its implementation;
- unsuccessful prior experience in the use of other techniques;
- low familiarity with the technique.

WIDEMAN (1999) states that a project of great importance requires a unit of planning and control that has professionals capable of collecting the information and making the Analysis of Added Value, turning its applicability justifiable.

CHRISTENSEN (1998) states, in his studies about the applicability of Added Value in govern organizations in the United States, that the implementation of Earned Value requires a cultural change, which demands time and effort. This means to make sure that policies and knowledge are taught by the organization and by the project in order to quicken the work of the ones involved.

To Sparrow (2000), the Earned Value Analysis enables a supplementary value to the project because it offers a premature visibility of its results, in other words, it is possible to determine a tendency of costs and deadlines of the project in a certain phase of it, when there is still a possibility of implementation of corrective actions.

On the contrary, WEST & MCELROY (2001) agree that the Earned Value Analysis is an adequate tool for the generation of reports of work done, and not a managerial tool, since the control in real time of the project, using all parameters of analysis becomes unviable: "the Earned Value Analysis shows to the project team the performance obtained until then, and not the future forecast of the project."

WIDEMAN (1999) supports that the technique is conceptually attractive, however it requires great efforts in its maintenance, therefore it needs a qualified team to understand and provide reliable information. He also states that many project managers don't consider the analysis an appropriate cost-benefit ratio.

From those opposite points of view, we may imply that the Earned Value Analysis is a group of powerful intrinsic characteristics, wide and varied, like payment projection and forecasting. However, it is bound to find great difficulty in either data collection or in the low speed of information generation.

These considerations may mean that, if the data collection is made in adequate speed and accuracy, and the information is correctly compiled accomplishing the deadlines, the analysis has its applicability widely enlarged. Otherwise, it will not add much to the process of project control.

TERREL et al (1998) states that, in order to make the Earned Value Analysis effectively implemented, it is necessary to have the information about the resources clearly defined. A failure in obtaining these data, motivate the creation of inaccurate performance measurement baseline (PMB), distant from the real scenario.

FLEMING & KOPPELMAN (1999) state, also that another difficulty factor is about an adequate work breakdown structure (WBS). If the work is subdivided in small packages of work, it will represent a high cost of control and a lot of paperwork. On the other hand, a badly stratified subdivision may represent an inaccuracy of data, concerning real costs and deadlines.

This confirmation may be proved in the low application of the Earned Value Analysis in technology and marketing areas, where the creative work is the variant in a scope previously defined, making its application limited and directly related to the stability of a defined scope, according to PETERSON & OLIVER (2001).

They state that, the more short-term projects grow, with reduced team and a generically defined scope, the more the Earned Value Analysis, according to Instruction 5000. 2R (DOD, 1997) and by ANSI/EIA 748, is not viable, due to inaccurate projections, consequence of a badly defined scope and to high costs noticed by the entrepreneurs.

## **CASE STUDY**

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The company researched belongs to a sector of civil construction, which applies project management in a steady way. It is a segment that most invests in researches and new tools in this field. Furthermore, it is the only one on the market that admits publicly the use of Earned Value Analysis in its process of construction control.

This company is the 11<sup>th</sup> in the national segment of heavy construction. It is also part of the three biggest groups in the segment in the country and a leader in other segments of the economy, such as government work and telecommunications. It has been on the market for more than 50 years. Its turnover in 2001 was about US\$200,000,000 with 80 engineers and about 4000 workers in its personnel.

Concerning the case study, everything started through a process of interview in which three professionals from the southeast business planning unit of the company, gave their opinion about the process in a wide and clear way. These professionals were the first ones to be interviewed, because they have developed the construction control system using the Earned Value Analysis.

After analyzing the issues discussed by the first interviewees, a new series of interviews was made, based on a new open line of interviews, with construction managers and the ones in charge of planning departments of each construction site. At this moment, the objective was to test the planning practices, analysis and gathering of data in different levels, aiming to find possible distortions, conceptual flaws, resistance and work style in the use of Earned Value Analysis in the construction sites.

In a third and final moment, the final result of the projects (deadlines and costs) was faced with the values computed for the Earned Value Analysis that were under the responsibility of the planning unit of the company. From that combination between

interview results and the data available in the company, we tried to get evidence that could link the success or failure of the business to maturity in the use of Earned Value.

