ADDING SHAREHOLDER VALUE THROUGH PROJECT PERFORMANCE MEASUREMENT, MONITORING & CONTROL:

A CRITICAL REVIEW

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Adding Shareholder Value through Project Performance Measurement, Monitoring & Control: A critical review

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Abstract

We present the various views and methods of measuring and controlling project performance, and factors affecting a project. The review indicates that there is a shift in the type and understanding of factors of project success or failure. However, the presence of various measurement methods, in addition to diverse interest groups, makes performance decision-making more complex and subjective. A holistic and uniform measurement approach is suggested for both project appraisal and subsequent follow-ups.

Key words: Performance appraisal, Accounting based methods, Value Management Techniques, DCF techniques, Project success or failure, Project control, Shareholder Value Analysis

1. Introduction

Project financiers invest their resource with a particular motive. This objective, especially in commercial ventures, is to create value greater than their initial investment. This idea is central irrespective of project type or ownership.

Assessing whether a firm has earned the required return or not raises the quest for performance measurement techniques. Since recently corporate managers face a new economic framework that requires implementation of methods that reflects the value and prosperity of their firm. In addition, investors are increasingly showing an interest to vouching the profitability of their investment and

monitoring from being ruined by value destroying factors (The Economist, 2001). Thus, measuring the performance of an investment is a cardinal issue for both managers and investors. There are a number of classes and types of models used to measure performances. Among the methods, those models based on accounting information systems are the oldest in the group. However, these models are proved insufficient and unable to stand the challenges from the increasingly efficient capital markets and management of resources. This increased efficiency requires efficient allocation of company's scarce resources, which in tern entails pertinent measurement methods. Apart from these traditional corporate performance measures, such as price-earning and market-to-book ratios, there are newly coined techniques called value management models and standard DCF methods.

In all measurement methods the main premise is firms' continued existence for indefinite period of time. This assumption, however, it is criticized for noble reasons. According to Foster and Kaplan (2001, p. 1), companies created at the beginning of the 19th Century exist for about 65 years. However, this average number of years declines to 10 years in their 1998 survey. This indicates that firms' age is shrinking, which has got an implication on the methods of measuring the economically viable existence of a firm. Hence, what is relevant to measure is not only their mere existence, but also continuous earning potential above their cost of capital.

The purpose of this review is to highlight and comment on the current trends of project performance measurement and control techniques. Moreover, it is intended to assess the basic problems of project performance measurement.

The paper is structured as follow. Section two discusses some of commonly applied measurement techniques. Section three is devoted to project performance measurement. Section four and five deals with project monitoring & control and success or failure designation respectively. Finally, section six concludes the review.

2. Measurement techniques

The magnitude and credibility of value for an investment or a project is highly affected by its measurement scales. Under ideal situations, a particular measurement is not only expected to show accurate and precise value, but should also be consistent with the objectives of a firm. It should provide timely information for decision-making, and reveal a true picture of performance. There are different groups of measurement techniques. For instance, Knight (1997) has identified income, cash, return, and value based methods. These methods are either time value based or non-time value based techniques. For the purpose of simplicity, we can classify the techniques into accounting and non-accounting models.

2.1 Accounting based metrics

Since decades the business performance is measured from the information provided by an accounting system. Techniques such as price earnings (PE), return on investment (ROI), return on equity (ROE), earning per share (EPS), economic value added (EVA) and market to book ratio (MB) are computed to judge the performance of a project or a business. A brief discussion of some of these techniques is given below.

Market-to-Book Ratio (MB): It is one of the performance measures that relate book to the market value of resources. It has been applied in portfolio

formation to maximize the profitability of a firm. The MB model is expressed as follows:

$$MB = \frac{(MV + \eta)}{D + E} \qquad (1)$$

Where

MB	market-to-book ratio
D	book value of debt
E	book value of equity
MV	market value of equity
η	market value of debt

The model is considered as one of indicators of performance (Fama and French, 1995, p.131). The ratio is believed to explain the performance of a firm, particularly, when lagged variables are used (Beaver and Ryan, 1993, p. 50). However, there is no agreement on the importance of this ratio. For instance, Peevy, *et al*, (1993) have found a contrary result with regard to its role in performance measurement. Furthermore, Kothari, *et al*, (1995) did not find any significant relationship between the ratio and market returns. As the book value data is part of the MB equation, there is no doubt that this ratio will be influenced by the changes in the methods of accounting.

