

Cash Flow Forecasting

Cash Flow Forecasting

A construction organization must not undertake a project until it has checked on its:

- Physical feasibility: The resources required to carry out the project according to schedule are available
- Financial feasibility: The funds necessary to carry out the project are available



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Financial Feasibility

- the incomes to be derived from all its individual projects
- the costs of construction of those projects
- the overhead costs of the company and the apportionment of such costs among the projects
- the working capital required to finance the construction operations
- the means of raising the working capital



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Cost of Construction

- Cost of Materials
- Cost of Labour
- Cost of Plant
- Sub-contractor's costs



Direct Costs

- Site Overheads
 - salaries of site staff
 - cost of services at site



Indirect Costs

Total Cost of the project = Direct costs + Indirect costs

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Head Office Expenses

- salaries of Head Office Staff including Directorate
- promotion costs
- planning and estimating costs
- administration, accounting and auditing costs



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Value of Work

Value of work is the price quoted in the tender. The contractor gets paid by the owner according to the value of work indicated in the bill of quantities or as agreed to in other forms of contracts.

Total cost at site

Add: Allocated Head Office Overheads

Add: Profit (required)

Value of work



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Value of Work

The Total cost (at site) is said to be given a Mark-up to get the Value.

Mark-up is usually expressed as a percentage.

$$\text{Value} = \frac{\{1 + \text{Mark-up}\}}{100} \times \text{Total cost}$$

And

Head Office Overheads allocation + Profit

$$= \frac{\text{Mark-up} \times \text{Total cost}}{100}$$

$$= \text{Contribution of the project to the company.}$$

Cash Flow Forecasting

Cash Flow Forecasting and Finance Schedule

Cash flow patterns can be worked out for all existing projects and anticipated new projects. If all cash flows are superimposed on a time scale, then it enables the planner to determine:

- (a) the level of working capital required at different times
- (b) the overdraft or credit requirements

The Financial Planner would then look into the feasibility of raising the required working capital through the allocation of internal funds and external borrowing.

If difficulties are expected, then it may be prudent not to take on some of the new projects.



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Financial Schedules

The Finance Schedules for a construction project for a contractor's includes:

- Cumulative Cost vs. Time (S-Curve)
- Cumulative Value vs. Time
- Cumulative Progress Payment Receivable vs. Time



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Cumulative Cost vs. Time

The expenditure to be incurred from time to time can be computed using the costs of activities (obtained from estimating department) and the construction programme (bar chart or network).

The cost vs. time curve must not be confused with the cash out-flow curves. The cash out-flows take place at the actual time of settlement of bills. The supplier of materials may extend credit over a period, the plant hiring company may allow time to settle dues, and sub-contractors will be paid after a period of delay. All these would help the contractor in financing the project by reducing the working capital requirement.



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Value vs. Time

Value of work may be calculated using the activity costs, the relevant mark-up and the construction programme.



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Retention

Work-in-progress is measured at regular (usually monthly) intervals or assessed as agreed to. Then the contractor makes a Progress Claim. This is checked by the Engineer/Architect and then certified for payment. The Owner holds back a certain amount and pays the balance. The money held back is known as the Retention.

There is an interval between making the claim and receiving payment referred to as the payment delay period.

