

CONSTRUCTION FINANCE AND ACCOUNTING: A REVIEW

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Abstract

Finance is one of the major part of construction industry. Because without finance on project cannot be start. It is also essential that from where the finance come from and how to manage the available finance and have a track on it. To track them cash flow is used and to manage accounting is foremost. In which earned value and break-even point is comes handy. Earned-value analysis helps to identify the project status depending on the cost and schedule variance and performance index. Delays in construction projects are a common phenomenon and a costly issue. The underlying triggers and discusses effective preventive measures for disruptions in the financial phase. Four main reasons have been identified: late payment, weak cash flow control, insufficient financial capital, and financial market volatility. In which weak cash flow control is the most important factor contributing to a pause in the project, accompanied by late payment, scarce financial capital, and financial sector volatility.

Keywords: Construction finance, Construction accounting, Cash flow, Break-even point, Earned-value analysis

I. Introduction

Finance is defined as money management which involves spending, borrowing, lending, budgeting, saving, and forecasting practices. Where Construction Finance is the solution that provides immediate and ongoing working capital across various stages of a contract for a construction sector.

In the construction sector, domestics, macroeconomics, product prices and a variety of other variables under control of the industry are heavily affected. These factors make lending money to construction firms relatively risky for mainstream institutions like banks. The major, inevitable reality is that the financing for a construction project is not cheap. An apartment block cannot be bootstrapped. Materials, manpower, insurance, conflict settlement and the very fact that projects beginning now would be at the whims of the economy in two or three years ' time, which will create a very different market climate, which means that for every big construction project to get off the ground, the companies involved need liquidity and resources.

In a world where contracting and subcontracting are normal, construction companies are often forced to wait for work to be paid for. You can have to wait 30, 60 or even 120 days in

certain serious cases. And this is in addition to having to pay for supplies, hires of equipment and salaries.

Factoring payment systems have been developed to ease cash flow for construction companies by allowing cash payments protected against the company's payment applications. This is a form of factoring that enables companies to obtain an advance on much of the payment for completed work. It can be used to help finance the next new venture, to provide cash for new machinery or supplies, to help pay suppliers early and benefit from economies of scale discounts that could have been previously out of reach.

A. Sources

There are number of sources for finance came. These can be from private to government, each source has its own benefits and drawbacks.

These are some examples of financial sources for construction industry:

- 1) Firm Investment
- 2) External Stakeholders
- 3) Foreign Direct Investment
- 4) End User
- 5) Owner
- 6) Government Sector
- 7) Loan
- 8) Bank Syndicates



Figure 1: Financial requirement as per phase [6]

B. Financial Requirement

- 1) Development:
In development phase, requirement of finance is low due to in this phase planning is going for the infrastructure, so risk of investors high compared to investment.
- 2) Construction:

During construction phase use of finance increased rapidly because of bills of materials, labors, machines, and other essential things. With finance risk of investor is also increased because their money is used in ongoing project and this project will decide the future of their money.

3) Ramp-up / Closing:

Up to this phase approx. 80% - 90% of finance is utilized in the project. This phase is especially important for investors because risk involves in project drastically decreased over time.

4) Operation:

It is usage phase of infrastructure, in this phase finance is utilized for the maintaining of structure. This phase is for long time with less finance and lowest risk.

II. Time Value of Money

Time value of money is one of the most fundamental principles in finance. Time value of money (TVM) is the concept that money you have now is worth more than the same amount in the future because of its potential earning power. The central theory of finance is that the money given will generate interest, every sum of money is worth more the faster it is earned. TVM is often referred to as the present discounted value.

A. Equations

$$\text{Future Value (FV)} = \text{Present Value (PV)} \times \left[1 + \frac{i}{n}\right]^{(n \times t)} \quad (1)$$

$$\text{Present Value (PV)} = \frac{\text{Future Value (FV)}}{\left[1 + \left(\frac{i}{n}\right)\right]^{(n \times t)}} \quad (2)$$

FV= Future Value of Money

PV = Present Value of Money

i = Interest Rate

n = Number of compounding periods per year

t = Number of years

B. Example

If you won ₹ 10,00,000 and you have two payment options:

A) Receive ₹ 10,00,000 in one year with 2% interest,

B) Receive ₹ 10,00,000 now.

