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Software Project

Analysis

Economic Analysis and Decision-Making Tool for Software Projects designed to help software engineering teams evaluate economic decisions throughout the Software Development Life Cycle (SDLC)

Group Member

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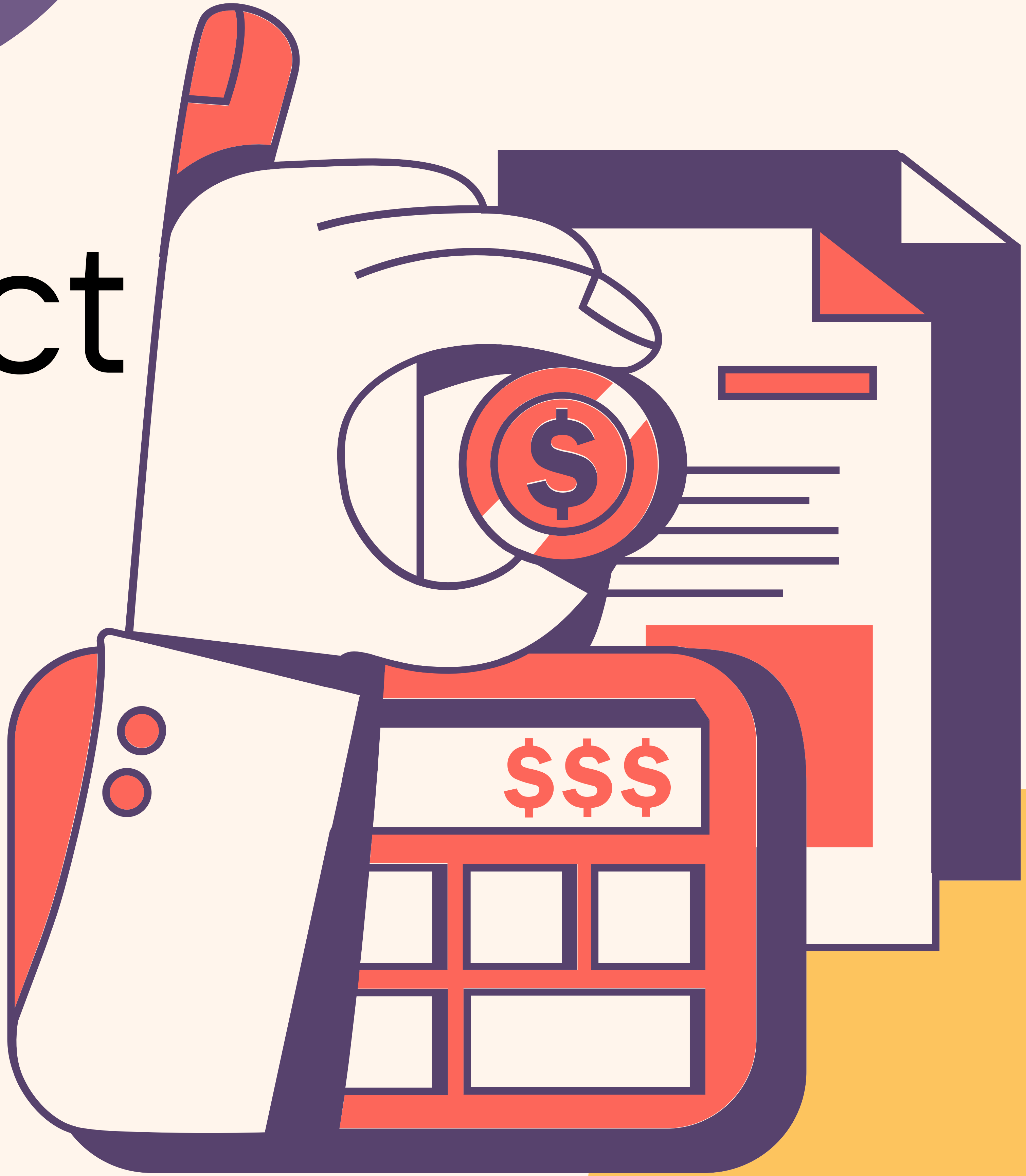

Choice
Of Technologies

A project refers to a sequence of tasks that are carefully planned and executed to achieve a specific objective. Projects are essential in various fields, such as business, engineering, and education, and often require collaboration and resources.