Progress Payment = Value of work during the period - Retention



Cash Flow Forecasting

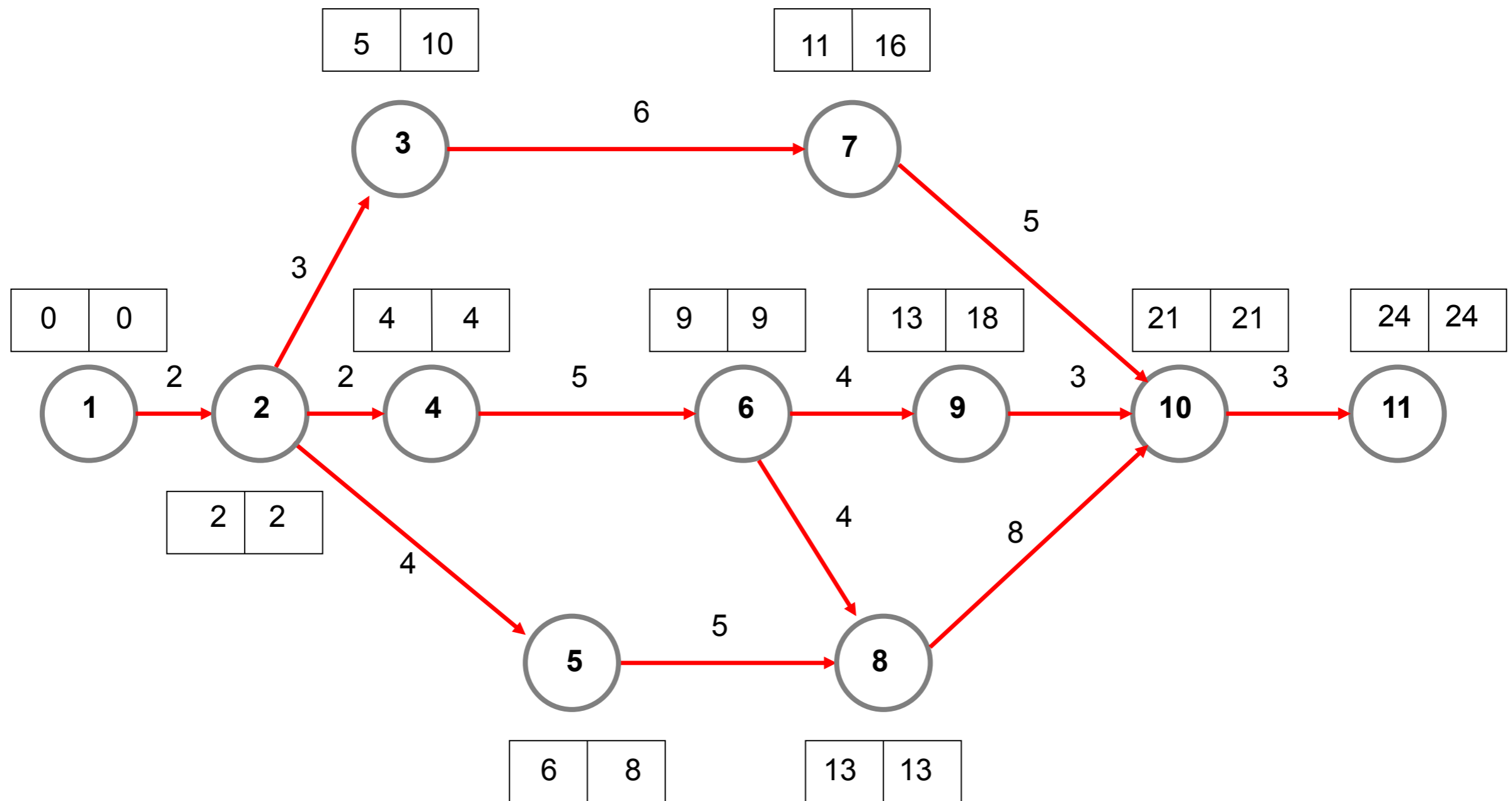
Example

Direct Costs of Activities

| Activity | Direct cost \$ | Activity | Direct cost \$ |
|----------|-------------------|----------|-------------------|
| 1 – 2 | 2,400 | 6 – 9 | 8,000 |
| 2 – 3 | 13,500 | 6 – 8 | 12,800 |
| 2 – 4 | 13,600 | 7 – 10 | 9,000 |
| 2 – 5 | 3,200 | 8 – 10 | 24,000 |
| 3 – 7 | 15,000 | 9 – 10 | 3,600 |
| 4 – 6 | 15,000 | 10 – 11 | 3,000 |
| 5 – 8 | 6,000 | | |

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Example



Cash Flow Forecasting

Example

The mark-up used is 20% on all costs. Progress measurements will be made every 4 weeks with payments due 4 weeks later. 10 % retention will be deducted and will be released in full 4 weeks after the last payment is received. The work on all activities is to start at their respective earliest times and to continue without delay. The value of work in progress is to be taken as proportional to the time spent on it. Assume that the cash out flow for the expenses takes place at the time that the expenses are incurred.

1. Draw the S-curve for the project
2. Draw the cumulative cash out-flow curve
3. Draw the cumulative income profile.
4. Draw the Net cash flow and the working capital diagrams.

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Cost of Activities in Progress

| Activity | Duration | Direct Cost | Time in Weeks | | | | | | | |
|---------------|----------|-------------|---------------|-------|-------|-------|-------|------|------|--|
| | | | 0 | 4 | 8 | 12 | 16 | 20 | 24 | |
| 1-2 | 2 | 2400 | 2400 | | | | | | | |
| 2-4 | 2 | 13600 | 13600 | | | | | | | |
| 4-6 | 5 | 15000 | | 12000 | 3000 | | | | | |
| 6-8 | 4 | 12800 | | | 9600 | 3200 | | | | |
| 8-10 | 8 | 24000 | | | | 9000 | 12000 | 3000 | | |
| 10-11 | 3 | 3000 | | | | | | | 3000 | |
| 2-5 | 4 | 3200 | 1600 | 1600 | | | | | | |
| 5-8 | 5 | 6000 | | 2400 | 3600 | | | | | |
| 2-3 | 3 | 13500 | 9000 | 4500 | | | | | | |
| 3-7 | 6 | 15000 | | 7500 | 7500 | | | | | |
| 7-10 | 5 | 9000 | | | 1800 | 7200 | | | | |
| 6-9 | 4 | 8000 | | | 6000 | 2000 | | | | |
| 9-10 | 3 | 3600 | | | | 3600 | | | | |
| Indirect Cost | | | 2000 | 2000 | 2000 | 2000 | 2000 | 2000 | 2000 | |
| Direct Cost | | | 26600 | 28000 | 31500 | 25000 | 12000 | 6000 | | |
| Total Cost | | | 28600 | 30000 | 33500 | 27000 | 14000 | 8000 | | |

Cash Flow Forecasting

Cumulative Cash Flows

Calculate value of work in progress, cumulative cost, cumulative value, cumulative retention, and cumulative claim as shown in Table.

(All cash flows in \$1000)

| Time (weeks) | 0 | 4 | 8 | 12 | 16 | 20 | 24 # | 28 | 32 |
|---|---|------|------|-------|-------|-------|---------|---------|---------|
| Monthly total cost | | 28.6 | 30.0 | 33.5 | 27.0 | 14.0 | 8.0 | | |
| Cumulative cost (This is also the Cum. Cash Outflow) | | 28.6 | 58.6 | 92.1 | 119.1 | 133.1 | 141.1 # | 141.1 # | 141.1 # |
| Monthly total value | | 34.3 | 36.0 | 40.2 | 32.4 | 16.8 | 9.6 | | |
| Cumulative value | | 34.3 | 70.3 | 110.5 | 142.9 | 159.7 | 169.3 # | 169.3 # | 169.3 # |
| Cumulative retention | | 3.4 | 7.0 | 11.1 | 14.3 | 16.0 | 16.9 # | 16.9 # | 16.9 # |
| 90% Monthly Value | | 30.9 | 32.4 | 36.2 | 29.2 | 15.1 | 8.6 | | |
| Paid at | | | 30.9 | 32.4 | 36.2 | 29.2 | 15.1 | 8.6 | |
| Cum. Cash In-flow | | | 30.9 | 63.3 | 99.5 | 128.6 | 143.7 | 152.4 | 169.3 * |