For, option A:

₹ 10,00,000 with 2% interest for 1 year

$$FV = 10,00,000 \times \left[1 + \left(\frac{2\%}{1}\right)\right]^{(1 \times 1)}$$

$$FV = ₹ 10,20,000$$

For, option B:

₹ 10,00,000 at a time

In this option idea is to take money and put it for same time but with different amount of interest.

₹ 10,00,00 with 5% interest for 1 year

$$FV = 10,00,000 \times \left[1 + \left(\frac{5\%}{1}\right)\right]^{(1 \times 1)}$$

$$FV = ₹ 10,50,000$$

From this example its visible that having money now is much better than later. It can be applied to construction industry.

C. Compound Interest

There is no point in investing money unless it rises faster than inflation. It is easier to invest money now because it's worth more. A regular bond returns a flat percentage of the principal value each year, which is basic interest. In that case, if you had a 5 % annual interest rate on a ₹1,000 face value bond, you would get ₹50

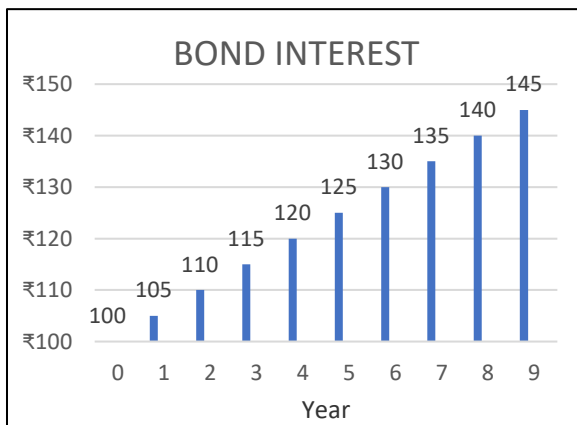


Figure 2: Bond interest

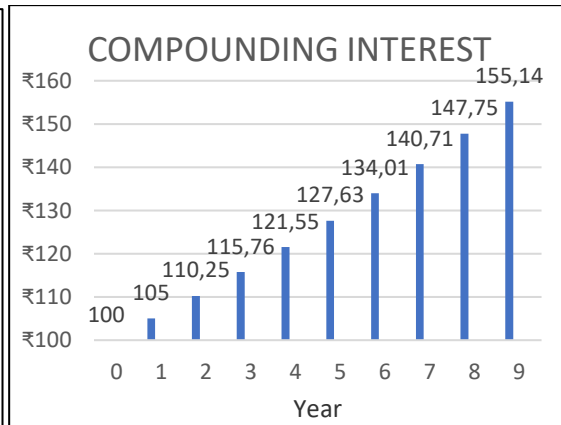


Figure 3: Compounding interest

If you look at investment as a share, you expect the average percentage rate to be 5% a year, or 7% if you consider the dividends. When you have a stock of ₹100 that has risen by 5 per cent by the end of the year, you have \$105 in the compounding era. By the end of year two, another 5% has risen and is worth ₹110.25. Although that is just an additional 25 cents, in this case for a long period of time and with huge dollar amounts, it might end up being a lot of money.

III. Managing Finance

After receiving finance from different sectors for project it's essential to manage that amount utilized it with care and having log of that. The financial manager is responsible for making sure that the organization's financial resource is handled wisely.

Financial manager's responsibilities:

- 1) Making sure that project and general overhead costs are accurately tracked through the accounting system.
- 2) Ensure that a proper accounting system has been developed and that it works properly.
- 3) Projecting the unbilled committed cost — costs that the organization has agreed to paying but has not provided a bill for — are included in these estimates.
- 4) Determine whether the project is over or underbalanced.
- 5) Ensure that the correct financial statements have been prepared.
- 6) Reviewing the financial statement to ensure that the company's financial structure is in line with the rest of the industry and trying to identify potential financial problems before they become a crisis.

B. Ways to manage finance

There are several ways to manage available finance:

1) Make a payment schedule:

By managing payments from clients and ensuring an agreement occurs, so you have certainty of payment will certainly make finance run in the right flow. Having good sales records and regular billing makes it easier to manage finances and monitor the revenue you receive each month.

2) Pay in advance:

Avoid using company funds for each project that is run. Try the billing contract agreement at the outset, so that more financial risk is borne by the client, not the contractor. This kind of agreement takes you away from bad financial risks. The payments you receive in advance can be used to do more structured and efficient work planning.

