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USING TECHNICAL DEBT DATA IN DECISION MAKING:

Potential Decision Approaches

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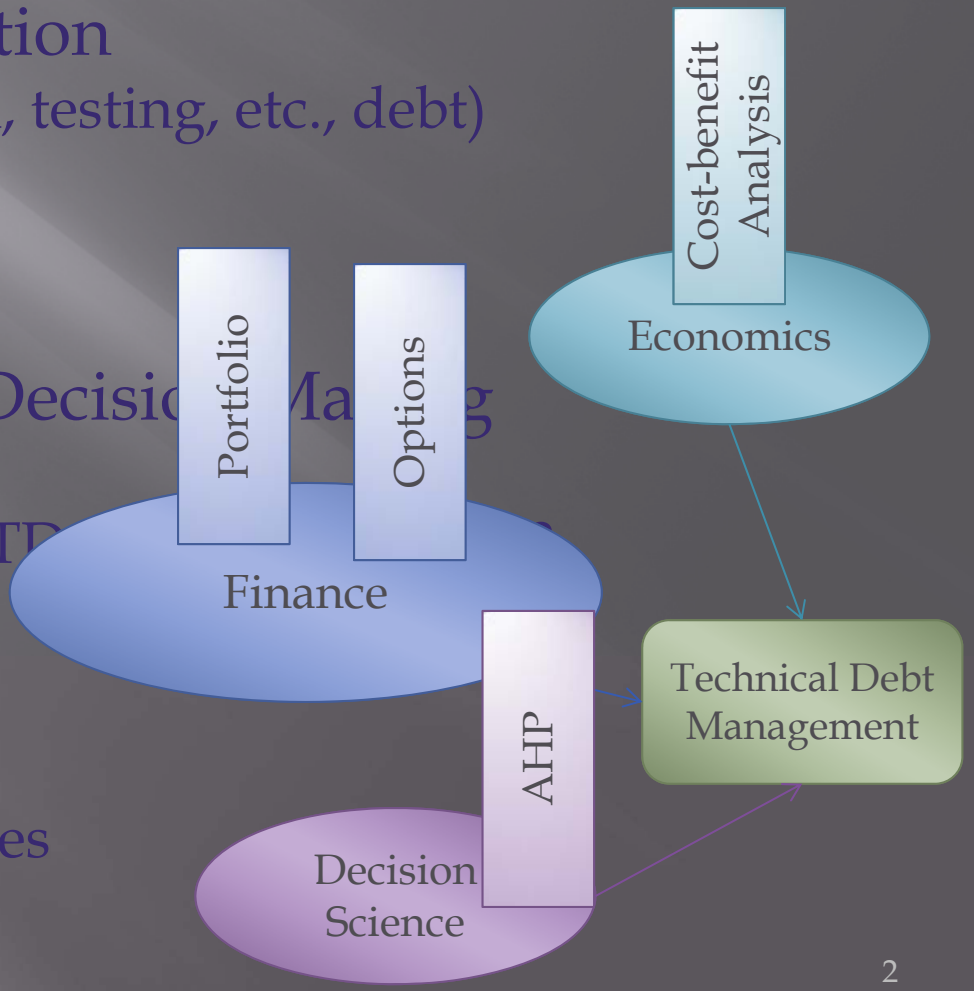
Introduction

- Managing Technical Debt should involve…
- Gathering TD information
  - TD items (defect, design, testing, etc., debt)
  - Principal and interest
  - Costs and benefits
  - Impact and risk
- …and Feeding it into Decisio Ma g
  - Which TD to pay off?
  - What's the right mix of TD
  - Release Planning
- Decision Approaches
  - Different domains
  - Strengths and weaknesses



Cost-Benefit Analysis (1)

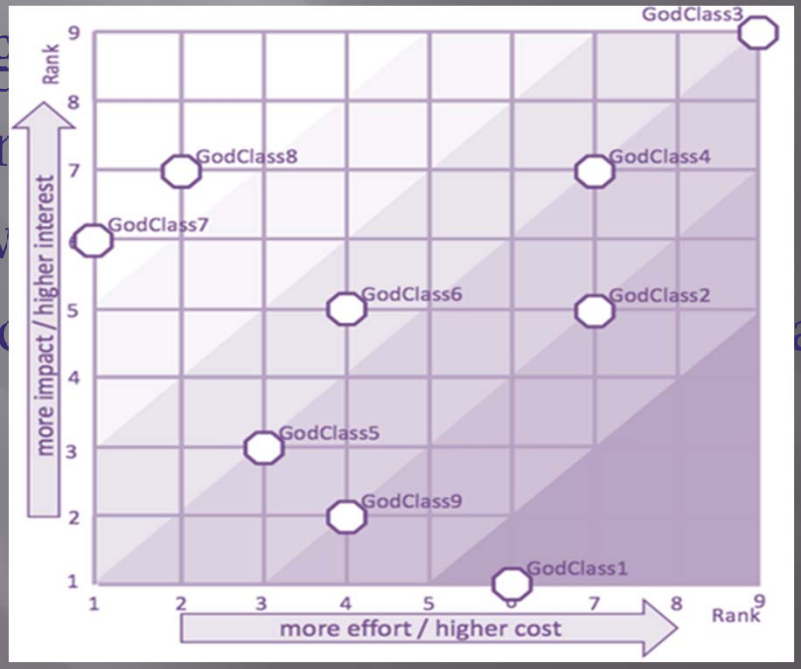
- General TD Management Framework
- Technical Debt Item
- Decision on Paying off a Technical Debt Item
  - Cost: Principal
  - Benefit: Interest Amount
  - Criterion: Benefit > Cost