*Retention released
#Project Completed

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New Cash Flows and Working Capital



| Time | Cum. Net Cash Flow | | Working Capital | |
|------|--------------------|-------|-----------------|------|
| | a) | b) | a) | b) |
| 0 | 0 | | 0 | |
| 4 | -28.6 | -28.6 | 28.6 | 28.6 |
| 8 | -58.6 | -27.7 | 58.6 | 27.7 |
| 12 | -61.2 | -28.8 | 61.2 | 28.8 |
| 16 | -55.8 | -19.6 | 55.8 | 19.6 |
| 20 | -33.6 | -4.4 | 33.6 | 4.4 |
| 24 | -12.4 | +2.7 | 12.4 | 0 |
| 28 | +2.7 | +11.3 | 0 | 0 |
| 32 | +11.3 | +28.2 | 0 | 0 |

| Time (weeks) | 0 | 4 | 8 | 12 | 16 | 20 | 24 # | 28 | 32 |
|--------------------|---|------|------|------|------|------|------|-----|------------|
| Monthly total cost | | 28.6 | 30.0 | 33.5 | 27.0 | 14.0 | 8.0 | | |
| Paid at | | | 30.9 | 32.4 | 36.2 | 29.2 | 15.1 | 8.6 | 16.9 (Ret) |

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Cumulative Cast Flows

The cumulative cost vs. time curve is commonly referred to as the S-Curve.

If the cash flow for any expense is assumed to take place at the time the expense is incurred, then the cumulative cash out-flow curve will be identical to the S-curve. It is possible to fine tune the cash out-flow to take into account the period of credit available in making payment to suppliers, plant hire, and sub-contractors. This will make the cash flow computations more complicated.

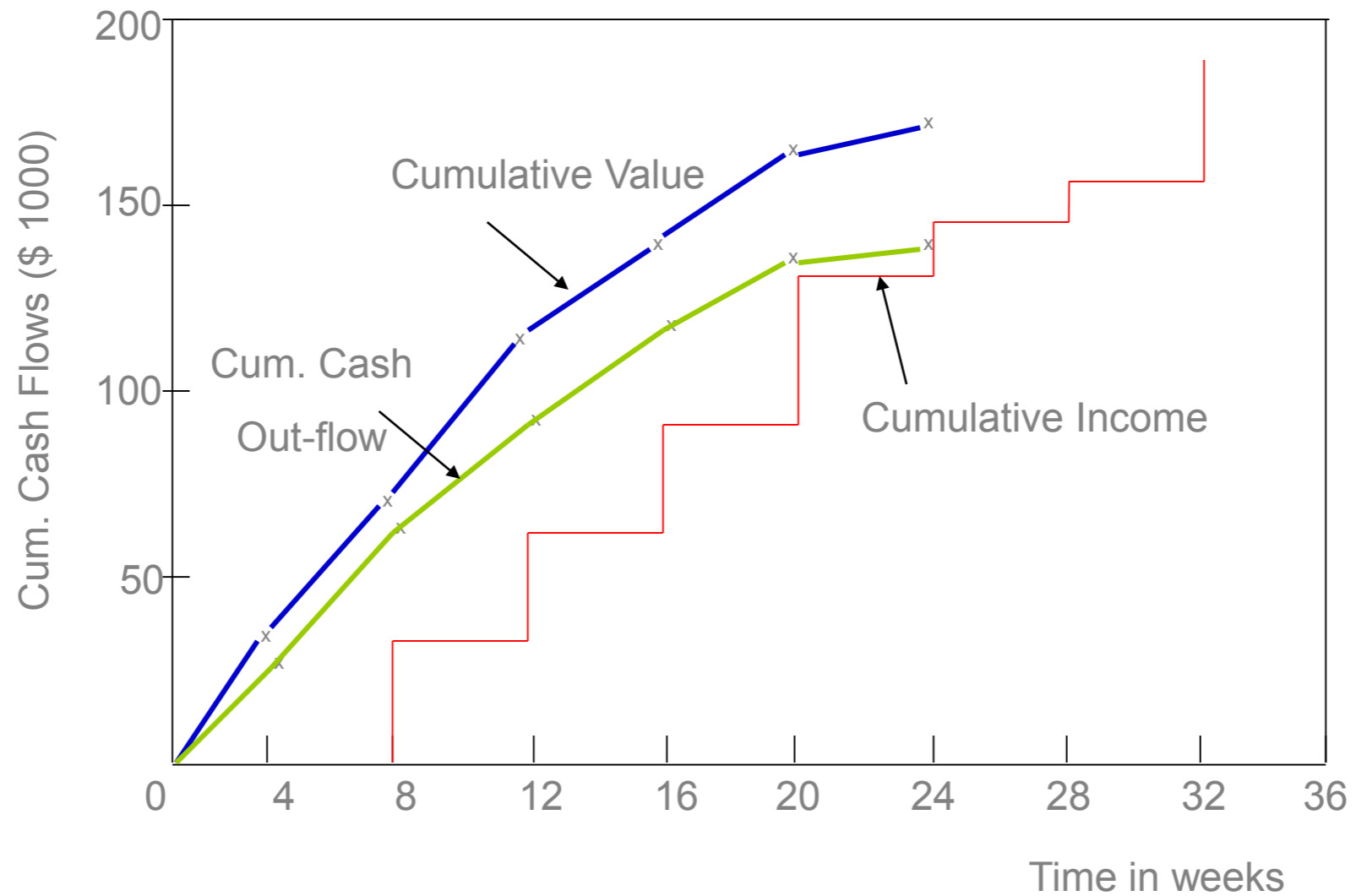
Payment on progress claim is received one month (4 weeks) after the claim is made.

These are discrete cash flows, and thus the cumulative cash in-flow curve is a step-wise function.



Cash Flow Forecasting

Cumulative Cash Flows Curves



Cash Flow Forecasting

Net Cash Flow

The cumulative net cash flow diagram that can be derived from the cumulative cash flow curves.

