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Estimating the Breaking Point for Technical Debt

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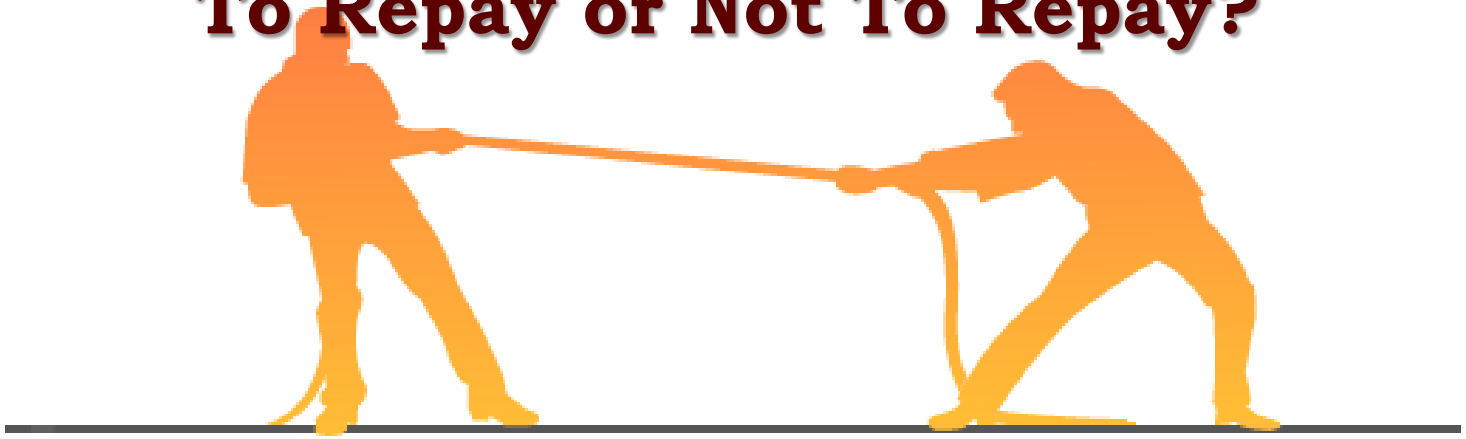
Context

To Repay or Not To Repay?



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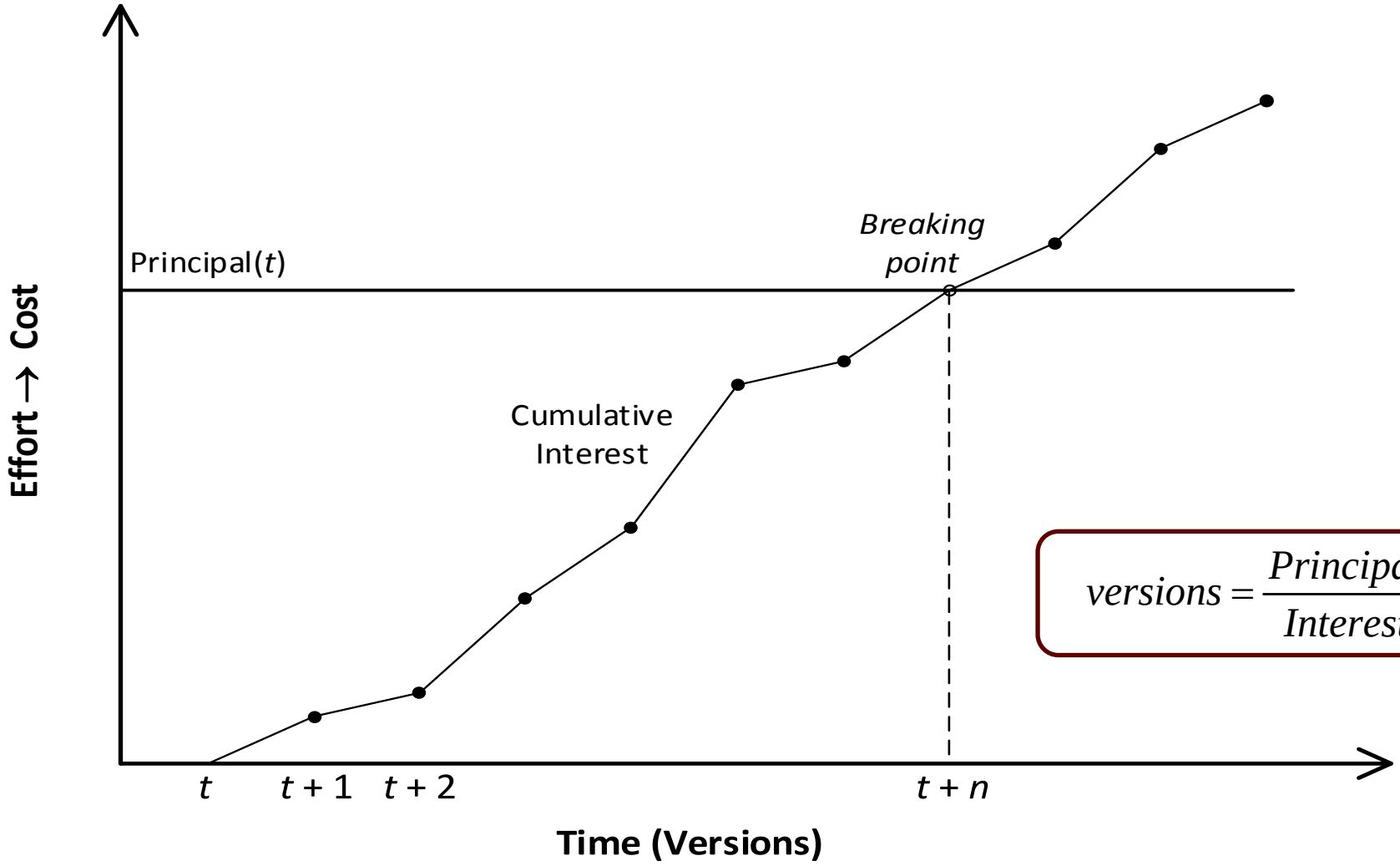
Interest Theory for MTD