3) Manage material effectively:

Ensuring that materials are properly managed and regulating their use effectively and efficiently will reduce the excessive costs that must be incurred by the contractor. The management of these materials would be simpler by using program which can track the availability and usage of materials in different projects. Using the Inventory System makes it easy for you to manage material so that you can manage the material outflow that will be used to run the project you are holding. Also manage well the use, so as not to waste the budget for the purchase of excess basic materials, or unnecessary.

4) Oversee worker's activities:

Monitoring the activities of workers so that the project can be completed properly and efficiently is not an easy job. How much work time is needed by workers to complete a project, or how many workers are needed to work on one part of the project is certainly a very useful observation as an evaluation material for the company. By knowing the data about the activities of these workers, managers can do good budgeting in each project that will run in the future.

IV. Construction Accounting

Accounting history has been around for about as long as money itself. Accounting history goes back to antiquity in Mesopotamia, Egypt, and Babylon. For example, the government had extensive records of its finances during the Roman Empire. However, since the early 19th century modern accounting as a discipline has existed.

Accounting is the method of reporting a business-related financial transaction. Accounting requires the summary, analysis and reporting to supervisory agencies, regulators, and tax collectors of these expenditures. The financial statements used in accounting are a descriptive description of financial activities during the accounting period, summarizing the results of the company, its financial status, and its cash flows.

Construction accounting is described as monitoring how the financial resources of the company are used, including general operating costs, project determinations over or underbilled, preparing financial statements and reviewing financial statements to ensure that the financial structure of the business is compatible with the rest of the industry.

A. Types

1) Financial Accounting:

Financial accounting refers to the methods used to produce interim and annual reports. The details of all financial operations during the accounting period are listed inside the balance sheet, the revenue statement, and the cash flow report. For certain businesses, such as publicly traded firms, audits are a legal necessity. Nevertheless, borrowers often usually request the results of external audits on an annual basis as part of their debt agreements. As a result, most businesses should have annual audits for one cause or another.

2) Managerial Accounting:

Managerial accounting uses many of the same documentation as financial accounting but organizes and incorporates information in a number of ways. Namely, in management accounting, the accounting department provides monthly or quarterly reports that the executive team of the business can use to make decisions on how the business operates. Managerial accounting also covers many other facets of accounting, including budgeting, forecasting and various methods for financial analysis. Essentially, any details that may be of interest to management falls under this umbrella.

3) Cost Accounting:

Just as managerial accounting helps companies make financial decisions, cost accounting allows businesses to make cost decisions. Essentially, cost accounting calculates all costs related to the development of a good. Analysts, executives, owners of companies and accountants use this knowledge to assess the cost of their goods. In cost accounting, money is used as an economic factor in production, while in financial accounting, money is considered to be a measure of the economic performance of a company.

B. Difference

There is major key difference in construction accounting and regular accounting many aspects some of them are mention bellow:

1) Sales:

Regular businesses account for sales and usually offer 1-5 categories of products and services. Construction businesses offer a greater range of service categories – service work, consulting, engineering, labour costs, design, physical products, and materials, and more. With all of these service categories, it can be more difficult to keep track of every expense or profit coming from each category. Revenue recognition can be tricky as well due to the many categories and each cost associated with each.

2) Cost of Goods Sold:

Regular businesses usually record the cost of the product sold. It's never that easy in building accounting. Through work incurs both direct and indirect costs, which fall into hundreds of categories. Keeping track of these direct and indirect costs can be difficult, particularly if they come from all categories. Implementing a software platform that can keep track of these costs for you can save you time and money.

3) Expenses / Overhead:

For normal companies, the difference between the cost of products sold and the cost of overhead is obvious, but this is not the case for construction. Some of the products that grocery stores may call "Overhead" fall under the category "Cost of Goods Sold" in production as they are directly related to the customer's project. It is important to know the distinction between the two when it comes to building accounting, since it can be difficult.

4) Break Even:

In regular businesses, the direct relationship between income and expenses makes breakeven points extremely easy to calculate. In construction, however, there are far too many categories of items to easily understand how to break even on a project.

