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B.Tech Computer Science & Engineering | 6th Sem | Div - C

SOFTWARE HELPER TOOLS

Objective

The objective of this project is to develop a mobile application using Flutter that assists students and professionals in applying key concepts of Software Project Management (SPM). The app includes interactive tools for :

- Cost Benefit Analysis
- Process Model Selection
- PERT Estimation
- Critical Path Calculation

This toolkit is designed to enhance understanding and practical application of theoretical SPM models.

Code Snippets for Key Functions

1. **Cost Benefit Analysis**

```
CostBenefitResult calculateCBA(double initial, List<double> flows, double rate, int lifespan) {
  double npv = -initial + flows.asMap().entries.map((e) => e.value / pow(1 + rate, e.key + 1)).reduce((a, b) => a + b);
  double netProfit = flows.reduce((a, b) => a + b) - initial;
  double roi = netProfit / initial * 100;
  return CostBenefitResult(
    initialInvestment: initial,
    cashFlows: flows,
    discountRate: rate,
    projectLifespan: lifespan,
    netProfit: netProfit,
    averageAnnualProfit: netProfit / lifespan,
    roi: roi,
    npv: npv,
    irr: 0.0, // Simplified; actual IRR requires iterative calculation
    npvCalculationTable: [],
    irrComparisonTable: [],
  );
}
```

2. **Process Model Selection**

```
ProcessModelResult selectProcessModel(String projectType) {
  if (projectType == "small") {
    return ProcessModelResult(
      modelName: "Waterfall",
      justification: "Simple, predictable projects",
      characteristics: ["Linear", "Defined stages"],
    );
  } else {
    return ProcessModelResult(
      modelName: "Agile",
      justification: "Flexible, iterative projects",
      characteristics: ["Iterative", "Adaptive"],
    );
  }
}
```

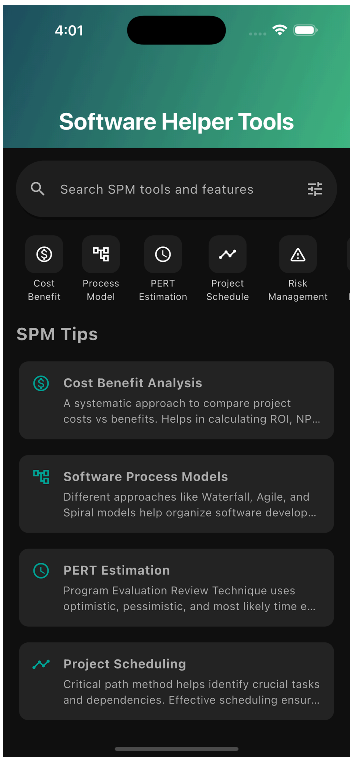
3. PERT Estimation

```
PertEstimationResult calculatePERT(List<PertActivity> activities) {
  for (var act in activities) {
    act.expectedTime = (act.optimisticTime + 4 * act.mostLikelyTime +
act.pessimisticTime) / 6;
    act.variance = pow((act.pessimisticTime - act.optimisticTime) / 6, 2);
  }
  var criticalPath = []; // Logic to determine critical path (simplified here)
  double totalDuration = activities.map((a) => a.expectedTime!).reduce(max);
  double totalVariance = activities.map((a) => a.variance!).reduce((a, b) => a + b);
  return PertEstimationResult(
    activities: activities,
    criticalPath: criticalPath,
    totalProjectDuration: totalDuration,
    totalVariance: totalVariance,
    standardDeviation: sqrt(totalVariance),
    zScore: 0.0, // Requires target time input
    completionProbability: 0.0, // Simplified
  );
}
```