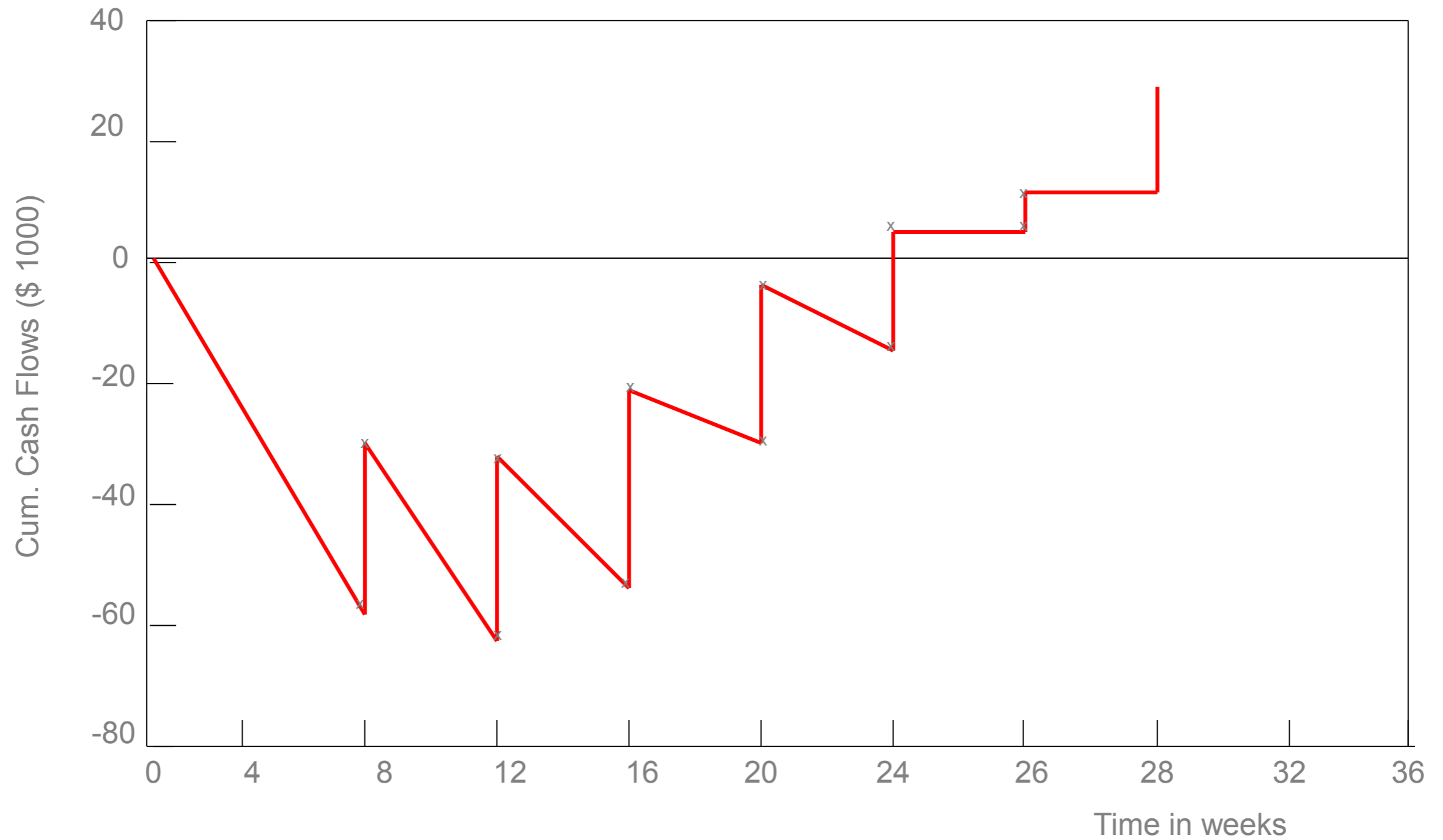
It should be noted that the cumulative net cash flow is negative till the end of the project - a frequent occurrence if the profit margin is low and the retention is high.

The variation of the net cash flow with time takes a saw-tooth pattern. This pattern is due to the discrete nature of the income profile.



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Cumulative Net Cash Flow



Cash Flow Forecasting

Working Capital Requirements

If the net cash flow is negative, then the contractor must provide funds to finance the construction operations.

Working capital required = - (negative net cash flow)

