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Spiral development

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Spiral Development

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Outline

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- Modularity in Spiral
- Examples of Spiral
- Conclusion

Introduction

- Background
- Literature Survey
- Motivation
- Focus and Scope
- Methodology

Background

- Acquisition strategy needs a second look
  - Many consider that it is ripe for repair
    - Cost overruns
    - Late deliveries
    - Unfulfilled expectations
  - Low operational availability
    - Traditional block approach
      - Long lead time
      - Obsolesce of technology

Literature Survey

- Literature reviewed in three groups
  - Defense related literature on Spiral Development
  - Applications of Spiral in past, present, and future
  - Modularity in Product Design

Motivation

- Past processes require the upfront knowledge of the end product or the upgrade
- Long time to deliver the final capability
- During the long lead times, the needs of the war fighters change
- Product fielded before it is ready and tested
- These reasons lead to partial or full-blown failures

One Possible Solution

- Fix the system with evolutionary approach
- New directive for Evolutionary Acquisition
- Process called Spiral Development

Focus of the Research

- Questions we raise are
  - What is the difference between Spiral and Evolutionary Development?
  - How is Spiral different from Block approach and Pre-Planned Product Improvement?
  - When should Spiral Development be implemented?

Focus of the Research

- Questions we raise are
  - Is this the magic tool from the Acquisition Tool Box that will cure the ailing Acquisition strategy?
  - How will Spiral Development affect Project Management and Program Managers?

Scope

- Analyze the spiral increments, characteristics of the increments, and the capabilities they deliver
- Spiral acquisition as it applies, specifically to program managers
- Role of modularity in the Spiral Development

Methodology

- Look at lessons learned by private sector and their practices that could be applicable in the public sector
- We do this by creating a simple model incorporating successive spirals
- This research is a work in progress
- Identify issues that need further study

Spiral: A Perspective

- Spiral is a set of acquisition activities that are incorporated in an evolving baseline using increments
- Successive and recursive set up helps program managers manage the risk of developing a product with user feedback
- Lessons learned from the previous spiral help reduce the uncertainty of the outcome of the next spiral

Spiral: A Perspective

- Each increment increases the capability of the product
- Each increment is done at a rapid pace
- Each increment builds over previous spiral

Limitations of Spiral

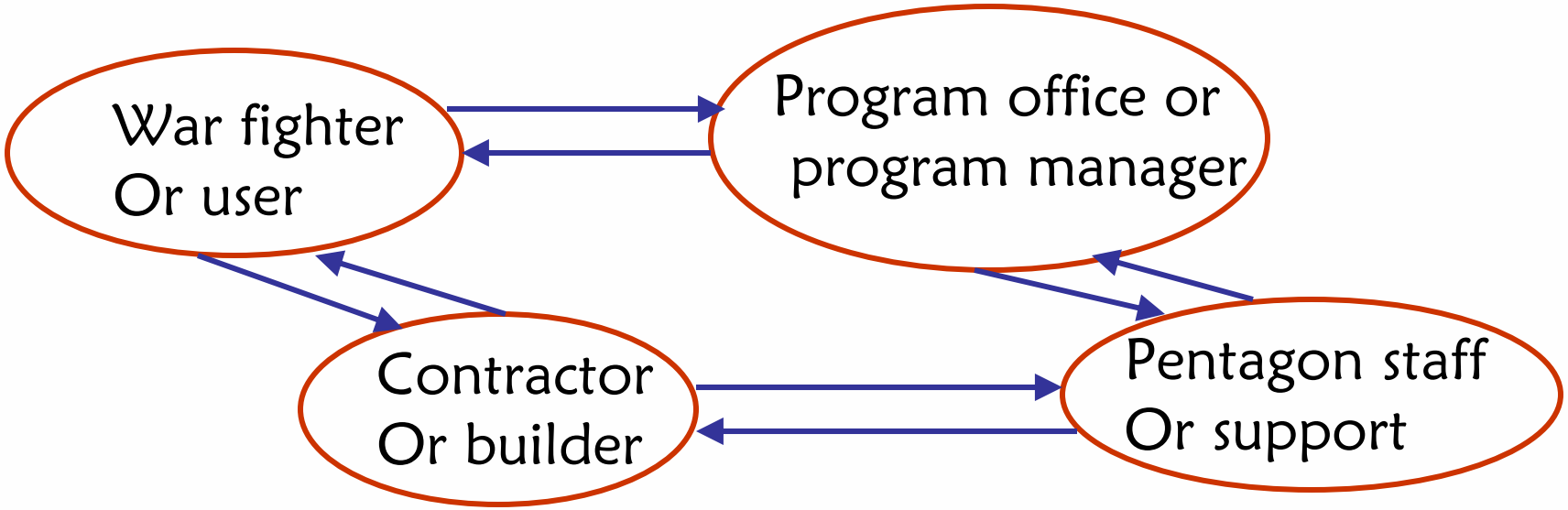
- Lack of Understanding
  - Has already acquired a reputation of the mysterious process in acquisition