4. Critical Path Calculation

```
void calculateCriticalPath(List<Activity> activities) {
  // Forward Pass
  for (var activity in activities) {
    activity.earlyStart = activity.predecessors.isEmpty
        ? 0
        : activities.where((a) => activity.predecessors.contains(a.id)).map((a) =>
a.earlyFinish).reduce(max);
    activity.earlyFinish = activity.earlyStart + activity.duration;
  }
  // Backward Pass
  var maxFinish = activities.map((a) => a.earlyFinish).reduce(max);
  for (var activity in activities.reversed) {
    activity.lateFinish = activity == activities.last ? maxFinish :
activities.where((a) => a.predecessors.contains(activity.id)).map((a) =>
a.lateStart).reduce(min);
    activity.lateStart = activity.lateFinish - activity.duration;
    activity.totalFloat = activity.lateStart - activity.earlyStart;
    activity.isCritical = activity.totalFloat == 0;
  }
}
```

Output



Software Helper Tools

Search SPM tools and features

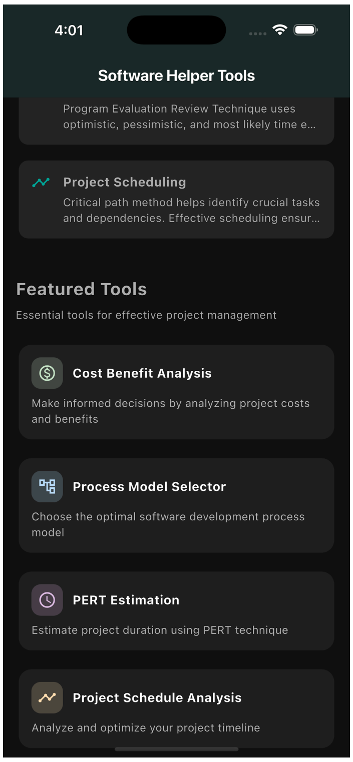
SPM Tips

Cost Benefit Analysis
A systematic approach to compare project costs vs benefits. Helps in calculating ROI, NP...

Software Process Models
Different approaches like Waterfall, Agile, and Spiral models help organize software develop...

PERT Estimation
Program Evaluation Review Technique uses optimistic, pessimistic, and most likely time e...

Project Scheduling
Critical path method helps identify crucial tasks and dependencies. Effective scheduling ensur...



Software Helper Tools

Program Evaluation Review Technique uses optimistic, pessimistic, and most likely time e...

Project Scheduling
Critical path method helps identify crucial tasks and dependencies. Effective scheduling ensur...

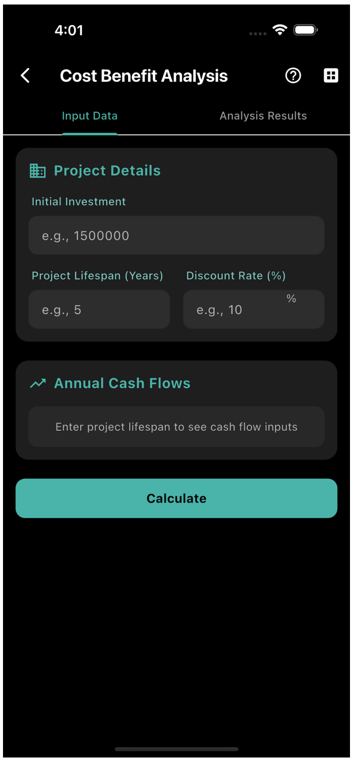
Featured Tools
Essential tools for effective project management

Cost Benefit Analysis
Make informed decisions by analyzing project costs and benefits

Process Model Selector
Choose the optimal software development process model

PERT Estimation
Estimate project duration using PERT technique

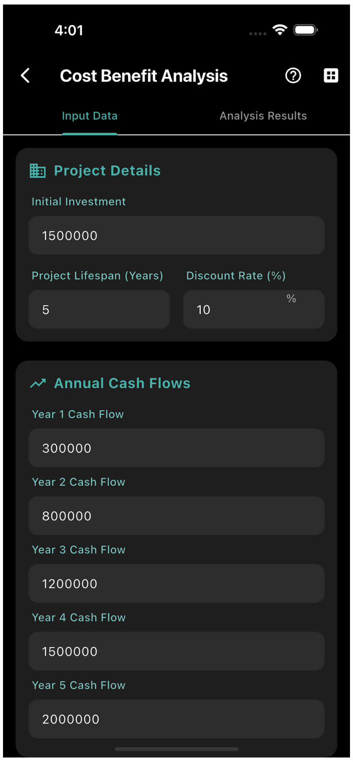
Project Schedule Analysis
Analyze and optimize your project timeline