Front End

React
Tailwind CSS

Backend

Flask
scikit-learn
numpy_financial

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Main Modules **Of The System**

An interactive software tool designed to help software engineering teams evaluate economic decisions throughout the Software Development Life Cycle (SDLC).

This tool will encompass various economic models and analyses, enabling stakeholders to make informed decisions regarding project budgeting, scheduling, resource allocation, and risk management.

Cost Estimation

COCOMO II (Empirical Estimation)
Predicted Cost

Budgeting & Cost Management

Financial Metric Computations
Budget Tracking
Cash Flow Analysis

Risk Management

Monte Carlo Simulation
Sensitivity Analysis
Risk Score
Scenario Analysis

Resource Allocation & Optimization

Critical Path Method
Resource Smoothing

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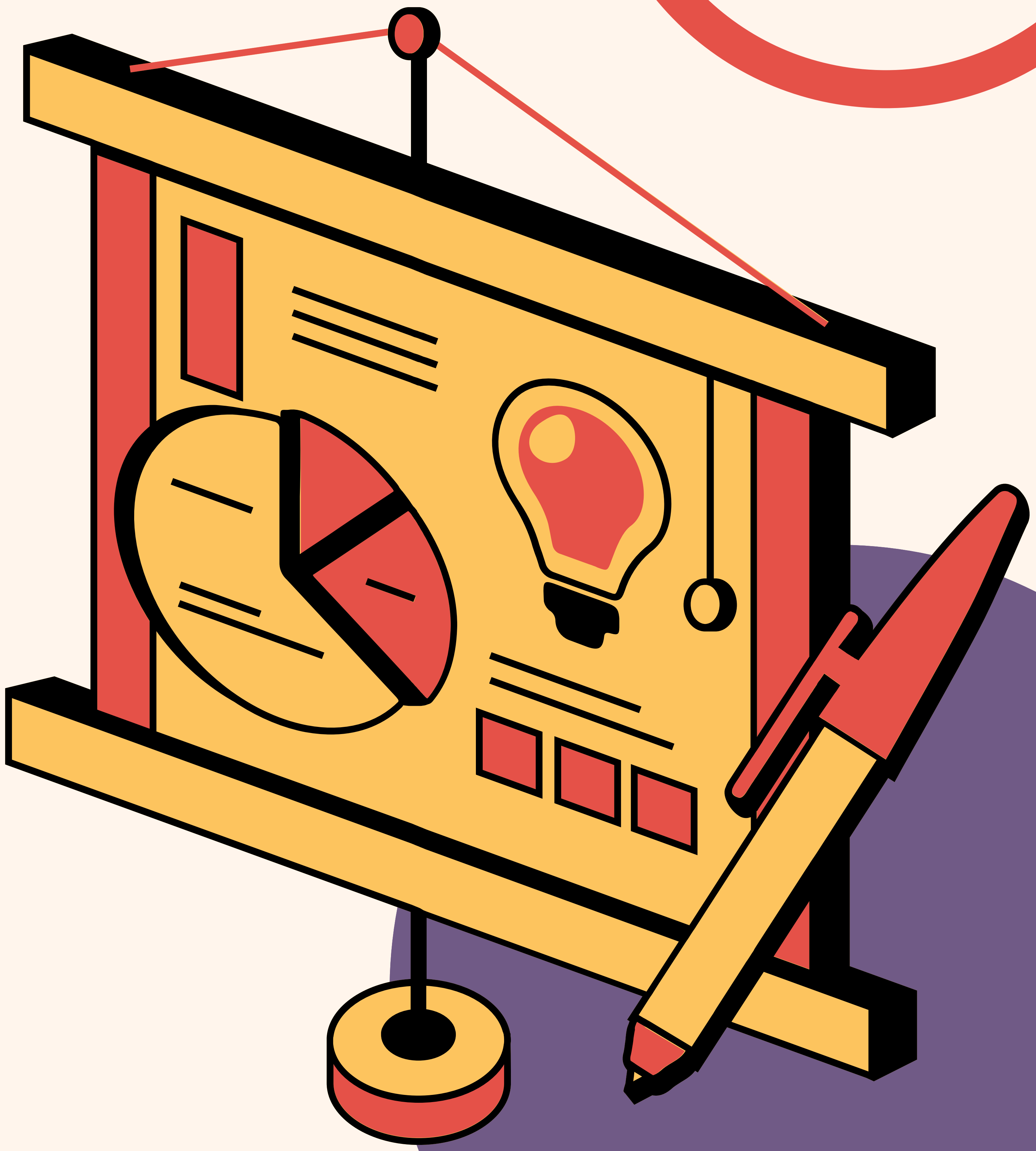
Function Module **Cost Estimation**