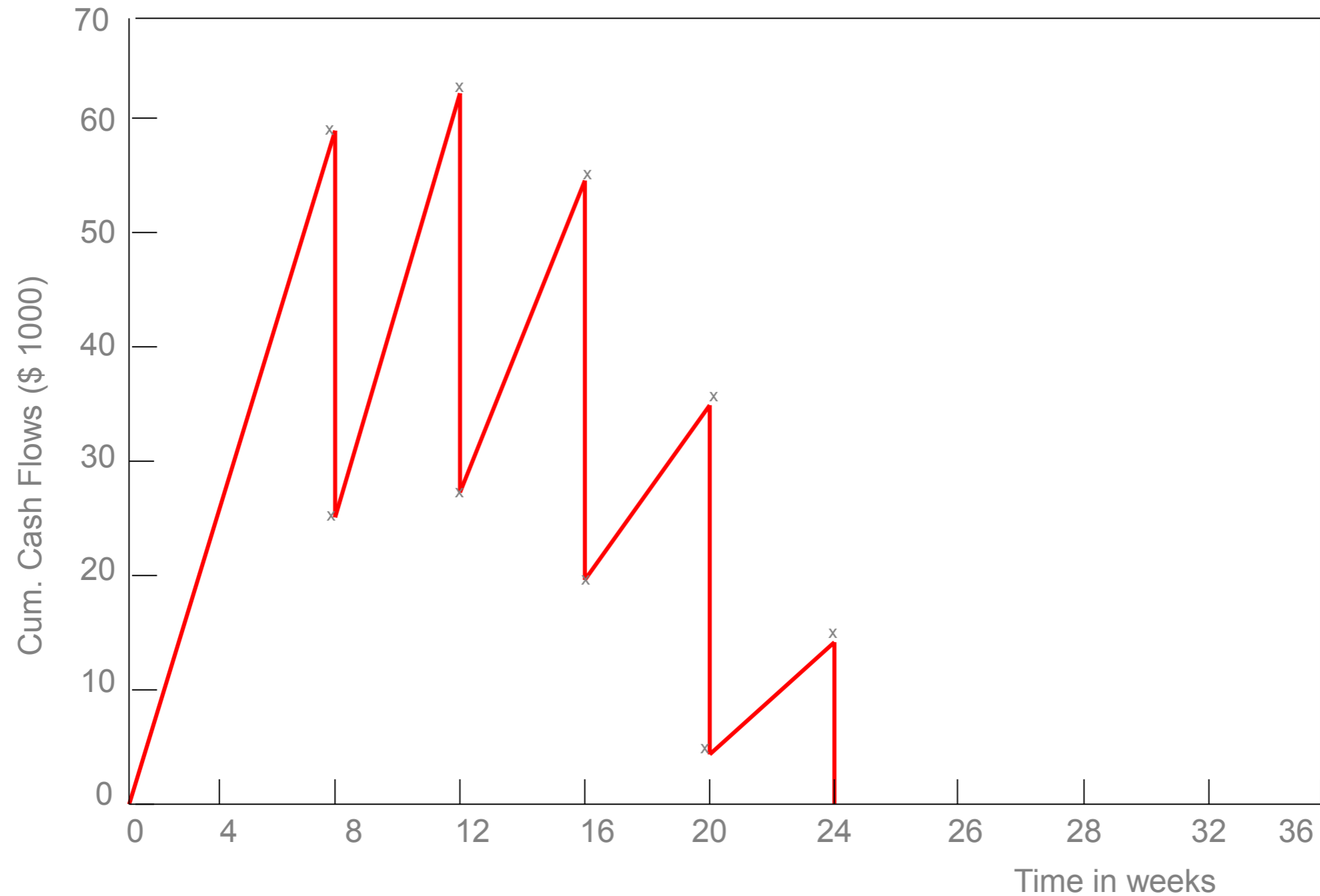
The variation of the working capital required with time also takes a saw-tooth pattern.

From the working capital diagram, the maximum working capital required (WC_m) could be determined.

WC_m an important parameter in deciding on the financial feasibility of the project.

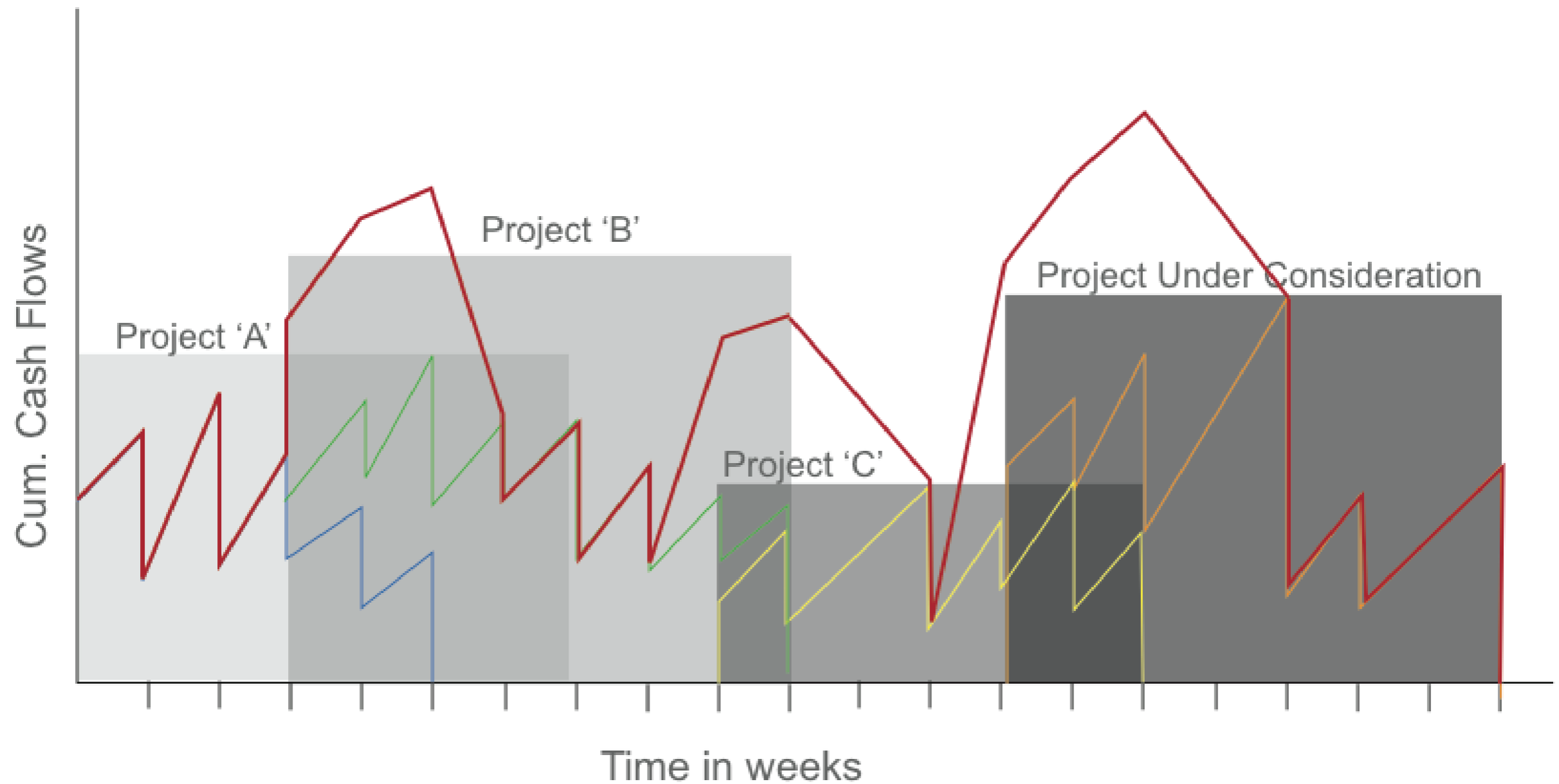
Cash Flow Forecasting

Working Capital Requirements



Cash Flow Forecasting

Working Capital Requirements



Cash Flow Forecasting

Working Capital Requirements

The negative cash flows predicted for the early stages of the project represent locked up capital that is supplied from the company's internal funds or borrowings. It is necessary to take into account the cost of this capital. The cost of capital includes the interest payable on borrowed funds and/or the opportunity cost of the company's funds.