Limitations of Spiral

- Requirements of Spiral
  - Successive rapid development that have to be independent of each other
  - User involvement in the evolving baseline of the subsequent increments

Limitations of Spiral

- Requirements of Spiral
  - Communication between the war fighter, the program office in charge of managing the product, Pentagon staff supporting the program, and the contractor that ultimately builds the system



Limitations of Spiral

- Logistics Complexity
  - Incremental nature is also a logistic challenge
  - Block approaches and P31 increase the mean logistic delay time (MLDT) which in turn reduces the operational availability
  - Spiral Development plans for the logistic delay and manages it
  - Modularization may help reduce this

Modularity in Spiral

- Advantage of modularization in private sector is in managing rapid sequential innovation
  - Proprietary Modular Upgradeable: customers must purchase both the improving and stable modules from the same firm

    e.g. cell phones, by making subsystems such as camera, battery, and storage upgradeable in modules a firm can potentially address customer concerns about obsolesce

Modularity in Spiral

- Advantage of modularization in private sector is in managing rapid sequential innovation
  - Non-Proprietary Modular Upgradeable: product is designed so that the stable module is a commodity that can be purchased from the open market

    e.g. personal computers are used for several generations of microprocessors with same combination of industry-standard non-proprietary peripherals

Examples of Spiral

- Past: Phalanx
  - Diversity of the system due to different baselines creates unique status of the mounts.
  - Currently, CIWS has 158 ships, 308 mounts, and 6 baselines
  - One baseline with economies of scale will bring costs down e.g. American Airlines and Southwest
  - Spiral could have helped propagate the product line in two dimensions, scale and scope when the end product is not known

Examples of Spiral

- Present: Global Hawk
  - Summer 2001 the Global Hawk became a Spiral Development program
  - Capabilities needed by war fighter were in production on yearly basis
  - Better communication between the parties concerned and so the risk factor was reduced
  - For each Spiral, review and risk analysis was performed to ensure that the program was on track