Market Value Added (MVA): It is a performance measure that contains both the accounting and market value data. It is another version of Market-to-book ratio. MVA is expressed as follows:

$$MVA = (MV + \eta) - I \qquad (2)$$

Where,

I	capital employed

Thus, the market value of a firm is the sum total of MVA and capital employed during the period. Since MVA is related to stock valuation, it has been used as a measure of shareholder value creation (Hillman and Keim, 2001). A variation of MVA is market-to-capital ratio, which is computed by dividing the market value of debt and equity to the invested capital. Scholars argue that MVA is much better than the MB ratio in that it has the ability to capture future value of income streams (Lubatkin and Shrieves, 1986; Rappaport, 1992). The MVA and its variants have got problems of definition. As they combine both the accounting and market information, interpretation is usually difficult. In addition, MVA is found a size sensitive measure of performance. As a result, Hogan (1999) has found that large companies tend to create or destroy more MVA than small companies do.

Price-Earning Ratio (PE): Price earning ratio (PE) provides the expected earnings when multiplied by the number of shares. It is the quotient of share price against its earning potential. The PE ratio is expressed using the following relationship.

$$PE = \frac{P}{EPS} \qquad (3)$$

Where

PE	price-earning ratio
P	price of a share
EPS	earning per share

It provides modest clue about firm's returns and has limited explanatory power (Lev and Patell, 1989; Reinganum, 1981). In addition, the basic argument for using PE ratio has got deficiency as changes in the stock price is independent of a firm (Hellings, 1984, p.19). Thus, price and

earning may move indifferent directions. Furthermore, this ratio is the combined result of observable market price and accounting earning figure with several drawbacks.

Return on Investment (ROI): Return on investment measures how effectively assets are used in the income generating process. The application requires the definition of the term *investment*, which has got some confusion as some take the total asset while others average asset of a firm. The same problem also arises with the term *income*. After proper definition of these terms, the ROI is computed using the following relationship.

Where,

$$\text{ROI}(\%) = \frac{\pi}{I} \qquad (4)$$

ROI (%) Return on investment
π income
I investment

In addition to its accounting related problems, the complications of this method increase when benefits are measured from investments such as organizational development and other intangible assets.

Return on Equity (ROE): It is one of the series of returns used to measure business performances. It measures how a firm is profitable in relation to its shareholders equity. The method is widely used by mortgage banks (McDonald, 1999). ROE is computed by dividing the net income of the year with the ending or average balance of equity figure.

$$\text{ROE}(\%) = \frac{\pi}{E} \qquad (5)$$

Where

ROE return on Equity
π net income
E equity balance

Economic Value Added (EVA): The EVA is a variant of residual income measure advanced by Stern Stewart & Co. (Stewart, 1991). It is the economic profit that a firm should earn in order to survive in the market (Rutledge, 1993, p.148). The EVA tries to correct the after tax operating income by performing accounting adjustments. Taking the residual income approach, EVA can be expressed as (Biddle, *et al.,* 1997, p. 306; Bacidore, *et al.,* 1997, p.15).

$$\text{EVA} = \text{NOPAT} - \alpha(\text{NA}) \qquad (6)$$

Where
NOPAT net operating profit after tax
α cost of capital
NA net Asset

The difference between EVA and MVA is that the later considers the difference in terms of market value (Fishers, 1995, p.105). By converting the economic book value of assets to the market value, Bacidore, *et al*, (1997), proposes another variant of EVA called refined economic value added (REVA). Despite wider application, EVA, MVA or REVA are not free from critics. Among the noted shortcomings, these methods don't take into account the variation in stock returns and unable to capture the value creation potential of firms (Doad and Chen, 1996, p.26; Fernandez, 2001). In addition, no association is found between returns and the EVA (Biddle, *et al*, 1997, p.336). Moreover, EVA is also criticized for being a short-term measure based on sunk costs (McConville, 1994, p. 56).