A measure of the interest payable can be obtained by calculating the area between the x-axis and the negative net cash flow curve, or the area between the x-axis and the working capital curve.

This measure is called CAPTIM (capital x time). If the vertical axis is scaled in \$ and the x-axis is in months then CAPTIM is in \$ months.

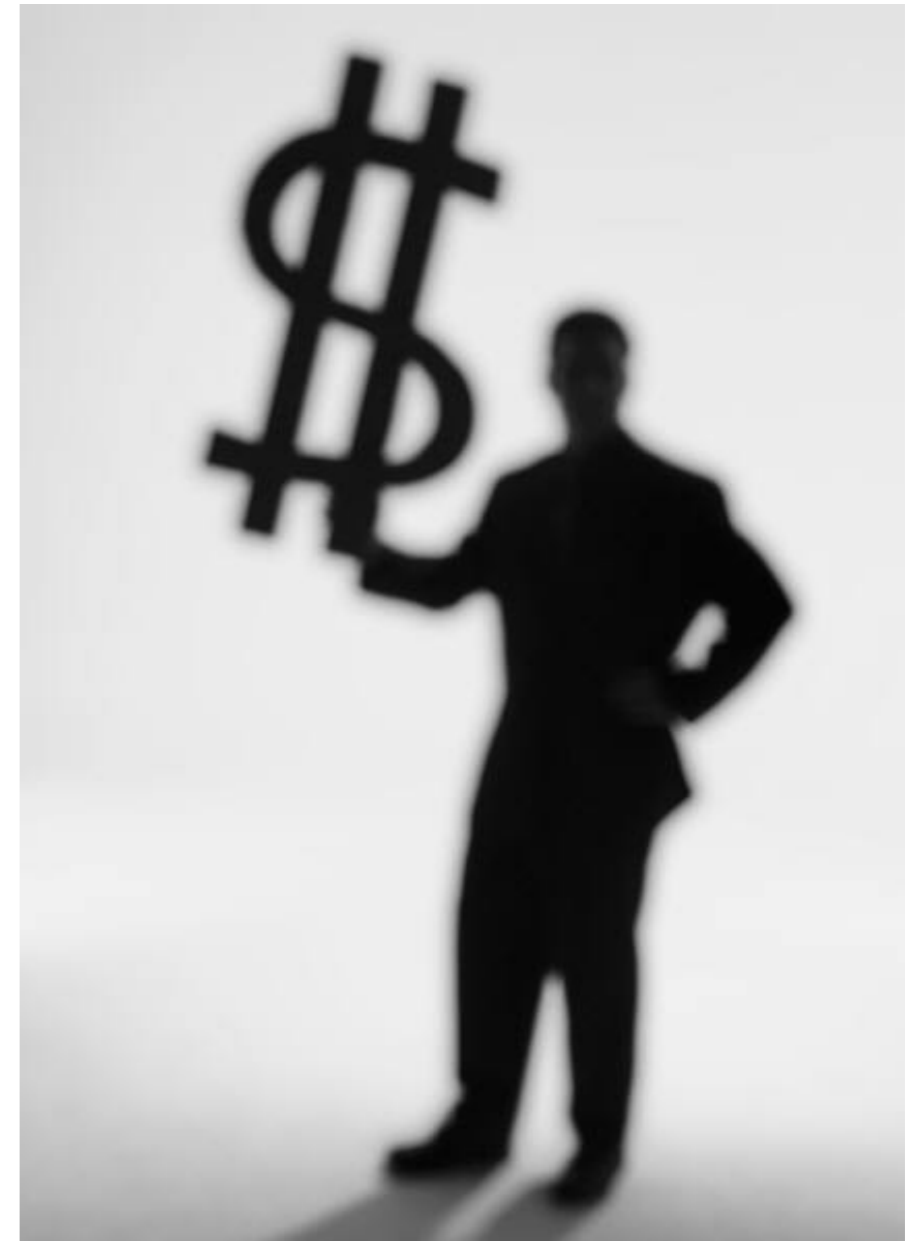


