Using the WinWin Spiral Model for Multimedia Applications

Barry Boehm, Alex Egyed, USC-CSE
Julie Kwan, USC Library
USC-CSE Annual Research Review
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Outline

- Barry Boehm -- Overview
- Alex Egyed -- Project Experience
- Julie Kwan -- Library Client View
Using the WinWin Spiral Model for Multimedia Applications: Overview

Barry Boehm, USC-CSE
March 11, 1997
Outline

• M.S. in Software Engineering Objectives
• WinWin Spiral Model Approach
  – Anchor Points, WinWin Groupware Systems
• Project Definition Approach
M.S. in Software Engineering Objectives

1. Prepare students for full range of SW Engineering issues

<table>
<thead>
<tr>
<th>Issues</th>
<th>Stages</th>
<th>Requirements, Architecture</th>
<th>Design, Code</th>
<th>Implement, Maintain</th>
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<tbody>
<tr>
<td>Computer Science</td>
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<td>CS Focus</td>
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<td>User Applications</td>
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<td>Economics</td>
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<td>People</td>
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2. Experiment with new tools and techniques
   - Web browsers, GUI prototypers, WinWin, Spiral processes
Theory W Extension to Spiral Model

2. Identify Stakeholders' win conditions

1. Identify next-level Stakeholders

3. Reconcile win conditions. Establish next level objectives, constraints, alternatives

7. Review, commitment

4. Evaluate product and process alternatives. Resolve Risks

6. Validate product and process definitions

5. Define next level of product and process - including partitions
## Elements of Critical Front End Milestone

**(Risk-driven level of detail for each element)**

<table>
<thead>
<tr>
<th>Milestone Element</th>
<th>Life Cycle Objectives (LCO)</th>
<th>Life Cycle Architecture (LCA)</th>
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</thead>
</table>
| **Definition of Operational Concept** | • Top-level system objectives and scope  
  - System boundary  
  - Environment parameters and assumptions  
  - Evolution parameters  
  • Operational concept  
  - Operations and maintenance scenarios and parameters  
  - Organizational life-cycle responsibilities (stakeholders)                                                                                       | • Elaboration of system objectives and scope of increment  
  • Elaboration of operational concept by increment                                                                                                                                 |
| **Definition of System Requirements** | • Top-level functions, interfaces, quality attribute levels, including:  
  - Growth vectors  
  - Priorities  
  - Stakeholders’ concurrence on essentials                                                                                       | • Elaboration of functions, interfaces, quality attributes by increment  
  • Identification of TBD’s (to-be-determined items)  
  • Stakeholders’ concurrence on their priority concerns                                                                                                                                 |
| **Definition of System and Software Architecture** | • Top-level definition of at least one feasible architecture  
  - Physical and logical elements and relationships  
  - Choices of COTS and reusable software elements  
  - Identification of infeasible architecture options                                                                                       | • Choice of architecture and elaboration by increment  
  • Physical and logical components, connectors, configurations, constraints  
  • COTS, reuse choices  
  • Domain-architecture and architectural style choices  
  • Architecture evolution parameters                                                                                                                                 |
| **Definition of Life-Cycle Plan** | • Identification of life-cycle stakeholders  
  - Users, customers, developers, maintainers, interoperators, general public, others  
  • Identification of life-cycle process model  
  - Top-level stages, increments  
  • Top-level WWWWWHH* by stage  
  • Partial elaboration, identification of key TBD’s for later increments                                                                                                                                 |
| **Feasibility Rationale** | • Assurance of consistency among elements above  
  - via analysis, measurement, prototyping, simulation, etc.  
  - Business case analysis for requirements, feasible architectures                                                                                       | • Assurance of consistency among elements above  
  • All major risks resolved or covered by risk management plan                                                                                                                                 |

Process/Anchor Point Examples

Rapid App. Devel.