Earned Value (EV): It is a performance measurement model used to

establish base line cost, schedule and goal for capital projects (Abba, 1997). Researchers use various names for this technique. For instance, phrases such as *Value Management* and *Integrated Value Management* (Thiry, 1997, pp.13-17), *Value Engineering* (Green, 1994, p.49) and *Earned Value Management* (Mayfield, 1997, p. 32) are commonly found in the literature. The model helps to compare physical work completed against the consumed hour or cost of a project. It is designed to evaluate and analyze projects through their life cycle (Locker and Gordon, 1991); hence, it is good for individual projects rather than a portfolio. Since it is based on the comparison of accounting and engineering data, there will be danger of interpreting the results. In addition, the model doesn't assess the relative impacts of time, cost and functionality on the performance of a project (Turner, 1998, p.70). Moreover, it oversimplifies project problems emanated from future uncertainties as it is based on assumption that the future performance is the same as the past performance (Howes, 2000).

Tobin's Q: It is one of the value-based measures that approximate the net present value of firms. It shows the relationship between market and replacement values. The method has been applied to measure the performances of strategic projects (Hillman and Keim, 2001). Tobin's q is calculated using the following formula (Hillman and Keim, 2001, p. 130):

$$Q=\frac{MV}{RV} \qquad (7)$$

Where

Q	Tobin's q-ratio
MV	the market value
RV	replacement value

However estimating the replacement cost of intangible assets is one of the difficulties of this model. In addition, the ratio is the combined result of market and replacement values, which may pose problem of interpreting the results.

Strategic Cost Management (SCM): A departure from the above models is the strategic cost management model proposed by Shank (1996). As oppose to the previous accounting based measures, SCM is based on a more broad strategic issues and tries to consolidate the financial and non-financial variables under one metric. The model has three parts: value chain analysis, competitive advantage analysis, and cost driver analysis. Although it encompasses broad range of information, mixing both financial and non-financial data may open a room for more subjectivity in the measurement of performances.

Multiattribute Decision Model (MADM): Adler (2000) has proposed a model based on the theory of utility and has listed factors affecting both an organisation and a project. In order to implement the model, however, the management has to establish weights for factors and corresponding probability. This model can be combined with the traditional measures so as to produce more improved results. Since the lists of factors are results of opinion, the model may lead to more subjective judgements than any accounting measure does. In addition, construction of weights and probabilities is an added problem to the management.

2.2 Issues in accounting-based models

Since years, companies' financial information is produced from accounting databases. This database accumulates data collected from different sources and originated at different time periods. However, the accounting database and its

reports have got deficiencies that could not enable the management to accept as a best pool from which reliable and pertinent performance reports are produced. Hence, the present empirical evidence questions the usefulness of accounting based ratios and their consistency to measure the performances of companies or investments (Barbee, *et al*, 1996, p.57). The following points are summaries of the major issues regarding accounting based models:

- The financial statements contain both historical (e.g. balances of Plant and Equipment, Accounts Receivables, periodic costs, etc.) and present value (e.g. Cash, Current liabilities, revenues, etc.) figures. These are two groups of values at different time periods, which may be difficult to added or subtract to bring a single figure such as total assets or net income.

- The accounting data is easily susceptible to changes in accounting policy and principles (Benston, 1982; Hillman and Keim, 2001; Briloff, 1977-78; Arnord, *et al*, 1985, pp.148-158).

- The traditional approach of financial information production ignores the incremental investments in fixed and working capital (Balachandran, *et al*, 1986, p.77; Jones and Sharma, 1999).

- The measures, produced from accounting records, don't explicitly reflect the importance of growth expectations and fails to measure changes in firm's economic value (Ludwig, *et al*, 2000; Rappaport, 1998, p.31).

- In the world where inflation is not an exception, no investment value or performance will be the same at any moment in time. Thus, a model should consider the impacts of the time value of money in the decision-making, which is not possible with accounting based methods.

- Moreover, today the inputs of decisions should include economic forecasts in addition to accounting information (Allen, 1992, p.52).

The existence of these problems creates loss of credibility and reliability on accounting reports and resultant decisions (Rappaport, 1998, pp.13-31; Burton, 1996, p.26). Hence, there is a need to move into alternative measurements of value, which incorporates among other things, the concept of value for money and risk, and which is consistent with the objective of a firm.

2.3 The non-accounting based metrics

These groups of methods are based on the principles of money value of time and risk. The approach utilizes both discounting and compounding cash flows. Some of the prominent performance measurement techniques are discussed below.