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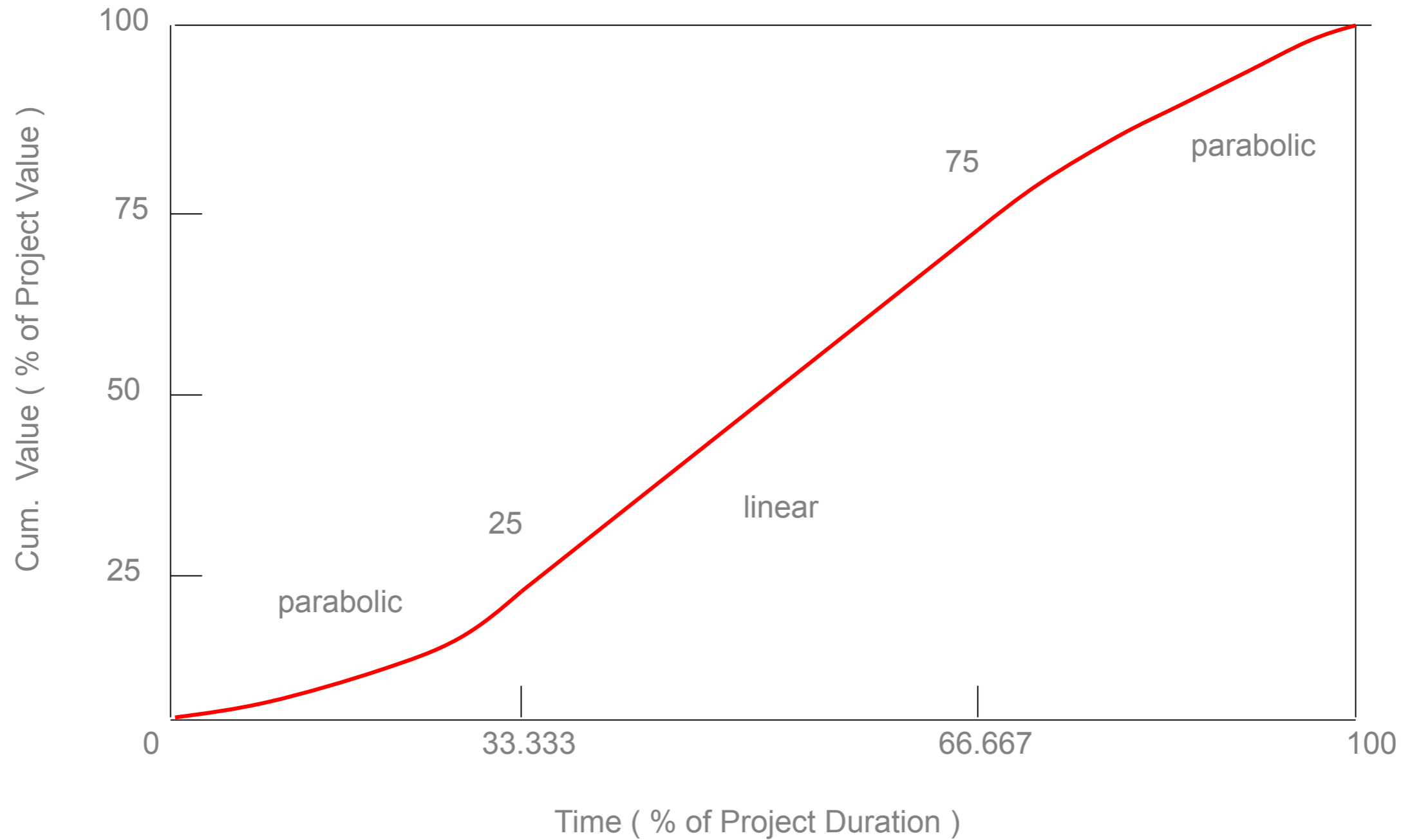
S-Curve Simplification

In the preliminary stages, it may be difficult to generate the cumulative cost curve or the S-curve in the manner described in the example above, as it would require detailed plans and activity schedules.

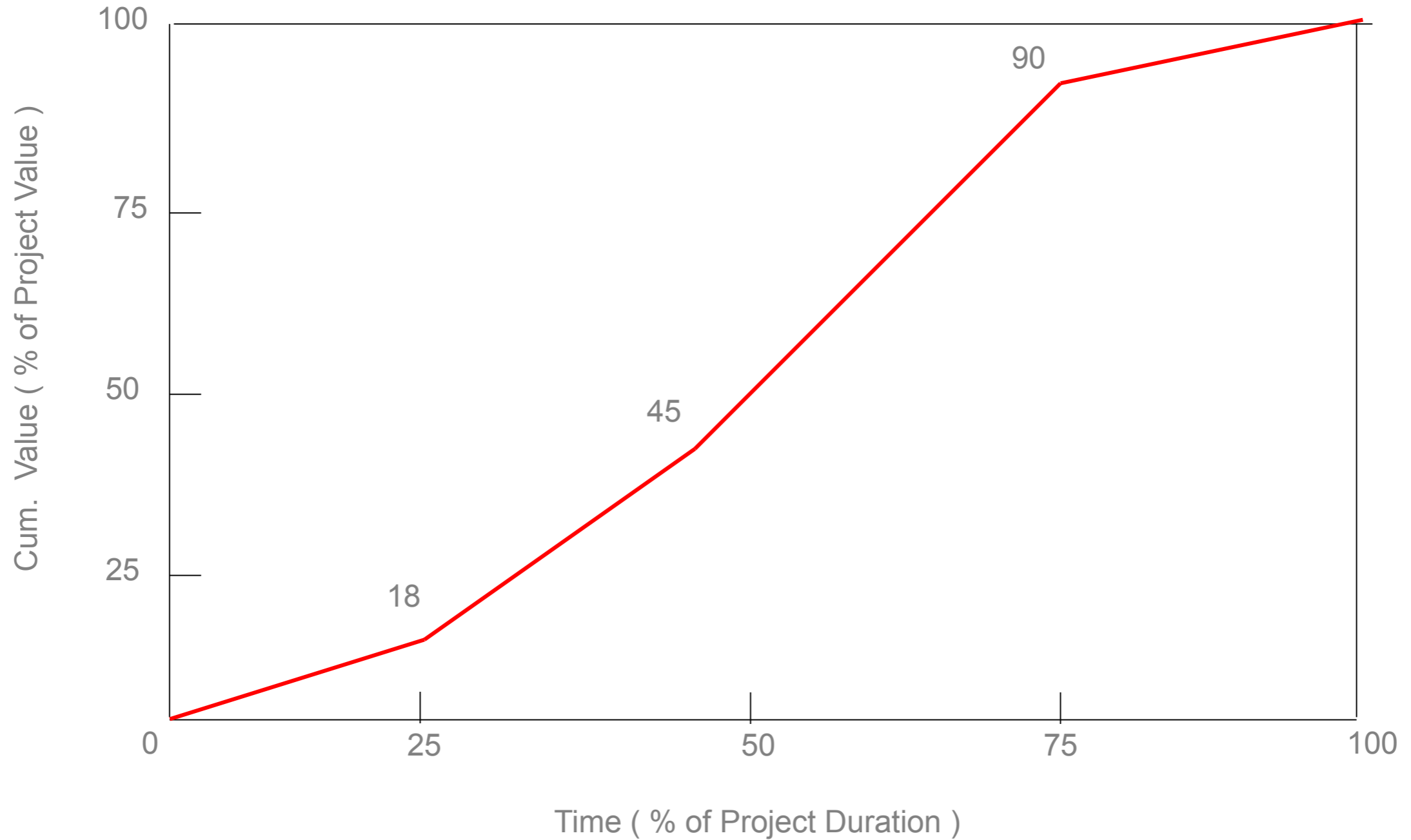
To overcome this difficulty, standard S-curves can be used.