Concerning the evaluated construction sites, they were categorized by the company as medium-sized and average technique complexity constructions, which will be finished by the end of this work.

**RESULTS**

The results to be presented and discussed in this section are about different characteristics of each construction site and its contribution to the success or failure in the implementation of the Earned Value Analysis. The second part is about the traces of similarity found in the construction sites and the general conclusions about the case study.

The results obtained in the process of interview and the combination of real data provided by the planning department, as seen before, were significantly different in each business.

From these different characteristics (Table 1), the main factors are presented and evaluated in each construction site, just like the final result concerning the fidelity of the results and the preliminary conclusions.

The factors evaluated have been presented in the discussion and analysis of each construction site, and they are: scope, deadlines and schedules, budget process, type of contract, type of client, partners and/or consortiums, organizational support, support by the client, geographic distribution of work, the presence of outsourced staff, use and knowledge of the indexes and models of projection provided by the tool.

Characteristic	Construction site one	Construction site two	Construction site three
Scope	Clearly detailed and specified	Defined preliminary, detailed as the project is done	Detailed and specified satisfactorily (not in the same level of construction site one )
Deadlines and schedules set up	Closed and previously defined according to clear schedules to be followed	Open with schedules to be defined while duties are accomplished	Closed, but with significant changes throughout the project, result of problems linked to lack of financial funds.
Budget process	Structured through CAP's allowing the adequate use of the	Traditional, not based on the Analysis of Added Value	Traditional, not based on the Analysis of Added Value

Characteristic	Construction site one	Construction site two	Construction site three
tool			
Type of contract	Fixed price. Not adjustable	One price	One price
Type of client	Private	Public	Public
Partnerships and/or consortiums	Nonexistent	Nonexistent	Consortium with another contractor that has the construction being controlled by the company evaluated
Organizational Support	High	Moderate to low	Moderate
Support by the client	High	Moderate	Moderate to low
Geographic distribution of work	Concentrated geographically	Concentrated geographically	Distributed in 150Km of groups of work
Presence of outsourced staff	None	None	High
Use of knowledge of indexes and models of projections provided by the tool	Moderate to low	Low	Low
Loyalty to official results presented with real results	High	Moderate to low	Low
Preliminary conclusion about the success of the implementation	Partial success	Partial failure	Failure

Table 1 – Comparative analysis of the main characteristics of three construction sites evaluated.

As we can see, after analyzing table 1, we may conclude that the implementation of construction site one was successful and of construction site three was a failure. Both results are not necessarily product of an isolated factor, but from lots of linked factors.

It is not possible to conclude that the unsatisfactory results found in construction site three are linked to the existence of a consortium or to an inadequate geographic distribution of work. This failure is a consequence of a group of many unfavorable characteristics, which contributed to unexpected results.

On the other hand, evaluating construction sites one and two, we find characteristics in construction site two that are significantly closer to those in construction site one. However, the main difference found was the lack of detailing of scope, which

consequently made the budget process unsatisfactory. We may conclude that it was one of the main factors that made the results different (see Table 1).

Similarities have been found in all three projects evaluated. They are related to the process of interview and obtained results.

Initially, we may conclude that there are factors linked to the organizational structure and to the management model of the company that could affect directly the fidelity of results. Therefore, it is necessary to investigate deeply about the influence in organizational structure in the use of the tool.

Also, concerning organizational aspects, the ones in charge of construction sites planning, questioned the need of a high number of indexes, and mentioned that the determination of performance indexes was redundant.

A preliminary evaluation of these considerations, allows us to conclude, at first, that the Earned Value Analysis as we can see in all of the three projects, may show a high use of excessive indexes, superior of the management potential of a construction site. That could make the construction site impossible, result of low priority in the process and unnecessary use of indexes.

The opinion of the interviewees about the real value of the tool was unanimous. They all agree that the Earned Value Analysis is a great step for the improvement and introduction to a more modern mechanism of construction site control. This would confirm the first result of THAMHAIN'S (1998) study about how popular the technique is, however, in the same study (THAMHAIN, 1998), they all agree that the conditions of market and the necessity of a quicker generation of results, made the dedication to the use of the tool, difficult, proving the low value of the technique presented in the study of THAMHAIN (1998).