Cost Benefit Analysis

Project Details
Initial Investment: e.g., 1500000
Project Lifespan (Years): e.g., 5
Discount Rate (%): e.g., 10 %

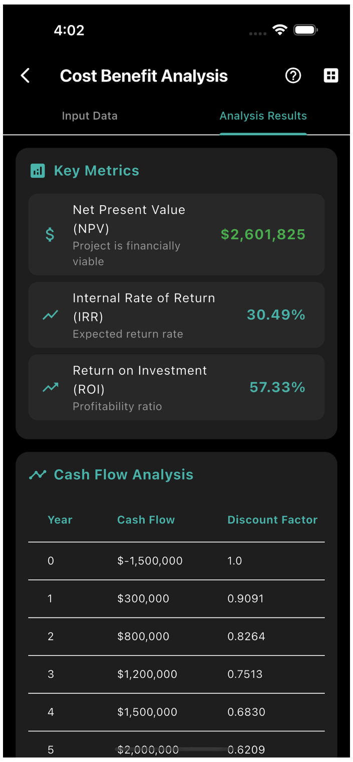
Annual Cash Flows
Enter project lifespan to see cash flow inputs



Cost Benefit Analysis

Project Details
Initial Investment: 1500000
Project Lifespan (Years): 5
Discount Rate (%): 10 %

Annual Cash Flows
Year 1 Cash Flow: 300000
Year 2 Cash Flow: 800000
Year 3 Cash Flow: 1200000
Year 4 Cash Flow: 1500000
Year 5 Cash Flow: 2000000



Cost Benefit Analysis

Key Metrics

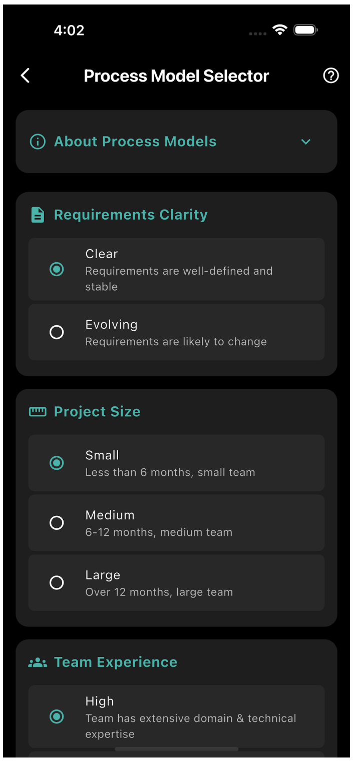
Net Present Value (NPV) $2,601,825
Project is financially viable

Internal Rate of Return (IRR) 30.49%
Expected return rate

Return on Investment (ROI) 57.33%
Profitability ratio

Cash Flow Analysis

Year	Cash Flow	Discount Factor
0	$-1,500,000	1.0
1	$300,000	0.9091
2	$800,000	0.8264
3	$1,200,000	0.7513
4	$1,500,000	0.6830
5	$2,000,000	0.6209



Process Model Selector

About Process Models

Requirements Clarity
● Clear
Requirements are well-defined and stable
○ Evolving
Requirements are likely to change

Project Size
● Small
Less than 6 months, small team
○ Medium
6-12 months, medium team
○ Large
Over 12 months, large team

Team Experience
● High
Team has extensive domain & technical expertise

Tools / Technologies

- Flutter (UI toolkit for natively compiled mobile applications)
- Dart (Programming language for Flutter)
- VS code (Development environment)
- Firebase (optional – if used for data storage or analytics)
- Git & GitHub (for version control)

Future Scope

- Add more project management features like Risk Management, Gantt Charts, Resource Allocation.
- Export results to PDF or Excel.
- Add user accounts for saving project data.
- Integrate cloud database to store and retrieve project history.
- Add AI-based suggestions for model selection or cost estimation.