

The 2nd MTD Workshop
Waikiki, Hawaii
May 23, 2011

A Portfolio Approach

to Technical Debt Management

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Overview

- Effects of Technical Debt
- Goals of Managing Technical Debt
 - Balance short-term **Short Term Effect** with long **Long Term Effect**
 - Make better decisions
 - What technical debt items should be incurred or paid?
 - When to incur or pay them?
- Perspectives
 - Technical debt is a software risk
 - Potential loss – re **Reduced time/effort** (extra effort to maintain (interest))
 - Uncertainty – may **Quality decline** (incur)
 - Risk management
 - Technical debt is an asset
 - Short-term benefit
 - Variable returns through different investment strategies
 - Investment approaches, e.g., Portfolio Management

Portfolio Management

- Portfolio
 - Combination of different types of assets
 - Risk reduction strategy
 - Decision making process
 - Determining the types and amounts of assets
- Principle
 - Different volatility and performance patterns
 - Reduced investment **risk** through diversification
- Modern Portfolio Theory
 - Mathematical model of the diversification problem
 - Mean-variance analysis model
 - Portfolio return
 - Portfolio risk
 - Constrained optimization problem
 - Minimize the portfolio risk
 - Maximize the portfolio return

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

- Measurement of Technical Debt Items
 - Principal
 - Interest
 - Expected interest amount
 - Interest standard deviation
 - Relationship with other debt items
 - Correlation Coefficient $[-1, 1]$
- Transformation to Portfolio Management
 - TD item -> Asset
 - Principal – interest (net benefit) -> Asset return
 - Interest standard deviation -> risk of asset return
- Process



Discussion

- Evaluation
 - Use past releases of software projects
 - Simulate decision making
 - Compare with other approaches
 - Determine the effectiveness of the approach
- Questions
 - What are the benefits of incurring technical debt?
 - Principal?
 - What if the technical debt is finally paid off?
 - How can the benefits be measured on the project level?