Additionally, most projects are one-of-a-kind custom jobs, with intricate requirements and a variety of associated costs. Since the relationship between income and expenses can be intricate, it can be helpful to have a software to keep track of income and expenses for you.

V. Cash Flow

In very general terms, 'cash flow' is the movement of income into and expenditure out of a business (or other entity) over time. When more money comes into the company than comes out of it, the cash flow is considered to be 'positive.' When more money goes out, it is a negative cash flow. In construction however, the term 'cash flow' generally refers to an estimation of when costs will be incurred and how much they will be incurred over the life of the project. Predicting cash flow is essential in order to ensure that an adequate level of funding is in place and that adequate withdrawal facilities are available.

Positive cash flow means that the net assets of a company are growing, allowing it to repay debts, reinvest in its business, return capital to shareholders, pay out expenses, and provide a buffer against potential challenges. Companies with strong financial flexibility can take advantage of profitable investment. They are even well off in downturns, reducing the risk of financial hardship. Even profitable companies can fail if they do not generate enough cash to remain liquid. This can occur if the income is associated with the accounts due and the inventory or if the company spends too much on capital. Investors and shareholders would also want to know that the company has enough capital and assets to cover short-term liabilities. Analysts analyze debt service coverage ratios to see how a corporation can meet its current commitments by bringing cash out of its transactions.

A. Types

Now that we understand the importance of cash flows, let's see the types of cash flows in that are in use:

1) Operating Cash Flow:

Cash flow produced from operating activities is referred to as operating cash flow. Operating activities include the day-to-day activities of a company, such as the purchase of raw materials or the sale of goods. Cash inflows are the product of cash sales and accumulation of accounts receivable. This is basically the collection of profits from major business operations, for instance XYZ's income is generated from its electronics sales. To

order to obtain these revenues, businesses must conduct operations such as the procurement of raw materials, the manufacture of inventories, the paying of workers, etc. As a result, revenue outflows arising from cash outflows for raw materials, wages, royalties, etc.

$$\text{Operating Cash Flow} = \text{Cash inflow from operating activities} - \text{Cash outflow from operating activities} \quad (3)$$

2) Investing Cash Flow:

The cash flow generated from investing activities is termed as investing cash flow. Investment activities include the purchase and disposal of long-term properties and other investments. Cash outflows are created from investments in long-term assets and other investments including land, plant, and equipment; intangible assets; long-term and short-term investments in equity and debt provided by other organizations; etc. Cash flow provided by the purchase of shares or investments exclusively for the purpose of investing or the main business activity of the company shall not be included in the cash flow spending. For example, if an Indian exporter hedges US dollar in order to reduce the impact of USD-INR price volatility on his current orders, the cash flow from this hedging would go to operating cash flows and not to investing cash flows.

$$\text{Investing Cash Flow} = \text{Cash inflow from investing activities} - \text{Cash outflow from investing activities} \quad (4)$$

3) Financing Cash Flow:

Financing cash flow comes from doing business financing operations. In other terms, cash flow funding requires the purchase or redemption of capital, be it equity or long-term debt. Cash inflows in this group include cash receipts from shares issued or bonds lent by long-term loans. Cash outflows include repurchase and interest payments of debt and other borrowings.

$$\text{Financing Cash Flow} = \text{Cash inflow from financing activities} - \text{Cash outflow from financing activities} \quad (5)$$

A. Net cash flow

Net cash flow refers to the difference between cash inflows and outflows of a company in each period. In the strictest sense, the net cash flow refers to the shift in the cash balance of a company as defined. On the cash flow analysis. You can estimate the net cash flow of a company by looking at the period-over-period shift in cash on the balance sheet. However, the cash flow analysis is a more informative document to look at. Net cash flow is the amount of cash flow from financing (CFF), cash flow from operations (CFO).

Net cash flow is a fuel that helps companies to grow, produce new goods, repurchase stocks, pay dividends or reduce debt. This is basically what makes it possible for businesses to conduct their day-to-day operations. Some people therefore value net cash flow more than any other financial measure, including earnings per share. Revenues and expenses are also important because they are major drivers of net cash flow.