According to prior quotations, we can also see that in all three cases, there was an active participation of the planning departments of the business unit. However, this participation was different in each construction site. We can imply that the success of construction site 1, concerning the implantation of the tool, is directly linked to a strong presence of the professionals of planning department.

Therefore, we may conclude that, very often, the efforts of the construction site team are divided in many different groups, and the team dedicates to the tool, directly used by top executives to evaluate the businesses. As a result, the dedication to other competitive tools is ignored or left behind, as seen in Earned Value Analysis in projects two and three.

In construction site one, this process inverted. In this project, the Earned Value Analysis was the main mechanism of construction site control. It gathered all the necessary support to be successful. Finally, we may conclude that the case study proved the

characteristics of the projects that favor the use of the tool and the use of others which show to be difficult in the process.

It was also proved that the implementation of the Earned Value Analysis is a complex process that involves several aspects, since the kind of business until its organizational structure, its scope, its geographic distribution and the relationship with the client, among others, that deserve a more detailed study.

## **CONCLUSIONS**

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From this paper, we may conclude that the Earned Value Analysis is a powerful tool in the control of performance evaluation. However, most of the projects have insufficiently detailed scope, staff with little experience in the use of the tool and a natural dissociation in the control of costs and deadlines. These elements make the results questionable to a necessary effort.

We may also conclude that the results are not very obvious in short-term basis. They will only be evidenced in future phases of the project, especially in cost reduction of operations and rework.

As a third conclusion, we may see that, in projects of clearly defined scope, or in contracts with price and work established, the Earned Value Analysis shows a favorable cost-benefit ratio. Other element that might favor the application of the tool is the qualification of project teams in the use of the tool and the organizational support, which allows the tool to be simplified to meet the specific needs of the project and the organization.

To sum up, the combinations of the conclusions obtained from the analysis of the theoretical reference, with the case study are shown as follows.

**Nature of the project** – the application of the Earned Value Analysis can be considered more successful in projects of clear and tangible objectives, with a detailed scope, simple and direct. This type of project presents better results in the use of the analysis, as evidenced in the case study (construction site one). Projects with incomplete final products or services, or projects that involve aspects of creativity that make a precise plan impossible, show high inviability in the use of the technique. Since the planning has not been established, the date of performance can be determined (construction sites two and three).

**Scope definition** – from empirical evidence obtained from the evaluated construction sites and based on theoretical discussions presented in the theoretical reference, we may imply that the facility or difficulty concerning detailing and specification of scope, permits the tool to be favored or disfavored, since a tangible scope, controllable and detailed provides better specification of the work to be made. Consequently, it facilitates the process of measurement of real and added values. The establishment of tangible,

controllable and detailed scope is a process that comes from the nature of the project and from the model of business established (contract, type of client, etc). Therefore, a strong dedication to the process of development of the scope improves results in the use in the Earned Value Analysis.

**Informality in management and resistance to changes** – we can see in the case study that the informality in the control of project is high, and resistance found in the implementation of a new model of control exists and cannot be ignored. This resistance is associated to a perception that the planning work and control rise in an unjustifiable way, when using the tool. Trying to associate both factors, ANTVIK (1998) states that the resistance comes from a cultural process of informality in the control of projects. In this way, it is implied that it is necessary to create a different work of management of changes, for example the training of management of projects, workshops, an efficient support of the professionals of this area, with prizes and bonuses. Everything aims to minimize the resistance found in the implementation and to favor the project environment.

**Attractively and value of the technique** – Based on the evidence of the case study and on researches presented on theoretical reference, we can say that the Earned Value Analysis is considered by the ones who have already used it or known it, as attractive and complete. However, this fact is not true, concerning the use of the technique. The interviewees and several authors that were cited and in this theoretical reference agree that the technique demands a strong effort that, if not analyzed widely, should not have good results. This consideration justifies the results presented on the research of THAMHAIN (1998).

**Training** – The Earned Value Analysis suggests a cultural change in the process of projects control, therefore people who have experience in dealing with the tool are really necessary in this process. Moreover, it is also necessary a process of intense training, in order to reduce the resistance to its implementation that comes originally from a low technical knowledge of the tool.

**Organizational support** – The way an organization implements the tool, influences directly the results. As seen empirically in the case study, the construction site one, that had an organizational support, provided by specialized resources, had better results in terms of application. However, the organizational support, has a cost that has to be determined and accounted, otherwise the obtained results might be distorted.

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