Evolutionary Strategies in Product Development

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Motivation

• Air Force realized the need for better development strategies
  • Increasing costs and cycle times for new products
    • Technology innovation cycle times shorter than product cycle times
    • “When it takes so long, it just can’t be state of the art”
      --Dr. Sambur, Assistant SAF/AQ
    • Lack of user feedback in product development meant products were less useful
  • Evolutionary Acquisition with Spiral Development
    • Deliver partial capabilities in shorter time
    • Increase user feedback
  • Seven research projects at LAI related to Evolutionary Acquisition
Process

- Product planning
  - Based on market and user needs
- Concept planning
  - Approach selection
- System Design
  - Architecture development, interfaces
- Detailed Design
  - Subsystem development
- System Testing
  - Evaluation of product to perform required tasks
- Product Delivery
  - Production and delivery to user

Product development processes include various combinations of these phases

Waterfall

- Variants:
  - Parallel waterfall
  - Overlapping waterfall
  - Evolutionary prototyping & delivery
  - Design to schedule & budget

- Primarily mitigates technical risks
  - Can address some user uncertainty
  - Can address schedule and cost risks

Implies static requirements
Incremental Delivery

- Variants:
  - Pre-Planned Product Improvement (P3I)
  - Block upgrades (to some degree)

- Primarily mitigates technical and schedule risks
- Can address some user uncertainty

Spiral

- Primarily mitigates user uncertainty
- Relies on mature technology
Process Summary

- Product development process selection is difficult:
  - Must consider a number of program attributes
    - Product strategy
    - Architecture
    - External constraints
    - Technology
    - Uncertainty
    - Practices

- Research underway to provide a method for selecting development strategies

Final Thoughts

- Vast majority of infrastructure is set up for waterfall and traditional processes
  - Infrastructure must enable process selection and use of new development strategies
  - New processes are challenging—must master practices to effectively use them in an evolutionary environment

- Tradeoffs
  - Each process addresses various uncertainties, but at a cost

- No clear method for selecting among the various processes