Objective : Calculate software development effort, duration, personnel requirements, and cost based on project scale and complexity. Analysis Process :

1. Input : sloc (source lines of code), project_class (project type, O/S/E), and eaf (environment adjustment factor).

2. Output

- E (effort, person-months): Total human input required for development;
- D (duration, months): Total project development time;
- P (personnel): Average number of concurrent developers;
- Total cost: Converted from effort using a fixed rate.



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Budgeting
& Cost Management

Objective : Evaluate project profitability by calculating core financial metrics (NPV, IRR, payback period, etc.).

1. Input :

- Historical cash flow data (obtained via GET /history API, including multi-year cash_flows);
- predicted cost from COCOMO (initial investment);
- User-provided discount_rate (discount rate).
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2. Cash Flow Projection : Generates new project cash flows (cashFlowAnalysis) based on historical trends (e.g., revenue growth).

3. Metric Calculation :

- NPV (Net Present Value): Discounted sum of cash flows using the discount rate;
- IRR (Internal Rate of Return): Discount rate making NPV zero;
- ROI (Return on Investment): Ratio of total profit to initial investment;
- payback_period : Time for cumulative cash flows to turn positive.
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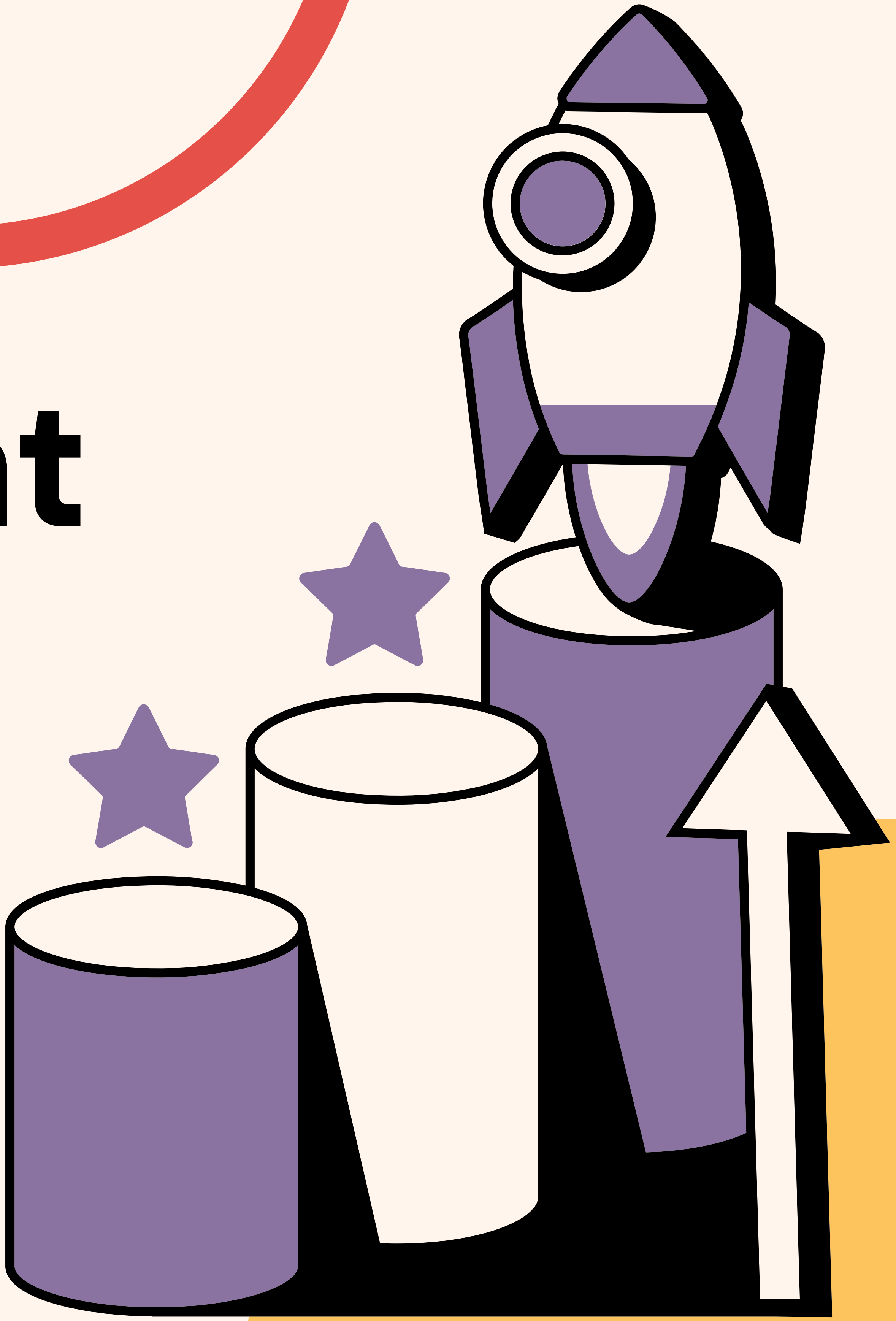
4. Budget Tracking : Compares planned budget (planned) with actual cash flows (actual) to compute variances (variance).



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Risk Management

& Analysis

Objective : Identify project risks and quantify the impact of uncertainties on financial metrics.