Table 1: Equation table for NCF

Year	Cash-Out	Cash-In	NCF
0	C_0	B_0	$NCF_0 = B_0 - C_0$
1	C_1	B_1	$NCF_1 = B_1 - C_1$
2	C_2	B_2	$NCF_2 = B_2 - C_2$
:	:	:	:
:	:	:	:
n	C_n	B_n	$NCF_n = B_n - C_n$

Table 2: Example of NCF

Category	Jan	Feb	Mar
Beginning Balance	₹ 550,000	₹726,000	₹746,000
Operating Activities			
Project Income	₹100,000	₹150,000	₹75,000
Supplier Payment	₹14,000	₹20,000	₹10,000
Subcontractor Payment	₹25,000	₹50,000	₹25,000
Payroll Expenses	₹10,000	₹10,000	₹10,000
Investing Action			
Truck Purchase	₹35,000	-	₹35,000
Bulldozer sale	₹10,000	-	
Financing Activities			
Sale of Stock	₹200,000	-	-
Building Lease Payment	₹50,000	₹50,000	₹50,000
Net Cash Flow	₹176,000	₹20,000	₹55,000
Project Balance	₹726,000	₹746,000	₹691,000

VI. Earned Value Analysis

Earned value analysis (EVA) appears to be a compelling technique to use on projects to better understand and manage performance. Companies that have won interest plan procedures and can have some basic training. Project managers are then advised to start using the money they have won,

and management expects the performance of the project to improve quickly. Typically, reality sets in around a year later.

Earned Value (EV):

It is the percent of the total budget actually completed at a point in time. This is known as “budgeted cost of work performed” (BCWP).

$$EV = \% \text{ complete} \times \text{budget} \quad (6)$$

Planned Value (PV):

It is the budgeted cost for the work scheduled to be done. This is the portion of the project budget that is supposed to be allocated at any particular period. This is known as “budgeted cost of work scheduled” (BCWS).

Actual Cost (AC):

It is simply the money spent for the work accomplished. This is known as “actual cost of work performed” (ACWP).

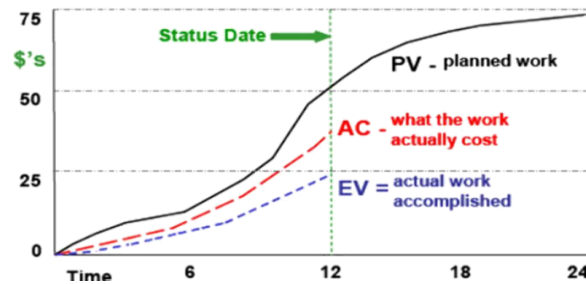


Figure 4: Earned value graph [5]

A. Cost variance and Cost performance index

The cost variance is defined as "the difference between the value earned and the actual cost ($CV = EV - AC$).” Often this calculation is expressed as the difference between the budgeted cost of the work performed and the real cost of the work performed. If the variance is equal to 0, the project is budgeted. When a negative variance is calculated, the project is over budget and the project is under budget if the variance is positive.

The CPI is defined as a "project cost-effectiveness measure." This is the ratio of earned value (EV) to actual costs (AC). The CPI is proportional to the received value divided by the actual costs, $CPI = EV - AC$. A CPI equal to or greater than one indicates a favorable condition and a value less than one indicates an unfavorable condition. For example, the calculation will display a CPI of ₹0.90, which translates to a project that recognizes ₹0.90 for every ₹1.00 spent to date on the project. Assuming that your CPI output stays the same for the rest of your work; your project will be over budget

B. Schedule variance and Schedule performance index

Schedule Variance status shows the dollar value discrepancy between the job ahead of or behind the schedule and represents the calculation tool used. Schedule The status of the variance does not address the impact of the work sequence, address the importance of the

work, reflect the critical path assessment, indicate the amount of time it will be slipped, identify the source (labor & material) of the difference, indicate the time before / behind (or recover) the schedule, or indicate the cost needed to recover the schedule. The calculation used for the express schedule variance is the value of the project obtained minus the project's expected value as of the date of the analysis. ($SV = EV - PV$) If the variance is equal to 0, the project is scheduled. If a negative variance is determined, the project is behind schedule and the project is ahead of schedule if the variance is positive.

The SPI is described as "a measure of the efficiency of the project schedule. This is the ratio of obtained value (EV) to expected value (PV). The SPI is equal to the value obtained divided by the expected value, $SPI = EV / PV$. An SPI equal to or greater than one indicates a favourable condition and a value of less than one indicates an unfavourable condition." For example, if your calculation shows an SPI of ₹1.1, which translates into a project that acknowledges ₹1.10 for every ₹1.00 spent to date on your project. Assuming that the SPI output is preserved during the job remainder; the project will be finished ahead of time.