Residual Income (RI): Residual income is the initial capital plus the present value of future net benefits. Its development is back to 1930s and designed to curb some of the problems of ROI model (Lee and Swaminathan, 1999; Clinton, 1998). The model is much more convenient for company valuation than individual projects. Depending on the type of data input, the model can be grouped under either accounting or discounted cash flow groups. The discounted cash flow version of the model is sketched below:

$$V=BV+\sum_{t=1}^{\infty}\frac{\Phi(\pi_{t+i}-(\alpha_e BV_{t+i}-1))}{(1+\alpha_e)^t} \quad (8)$$

Where

V	value of a company
BV	book value
Φ	expectation operator
π	net income
α_e	cost of equity
t	time

Cash Flow Return on Investment (CFROI): From the traditional return on investment, a link is created to the cash flow of a company. Cash flow return on investment is one of performance measures, developed by HOLT Value Associates (Madden, 1998). The model is extended to measure the value of a firm with two groups of cash flows. Accordingly, the sum of cash flows from existing assets and those from future investments gives the total firm warranted value (FWV). The computation of FWV is based on the following relationship (Madden, 1998, p. 32).

$$FWV = \sum_{t=1}^{T}\frac{\theta_E}{(1+\alpha)^t}+\sum_{t=1}^{T}\frac{\theta_F}{(1+\alpha)^t} \quad (9)$$

Where

FWV	firm warranted Value
θ_E	net cash flow from existing assets
θ_F	net cash flow from future investments
α	cost of capital
T, t	time

The FWV model is based of the assumptions of Rappaport (1986) and can be applied in different ways (Nichols, 1998).

Cash Value Added (CVA): Cash value added is another variant of CFROI developed by Anelda, a Swedish Consultant Group (Nichols, 1998, p.27). The method separates the forecasted cash flow from the cash flow required to obtain zero net present values. Then, average CVA index is computed by dividing the present value of operating cash flow to the present value of cash flow demanded. According to the model, a firm creates shareholder value if and only if CVA index is greater than one. In this respect, the model resembles the profitability index of the DCF group. The CVA model can be expressed with the following relationship:

$$\text{CVA Index} = \sum_{t=1}^{T} PV\left(\frac{\theta_O}{\theta_D}\right) \quad (10)$$

Where

CVA	cash value added
PV	present value
θ_O	operating cash flow
θ_D	cash flow demanded
T, t	time

Total Return to Shareholders (TRS): Another market-based performance measure is the total return to shareholders. The model combines dividends and capital appreciation to create a full picture of what investors will receive over a certain period. Since it is completely based on the movement of share prices, it is fully market driven measure. It has been applied to measure firm performances (Barfield, 1998a). The model can be expressed as (Barfield, 1998b, p. 67)

$$TRS = P + d \quad (11)$$

Where

TRS	total return to shareholders
P	average annual share prices growth rate
d	average annual dividend growth rate

As all market variables are not under the control of a manger, it is difficult to evaluate performances based on TRS (Copeland, *et al*, 2000, p. 57). A variant of TRS is the total business returns (TBS), computed by talking changes in the capital value over one year period. The TBS is used to measure the total value of the company in the absence of stock market data (Smith, 1997). However, the method remains an accounting based measure and embrace all accounting related problems.

Shareholder value analysis (SVA): It is a model developed by Rappaport (1986) to measure the value of a firm or a project. The model is fully time value based and engineered by value drivers. The following formula can be used to compute shareholder value (Akalu, 2001, p.380).

$$SV = \sum_{t=1}^{T} \left(\frac{\theta}{(1+\alpha)^t} \right) + \frac{\theta_T}{\alpha (1+\alpha)^{T-1}} + \theta_{inv} - \eta \qquad (12)$$

Where

SV	shareholder value
T,t	planning period
α	cost of capital
θ	net cash inflow
θ_T	terminal net cash flow
θ_{inv}	market value of the temporary investments
η	market value of external financing

There are also other groups of performance measurement models, such as the net present value and the internal rate of return. Since these models are not widely practiced to measure assets in progress, they are not included in this discussion (Akalu and Turner, 2001a, 2001b).

3. Measuring project performance

Since the majority of company's work is project based, the issue of project performance monitoring is an important task in project management (Paul, 1998; Akalu and Turner 2001a, 2001b). Questions related to completion time, total cost of completion and rate of performance vis-à-vis the target are raised during project monitoring. In order to provide legitimate answer for such relevant issues, measurement of project performance is required.