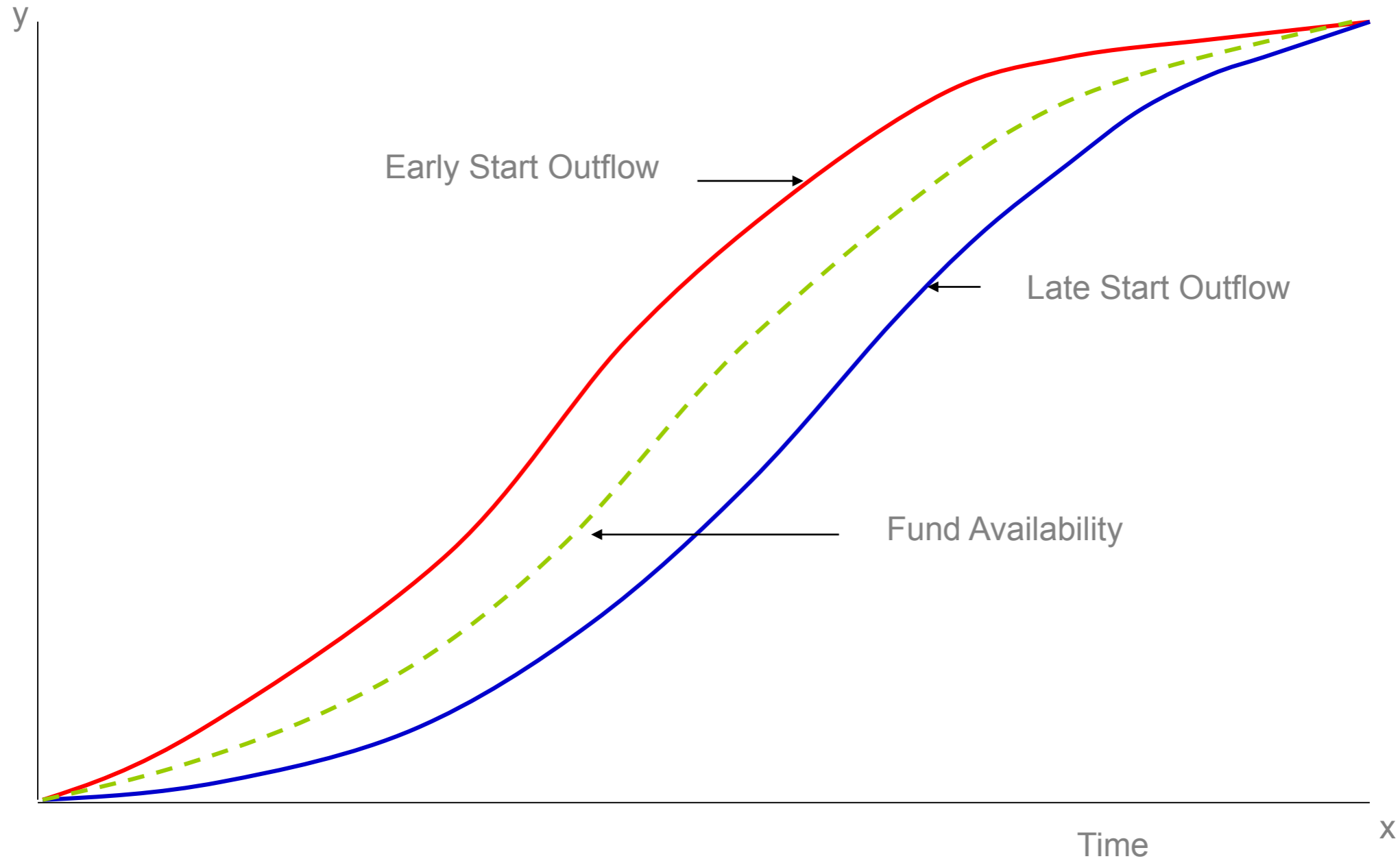
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Cash Flow Forecasting



Cash Flow Forecasting



Cash Flow Forecasting

Factors Affecting Cash Flows

- **Project Factors**
 - Project duration
 - Cost vs. Time profile
 - Proportion of cost of each resource type
- **Contractual Factors**
 - Measurement and certification interval
 - Payment delay period
 - Retention percentage
 - Retention maximum
 - Defects liability period



Cash Flow Forecasting

Factors Affecting Cash Flows

Organizational Factors

- Credit period allowed by suppliers
- Labour payment interval
- Markup or Net Profit
- Billing policy



Cash Flow Forecasting

Last Words

Cash flow forecasting provides a valuable warning system to predict possible insolvency. Preventive measures could be considered and taken in good time. Some of the actions that may be considered are:

- Not taking on a new project if, when the new project is included the company's projected cash requirements exceeds the company's borrowing capacity
- Renegotiating limits on bank overdrafts and short term loans
- The adjustment of the proposed work schedules for the new project and those of the existing projects
- Negotiating extended credit with some suppliers and accepting suppliers' full credit facilities even if it means losing some discounts.