B. Example

If a Work Package is the delivering of 500 cement bags at project site, and 350 are delivered, the Work Package progress is 70% complete (350/500). If the budget for this Work Package is ₹ 200,000, the earned value is ₹ 140,000 (0.70 x ₹ 200,000).

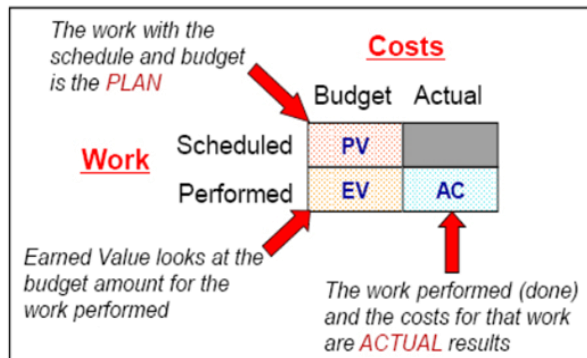


Figure 5: Relationship of earned value terms [5]

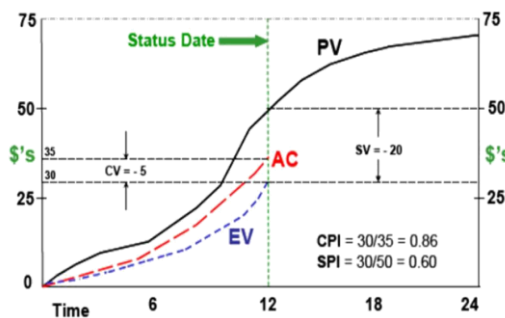


Figure 6: Earned value analysis [5]

Fig. 6 shows the Planned Value, Actual Cost, and Earned Value for a project. Please note that as compared to the actual amount spent, the planned spending curve shows a difference of \$15. An outsider would probably assume that the project team does the job and does it for less money.

However, an analysis of the project using earned value gives a different picture. The graph shows a cost variance of-US\$5 and a plan variance of-US\$20. The project team has made \$30 ("earned"). At this point in time, however, the scheduling plan was to carry out US\$ 50 of work. The project team is now 20 dollars behind schedule work. In addition, the actual cost of the work performed was US\$ 35 and the budget for the work performed was only US\$ 30.

It means that the project manager has invested so much on the research that has been completed. The bottom line Earned Value Analysis clearly reveals that this project is in trouble!

C. Key parameters, performance measure and forecasting

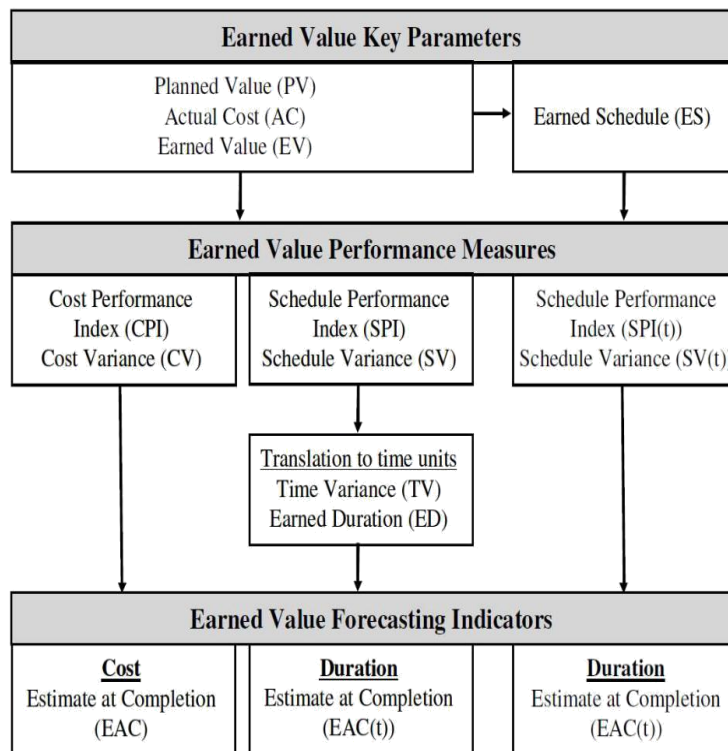


Figure 7: Earned value method flowchart [7]