Examples of Spiral: Global Hawk

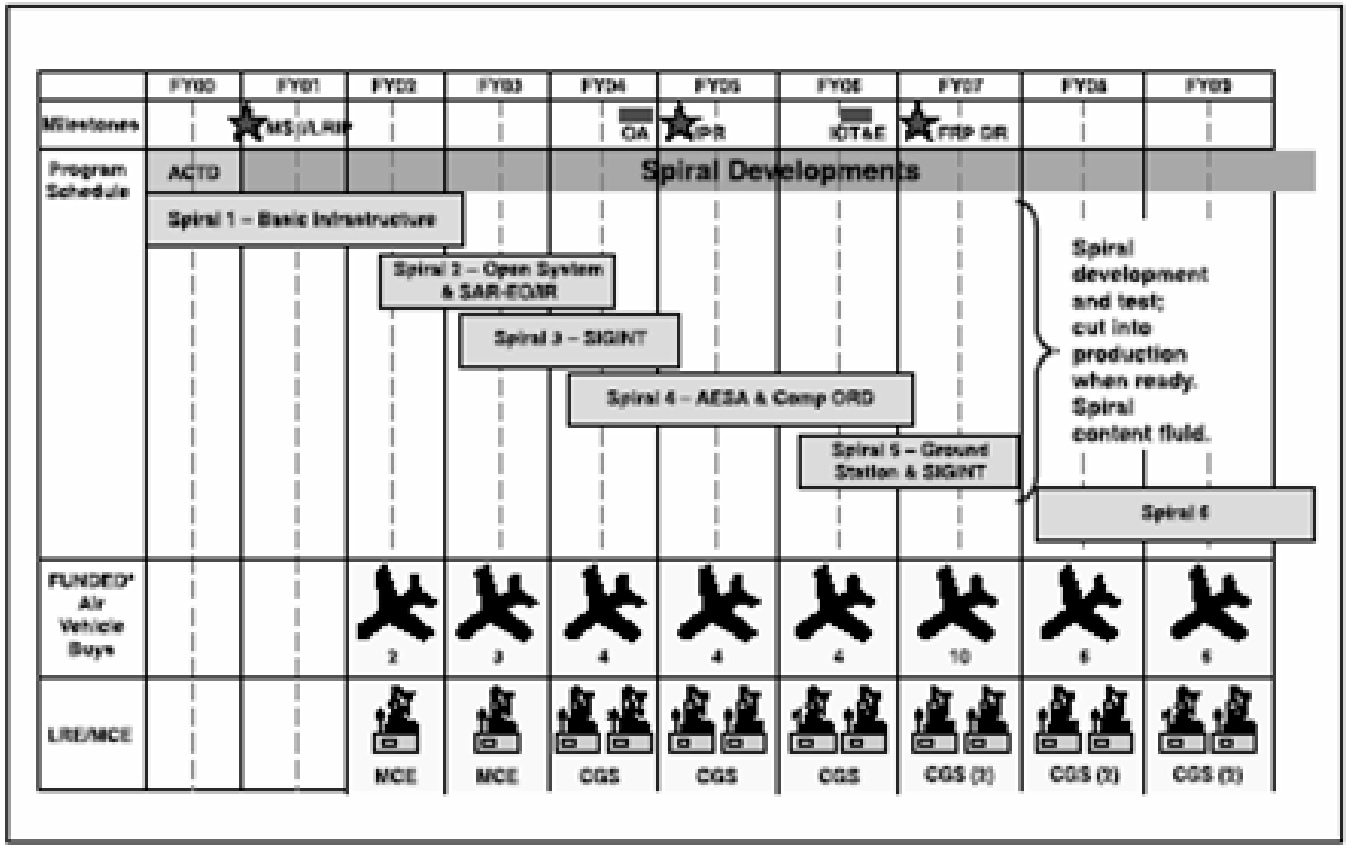


Figure 1. Draft Example of a Global Hawk Sprial Development

Examples of Spiral

- Future: Littoral Combat Ship
  - Spiral Development if applied to LCS for its design and acquisition will let Navy and the industry build ships faster
  - Basic capability with subsequent increments will be delivered based on testing and advanced technology.
  - Will aggressively address bringing modern technologies at lower expenses

Conclusion

- We analyzed the benefits and identified the limitations of Spiral Development
- We plan to formulate a mathematical model that will serve as a template for program managers
- A research project validating the model will be of great benefit to the Acquisition Research

Conclusion

- Introducing modularization in Spiral Development is an important contribution of this research
- A case study or a research project that chronicles a step by step implementation of Spiral would be valuable and is planned
- Our scope did not include the cost factor but a case study to that effect has been planned