Constructive Product Line Investment Model

An Overview of its Application in Software Development

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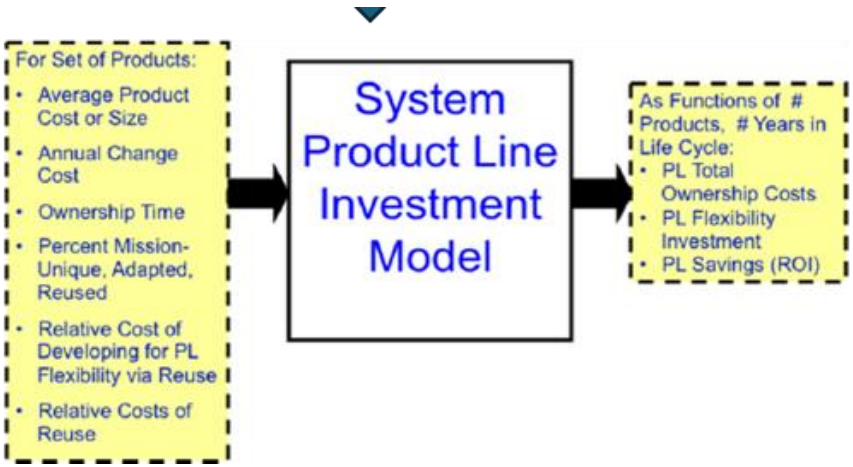
Agenda

- Background/Motivation
- Overview
- DoD Application

Background/Motivation



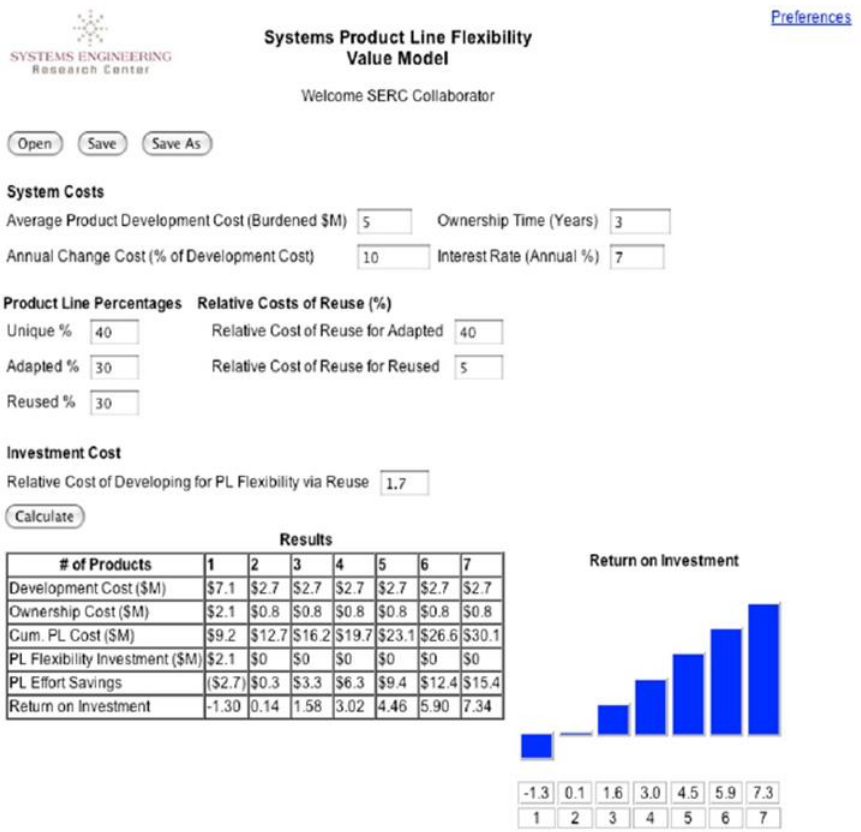
- In progress of developing an ASW Combat Suite for airships. Current acquisition practice is to procure the ASW combat system separately from different sources thus there is little reuse (Madachy & Green, 2019).
- My research will dive into system variability modeling to highlight an analysis of alternatives of the individual systems that could potentially comprise the airship

COPLIMO Overview

COPLIMO utilizes parametric inputs related to engineering product lines across various system types. Its outputs provide insights into lifecycle savings from product reuse and return on investment (Boehm et al 2004).

Originally, COPLIMO was developed as a comprehensive model for software product lines to quantify the benefits of reusing source code.

- Key Inputs for the System COPLIMO Include:
  - System Costs: Average product development cost, ownership time, annual change cost, and annual interest rate.
  - Product Line Percentage
  - Relative Cost of Reuse Percentages
  - Investment Cost



# of Products	1	2	3	4	5	6	7
Development Cost ($M)	$7.1	$2.7	$2.7	$2.7	$2.7	$2.7	$2.7
Ownership Cost ($M)	$2.1	$0.8	$0.8	$0.8	$0.8	$0.8	$0.8
Cum. PL Cost ($M)	$9.2	$12.7	$16.2	$19.7	$23.1	$26.6	$30.1
PL Flexibility Investment ($M)	$2.1	$0	$0	$0	$0	$0	$0
PL Effort Savings	($2.7)	$0.3	$3.3	$6.3	$9.4	$12.4	$15.4
Return on Investment	-1.30	0.14	1.58	3.02	4.46	5.90	7.34

DoD Application

- For his research, Alves demonstrated how shows how using product line economics to develop UUVs have a high ROI by using COPLIMO (Alves, 2022).

Table 18. ROI Analysis for RCDR 1.5 through Six Architecture Alternatives

	Eq. Size - Reuse Model	Non-Reuse Size	PL Effort Savings	Cumulative Savings	ROI	Cumulative ROI
Alternative 1 (Baseline)	23.50	16	-7.50	-7.50	-1.00	-1.00
Alternative 2	3.20	17	13.80	6.30	1.84	0.84
Alternative 3	4.20	18	13.80	20.10	1.84	2.68
Alternative 4	3.80	17	13.20	33.30	1.76	4.44
Alternative 5	4.20	18	13.80	47.10	1.84	6.28
Alternative 6	5.20	19	13.80	60.90	1.84	8.12
PL Reuse Investment	7.5					

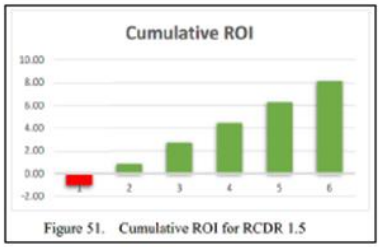


Figure 51. Cumulative ROI for RCDR 1.5

- Virtually all case studies have demonstrated high ROI of product line practices on defined DoD missions (Madachy & Green, 2019).
- This result corroborates previous product line economic analyses, demonstrating that many DoD systems and other types of system families would benefit from a product line strategy.

References

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Questions