VII. Break Even Point

By definition, the Break-Even point is the point where costs or expenditures are equal to revenues. Simply put, this is the inflection point where a corporation does not make money or lose money. For accounting purposes, the formula for a break-even point is calculated by dividing the total fixed costs involved in manufacturing by sales per product minus the operating costs per company. In this scenario, the fixed costs are those which do not adjust on the basis of the number of units produced. In other terms, the breakeven point is the amount of output at which the net income for the business is equivalent to the total expense.

$$\text{Break Even} = \frac{\text{Fixed Costs}}{\text{Gross Profit Margin}} \tag{7}$$

$$\text{Total Revenue (TR)} = \text{Direct Cost} + \text{Cost of administering} + \text{Cost of marketing} + \text{Profit} \tag{8}$$

$$\text{Total Cost (TC)} = \text{Variable Cost (VC)} + \text{Fixed Cost (FC)} \quad (9)$$

VC includes cost of direct material, labour, equipment, fuel, etc. Cost varies with the volume.

FC is constant and is regardless of the volume. It includes rent, salary, taxes, etc.

A. Example

A construction material company makes and sells windows panels. The selling price per panel is ₹900. The variable cost for making the window panel is ₹500 per unit. The fixed cost is ₹8,000,000. Company has capacity of 25,000 panels. Find the break-even point (BEP).

P = selling price per unit = ₹900

V = variable cost per unit = ₹500

FC = Fixed Cost = ₹8,000,000

Table 3: Solution of break-even point

Volume	x = 18,000	x = 20,000	x = 22,000
TR (Total Revenues)	₹900 × 18,000 = ₹1,62,00,000	₹900 × 20,000 = ₹1,80,00,000	₹900 × 22,000 = ₹1,98,00,000
VC (Variable Cost)	₹500 × 18,000 = ₹90,00,000	₹500 × 20,000 = ₹1,00,00,000	₹500 × 22,000 = ₹1,10,00,000
FC (Fixed Cost)	₹80,00,000	₹80,00,000	₹80,00,000
TC (Total Cost)	₹1,70,00,000	₹1,80,00,000	₹1,90,00,000
Net Income	₹ 8,00,000 Loss	0 BEP	₹8,00,000 Profit



Figure 8: Graphical presentation

Mathematical presentation

$$TR = (p)(x)$$

$$TC = (v)(x) + FC$$

At BEP, TR = TC

$$(p)(x) = (v)(x) + FC$$

$$BEP = x = \frac{FC}{p - v}$$

$$BEP = x = \frac{8,000,000}{900 - 500} = 20,000 \text{ units}$$

$$\% \text{ capacity at BEP} = \frac{FC}{(p-v)(\text{Total capacity in units})} \times 100\%$$

$$\% \text{ capacity at BEP} = \frac{8,000,000}{(900-500)(25,000)} \times 100\%$$

$$\% \text{ capacity at BEP} = 0.8 / 80\%$$

VIII. Conclusions

- 6) In conclusion finance is the core of the construction project, it is an essential part of every construction ventures, no matter how big or how complex it is.
- 7) A construction company is a risky venture. Each year, many construction companies go out of business. Operating a successful construction company requires a specialized set of financial management skills, because of the unique nature of the construction industry.
- 8) The construction industry faces a number of challenges including:
 - a. constantly building unique, one-of-a-kind projects,
 - b. building a project at a different location each time,
 - c. dealing with retention and progress payments,
 - d. relying heavily on the use of subcontractors to complete the projects
- 4) After having capital, management of that is as critical as the project, where accounting plays a major role in it.
- 5) During project knowing how and where stakeholder's money is spent cash flow and net cash flow is important.
- 6) If scope or duration changes is directly or indirectly affecting the cost of the project.

- 7) Delay is a serious issue in construction industry because it affects the time and expense of the project. Delays in construction projects will result in increased costs and losses in the financial return or other benefits of the project. Thus, delay is costly for both owner and contractor.
- 8) Financial delays are root causes for weak cash flow control, followed by late payment, insufficient financial resources, and uncertainty of financial market.

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