$$versions = \frac{Principal(\$)}{Interest(\$)}$$

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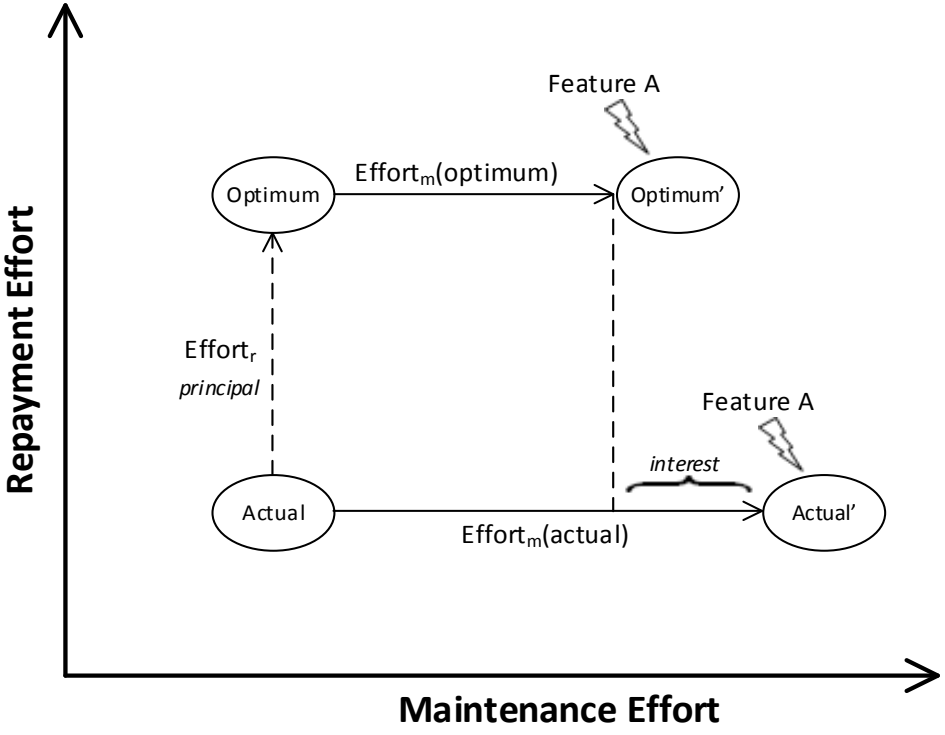
Proposed Approach



$$Principal = Effort_r$$

$$Interest = \Delta Effort_m$$

***Tool**: jCaliper*

Entity Placement → Coupling & Cohesion

- **optimum design**

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Illustrative Example

JUnit version: 4.1
147 classes

1) Principal Estimation?

2) Interest Estimation?

3) Breaking Point?

Entity Placement					Effort	
actual	optimum	distance	Improvement	#Refactorings	time	Cost
0.819[a]	0.692	0.127	15.5%	330	41.25h	1,891$

	Actual Effort		Optimum Effort	
average added LOC	time	Cost	time	Cost
848	33.9h	1,553$	28.6h	1,310$

Interest = Effort(actual) – Effort(optimum) = 243$

Elapsed time to breaking point = 7.78 versions

Principal estimation:
- AVG 5-10 mins/refactoring (W. C. Wake)
- 5.73$/refactoring (US Bureau of labor statistics)

Interest estimation:
- AVG 848 added LOC between any two successive versions (T. Chaikalis, E. Ligu, G. Melas, and A. Chatzigeorgiou)
- 25 LOC/hour JAVA productivity (L. Prechelt)
- $45.81 hourly wage (US Bureau of labor statistics)

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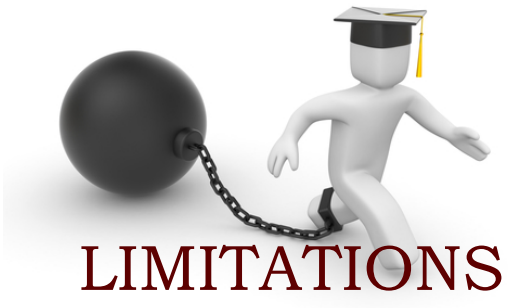
Limitations



- TD has other dimensions beyond coupling and cohesion
- Maintenance effort should account for other activities beyond addition of LoC (e.g. modifications, deletions)
- Future maintenance effort cannot be predicted solely on the basis of past maintenance tasks
- Cost estimates for refactoring application and introduction of new code, do not reflect commonly agreed figures

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Questions?

Thank you for your attention!