1. Risk Identification & Assessment :

- Predefined risk list (e.g., Technical Complexity Risk, Human Resource Risk, Budget Overrun Risk);
- Adjusts risk probabilities based on COCOMO's project_class (higher complexity increases risk probability);
- Computes risk scores (probability × impact) to generate a risk matrix and total risk score
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2. Monte Carlo Simulation : Simulates random fluctuations in cash flows (cashFlowAnalysis) (e.g., ±20% initial investment, ±15% subsequent revenue) to calculate NPV's expected value, standard deviation, and confidence interval (monteCarloResults).

3. Sensitivity Analysis : Tests the impact of key variables (discount rate, development cost, project scale) on NPV (sensitivityAnalysis), identifying the most sensitive risk factors.

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Resource **Allocation & Optimization**

Objective : Optimize resource allocation to balance project cost, duration, and resource utilization. Analysis Process :

1. Input Parameters : User provides resource_allocation_inputs

- tasks (task list with ID, name, duration, dependencies);
- resource_capacity (resource availability, e.g., developers, testers).

2. Critical Path Analysis : Determines the longest task sequence (criticalPath) via task dependencies to set the minimum project duration (projectDuration).

3. Resource Utilization : Calculates load for each resource (developers/testers) over task periods, outputting utilization rates (resourceUtilization).

4. Optimization Simulation : Uses resource leveling/smoothing algorithms (e.g., adjusting task order/parallelism) to generate optimized cost (optimized.cost) and duration (optimized.duration), and computes savings (savings).