Project performance measurement involves progress monitoring, which has two related processes and outcomes. The first part of the process is a backward looking beginning from the date of project kickoff. The outcome of this measurement is historical in content. The second part involves a forward-looking measurement, which is more subjective than the former. The later may trigger changes on the partial or total structure of the project.

In the discussions of performance measurement, issues such as the methods of measurement, standards of comparison and interpretation of the results are open to debate. The performance measurement methods are covered in section two. In this regard, firms use either accounting or non-accounting based models. Project control and the designation of project success or

failure are the remaining issues to be addressed in relation to project performance measurement.

4. Project monitoring and control

Projects are planned based on prior facts (historical data) and educative guesses. As a result, the actual value may differ from the planned estimates. The effort of every project manager, however, is to narrow the gap between estimated and actual value of a project. Since years, various methods and forms are designed to bridge this gap. One of the mechanisms to reduce the gap is continuous monitoring and control of operations.

Until 1980s, the main focus of project management was on the administration of resources, while schedules and control was limited only to certain areas (Thamhain, 1996). In later years, however, managers have realized the effect of project control in all activities (Thamhain, 1996, p. 38). Different theories and models have been developed to assist the control effort of management. Today, many project control systems are becoming more complex in order to meet the complex nature of project environment and data analysis.

There are different views about the nature and methods of project control. For instance, Turner and Payne (1999), have found that tailor made control techniques are relevant at operational levels. In addition, a multivariate project monitoring technique is also proposed by Dey, *et al*, (1994). Hartman and Jergeas (1997), however, argue differently. They support different methods of control for different stages of project. Accordingly, at the stage of project definition and approval, they propose cost, schedule and time (CST) as measures of control. This approach, however, will invite the use of various methods in each stage and deprives the benefits of uniform control method over the project life span.

On the other hand, determining project control time horizon is important in order to have a complete control procedure. It can be done at fixed or continuous time spans. Continuous assessment helps to early warning, detection and correction of material errors in the operation. Some researchers argue that a milestone-based control is sufficient time horizon. From such background, Purvis and McCray (1999) classified the phases of project assessment into three: initial (during project initiation project planning), in progress (project execution) and completion (closure). However, the fixed time frame based control is not capable of providing continuous data for continuous control of operation. Hence, there is a possibility that some of the errors will remain unnoticed until the fixed milestone period.

There are a number of control techniques. And it is impossible to exhaustively list all the methods and definitely prescribe for a particular project. Each project has got a particular feature and the application of a particular control tool is situation dependent. However, it is possible to classify control methods using various bases. For instance, Merdith and Mantel, (1995, pp. 513-521) have classified as cybernetics (automatic) control, test control and post project control. On the other hand, Thamhain (1996, pp. 39-41) has made detail categorical classifications as presented in Table 1.

Table 1: Classification of control

Category	Types of Methods
Analytical	Reports, Computer aided
Process oriented	Concurrent engineering and Bench marking
People oriented	Team building

In addition, installation of a given control system has to be studied carefully in relation to its short and long run repercussions. For instance, too tight control may frustrate project workers and may lead to delay the project completion time. On the other hand, too loosen control system may increase cost of operation and, hence, resulting budget overrun projects.

5. Success or failure designations

In most circumstances, project success or failure determination is made at the stage of project completion. However, the yardstick against which success or failure is measured usually raises a question of ownership and authority. A project work comprises a number of diverse groups and functions that have got authority to set standards and test their share of project performance. For instance, in addition to the CEO, the Finance, Engineering, Marketing and the Environmental groups may want to measure success or failure in different ways. This creates problem of choosing a particular metric as a result of mixes of interests. In addition to the diversity of standards, some of the performance scales are highly subjective, which is contrary to what the project data provides.

Moreover, the presence of diverse critical factors is another problem to perform objective project evaluation. Since 1960s researchers have been searching for factors responsible for the success or failure of a project (Boynton and Zmud, 1984, p.17). There are different views as to the number, nature and type of factors affecting project success or failure. In general, researches in this area can be classified into two groups. The first group includes those focused on the identification of factors affecting project success or failure. The works of Pinto and Slevin (1987), Freeman and Beale (1992), Riggs, *et al*, (1992), Paek (1995), Slesinger (1997) and Baker (1997) can be mentioned as an example. According to these scholars, these critical factors are: clearly defined goals, competent project manager, top management support, competent project team, sufficient resource, adequate communication, control, feedback capability, client related issues, technical tasks, and trouble shootings.