ID	20
Date	7/18/2009
Responsible	Rose Angel
Type	Documentation
Location	Module S
Description	In the last release, function F was added to module S, but the documentation has not been updated to reflect this change.
Principal	1.5 person-day
Interest Amount	2.5 person-day
Interest Probability	70%
Time Frame	In the next release

TD Identification

Cost-Benefit Analysis (2)

- Decision on Paying off Multiple TD items
  - Example: Cost/Benefit Matrix
- Advantag
  - A baselir
  - Works w
  - Increasec availability



Portfolio Approach (1)

- Portfolio
  - Combination of different types of assets
  - Risk reduction strategy
  - Decision making process
    - Determining the types and amounts of assets
- Basic Principle
  - Different volatility and performance patterns
  - Reduced investment risk through diversificati
- Portfolio Model
  - Mean-variance analysis: return and risk
  - Constrained optimization problem: maximize return or minimize risk

weighted sum of the expected returns of the constituent assets

standard deviation of the portfolio return : a function of asset risk and correlations of assets

Portfolio Approach (2)

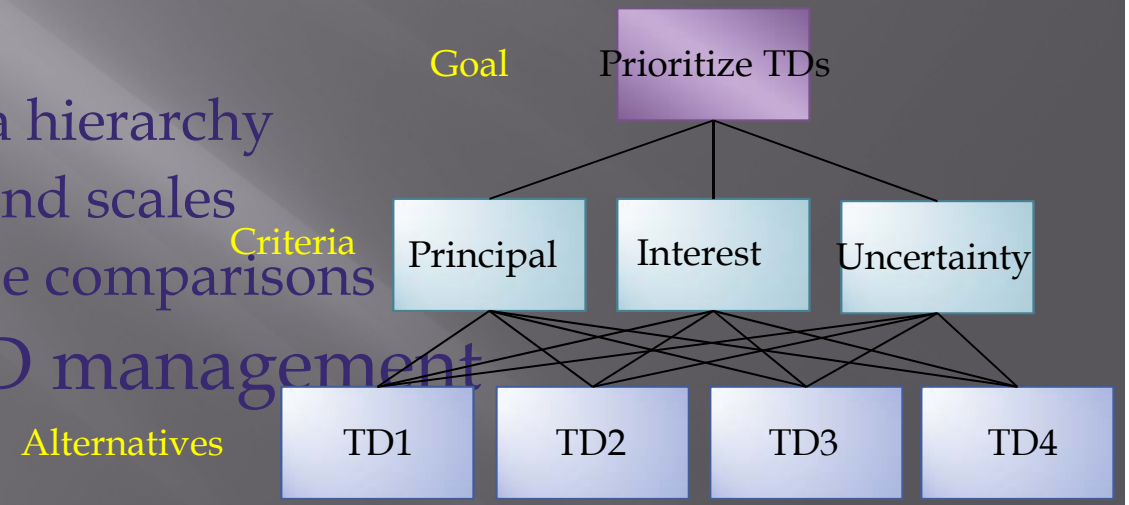
- Transformation to TD Management
  - TD item -> Asset
  - Principal – interest (net benefit) -> asset return
  - Interest standard deviation -> risk of asset return
  - Relation with other TD items -> correlations between assets
- Advantages and Disadvantages
  - Consideration of relations among TD items
  - Inapplicability of the assumptions
    - Normal distribution of asset return
    - Continuous divisibility of assets

Options

- Finance Domain
  - Derivative financial instrument
  - Future transaction on an asset at a reference price
  - Buying the right, but not the obligation
- Technical Debt Management
  - Investment Decision: Refactoring a module or not?
  - A module provides the right to be replaced by a better one.
  - Option value is represented by the changing cost in the future
- Limitation
  - Difficulty in determining the key parameters (Black-Scholes model)
  - Technical Potential is hard to estimate (NOV Model)

Analytic Hierarchy Process (AHP)

- Method
  - Key elements: Goal, Criteria and Alternatives
  - Process
    - Construct criteria hierarchy
    - Assign weights and scales
    - Perform pair-wise comparisons
- Application to TD management
- Advantages
  - Group decision making
  - Quantitative and qualitative criteria
  - Objective and subjective criteria



Discussion

- Questions
  - Applicability
  - Strengths and Weakness
  - Relations between these approaches
  - Cost-effectiveness
- Evaluation
  - Case studies for each approach
  - Comparisons of different approaches
    - Experiments in a lab setting
    - Case studies in industrial contexts
- Long-term Vision
  - Provide a technical debt management tool kit

Questions?