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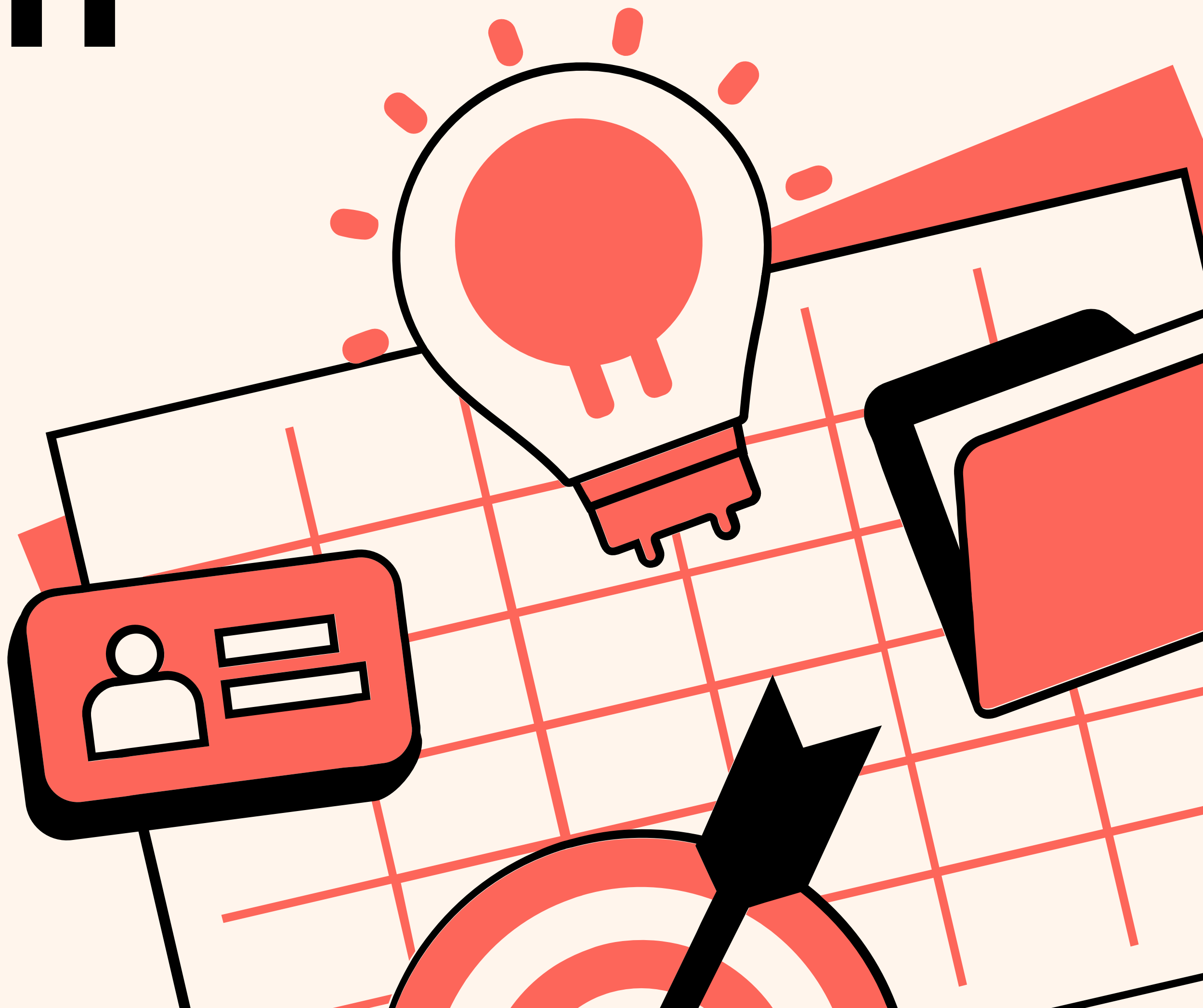
Demonstration



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Thank You **For Your Attention**

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