Spiral-type | Ev.Dev., Spiral

| LCO, LCA | IOC |

Sys Devel

Spiral-type | Waterfall, Spiral-type

| W'fall, IncDev, EvDev, Spiral, Design-to-Cost, etc. |

| LCO | LCA | IOC |
# Relation of Win Win Spiral Model to LCO and LCA Milestones

<table>
<thead>
<tr>
<th>Cycle 1</th>
<th>Cycle 2</th>
<th>Cycle 3</th>
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<tbody>
<tr>
<td>Determination of top-level concept of operations</td>
<td>Determination of detailed concept of operations</td>
<td>Elaboration of detailed concept of operations by increment, especially IOC</td>
</tr>
<tr>
<td>System scope/boundaries/interfaces; top-level requirements</td>
<td>Top-level HW, SW, human requirements</td>
<td>Determination of requirements, growth vector by increment, especially IOC</td>
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<tr>
<td>Small number of feasible candidate architectures (including major COTS, reuse choices)</td>
<td>Provisional choice of top-level information architecture</td>
<td>Choice of life-cycle architecture Some components of above TBD (low-risk and/or deferrable)</td>
</tr>
<tr>
<td>Top-level life cycle responsibilities (stakeholders), process model, cost/ schedule parameters</td>
<td>More detailed process strategy, responsibilities, cost/schedule allocation</td>
<td>Thorough WWWWWHH plans for IOC; essentials for later increments</td>
</tr>
<tr>
<td>Stakeholder concurrence on top-level prototyping and analysis supporting win-win satisfaction</td>
<td>More detailed prototyping and analysis supporting win-win satisfaction</td>
<td>Stakeholder concurrence on thorough prototyping and analysis supporting win-win satisfaction</td>
</tr>
<tr>
<td>Top level rationale, including rejected candidate architectures</td>
<td>More detailed rationale underlying system choices</td>
<td>Elaboration of rationale, including risk resolution results</td>
</tr>
</tbody>
</table>

IOC: Initial Operational Capability  
LCO: Life Cycle Objectives  
LCA: Life Cycle Architecture  
How a Review Is Conducted

- Chairperson meets with the project to determine technical focus and required expertise for review
- Chairperson assembles review team of subject matter experts; project sends out review material
- A 2 or 3 day review is conducted. Detailed talks are presented on key technical areas. Issues raised during discussions are recorded on cards
- Immediate readout is given to the team at the end of the review. Cards are grouped by Things Done Right, Issues, and Recommendations
- Chairperson follows up with a written report and presentation to the project’s management if requested
- Used regularly since 1988, with over 10% project savings
Architecture in a Project’s Life Cycle

It encompasses the requirements, architecture and high level design phases of the typical waterfall diagram. It also continues throughout the life of the project (someone continues to wear the architect’s hat).

Planning and Architecture Phase

Iterative process until consensus is reached

Carries through the life of the project
Win Win as a Requirements Engineering and Architecting Approach

- Stakeholders use groupware support system to identify win conditions, negotiate win-win agreements
  - Schemas for win conditions, conflicts, agreements
  - Domain taxonomy and glossary
  - Taxonomy-based navigation aids
  - Tradeoff analysis tools
- Negotiated points of agreement become system specs
  - Mapping provided from domain taxonomy to table of contents for Requirements Description
  - Teams encouraged to negotiate at least one agreement for each domain taxonomy element
Software Engineering Core Course: CS577a,b

- 577a: User application plans, requirements, architecture
- 577b: User application development, test, maintenance
- 1993-96: Hypothetical applications
  - Emergency services, library applications
- 1996-97: Real library applications
Fall 1996 Library/Multimedia Projects

- Fifteen 6-person teams
- Develop Ops-concept, Requirements, Architecture, Prototype, Development Plan, Rationale
  - Using concurrent spiral cycles, USC WinWin system with librarian win conditions
- All completed satisfactorily, on schedule
- Preparing to develop selected projects this semester
- Seven of applications being implemented in Spring 1997
Library/Multimedia Student Projects

1. Stereoscopic Slides - John Ahouse
2. Latin American Pamphlets - Barbara Robinson
3. EDGAR Corporate Data - Caroline Cisneros
4. Medieval Manuscripts - Ruth Wallach
5. Hancock Photo Archive - Jean Crampon
6. ITV Courseware Delivery - Julie Kwan
7. Technical Reports Archives - Charles Phelps
8. CNTV Moving Image Archive - Sandra Joy Lee
9. Student Access to Digital Maps - Julie Kwan
10. LA Regional History Photos - Dace Taube
12. Urban Panning Documents - Robert Labaree