The second groups of researchers are not only listing but are also categorizing those factors for further analysis. The works of Belassie and Tukel (1996), Jang and Lee (1998), Wateridge (1998) and Shenhar, *et al*, (1997) are prime examples in this group. For instance, Shenhar, *et al*, (1997, p. 11) have developed four groups of factors with sub-factors in each category. Accordingly, project efficiency, impact on customer, business success and future impacts are the major groups of factors for project success or failure.

An attempt is made to analyze 53 empirical papers of the last two decades focussing on the critical factors of project success or failure[1]. From this analysis, two different groups of factors can be distinguished. The first group is related to ICT projects while the second group were emphasizing on generic projects. This helps to identify factors that are peculiar to a given project type, which prevents form

[1]The detail review of these articles can be found from the corresponding author.

mere generalizations of factors of project success or failure.

There are variations in the method of studies and the eventual listing of factors. Accordingly, most of the factors found after 1996 were case study-based as compared to the previous years. From the total articles, 19% of the surveys determine those factors taking one or more projects in their sample. In terms of the area of study, 4%, 13% and 83% were related with construction, ICT and generic projects respectively.

From this review, it can be concluded that there are diverse factors affecting project success or failure and these factors depend on the type of project. As a result, the different ICT papers don't exhibit the same result although they analyze the same category of projects. However, some factors are common across all ICT projects. For instance, the factor *lack of management support* is the most commonly mentioned item that causes success or failure for ICT projects. In addition, the ICT papers witness the existence of factors, which are peculiar to ICT projects only.

In the patterns analysis, it is clearly visible that there is a shift in the factors that determine project success or failure. In the 1980s and early 1990s the attention was to make sure a project is meeting the deadline at a given cost so as to celebrate success. Later, it became evident that the mere analyses of the functional measure don't provide success or failure of a project. Thus, other variables such as the concern of the owners, clients and other stakeholders are felt relevant in the determination of project success or failure.

In summary, listing critical success or failure factors and categorizing them into manageable units will be useful if the management has established criteria to judge. And, hence, it is dispensable to have full-fledged standard of measurement and criteria for projects with identified critical factors. Different from the previous works, Tan (1996) has formulated criteria to evaluate success or failure of a project. She has developed three criteria to evaluate the nine factors that affect the performance of external transfer of technology. Moreover, she suggested measuring such factors in terms of its process, overall performance and user satisfaction levels (Tan, 1996, p.47).

After identification of factors and development of criteria, managers can apply the measurement scales. However, the nature and extent of success or failure still remains subjective. For example, the rate or degree of acceptability for success or failure and partial satisfaction of the established criteria may still lead to subjective judgments. Thus, it is extremely essential to determine the range of values within which a particular project will be marked as success or failure.

6. Discussions

We have presented the various views and methods so far applied to measure and control project performances. The presence of various metrics in addition to multiple group of interests, make the performance decision-making more complex, costly and subjective. In addition, the disparity of metrics between project appraisal (usually DCF techniques or value management models) and subsequent evaluation (such as ROI, MB, etc) will not give a clear picture a bout a project. In such approaches, the effect of project performance on the shareholder value of the company will not be seen transparently. In general, project success

or failure factors are not uniform and depend on the type of project.

Thus, it is not advisable and not economical to apply diverse methods throughout a project life span. We suggest the application of uniform metrics (from project inception to completion), which is consistent with the objectives of the firm and capable of handling both risk and time value of the money. This will bring the following benefits:

- Uniform methods reduce the cost of information production.
- Operating with the same method will facilitate the interpretation of performance results among multiple projects (portfolio).
- Applying uniform method for both appraisal and subsequent evaluation facilitates project monitoring and control.
- The approach is much more transparent: showing the impacts of project performance on company's shareholder values.
- The approach eases the tension among multiple interest groups during the measurement of project success or failure.
- Under such procedure, rich experience will be obtained as a result of using uniform methods. This helps to evaluate the validity and degree of precision of a metric.

Models such as the shareholder value analysis can be used to perform both appraisal and evaluation. As it is DCF based metric, it can, at the same time, encompass the benefits of all other methods. In the end, shareholder value will be maximized by uniformly applying pertinent methods throughout the project life span.

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