Lifting the Veil;
The relationship between
Budgeting and Iterative Development:
The Value of Corporate Control

Twin-Spin
October, 5 2006

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Project Manager: Project – Will it →

- Within Budget
- Within Schedule
- Deliver Quality and Required Content
- Have Continuous Funding
- Follow an Iterative Way
Project Manager: Capital – Spend It? Or Lose It?

12/31/nn
Agenda

• **RUP - Overview**
• *Iterative and Incremental Development Overview*
• *Facing the Challenge*
• *How to Get There*
• *Budgeting Release (s) and Feeding Release (s)*
  *Financial Figures and Allocating Capital Funds*
• *Demonstrating means of Corporate Control*
Use Case Driven Product Development is Use case Driven:

- Use cases
  - Specified by
    - Analysis
  - Realized by
    - Design
  - Implemented by
    - Implementation
  - Verified by
    - Test

User Docs
RUP - Risk Driven

Functional Requirements (Use cases)

1. Usability
   a. Aesthetics
   b. Consistency
2. Reliability
   a. Recoverability
   b. Predictability
   c. Accuracy
3. Performance
   a. Efficiency - Resource Consumption
   b. Throughput - Response Time
4. Supportability
   a. Testability
   b. Extensibility
   c. Adaptability
   d. Maintainability
   e. Compatibility
   f. Configurability
   g. Others

Quality Attribute Drivers

Software Architecture

Software

possess this

Supplement with Non-Functional Requirements

analysis, design, development

Business

Risks
Build components which trace to design objects (and all the way back to use cases)
To identify and ensure defects are addressed prior to deployment
Configuration of run-time processing elements and software components, processes, and objects that live on them
Iterative: Repeat essentially the same process

Incremental: Deliver usable functionality in chunks

RUP - Iterative and Incremental

Balancing Risks Across Multiple Releases

Architectural Risks Could be Moved Forward Making Initial Releases Harder and Subsequent Releases Easier

Production Risks Could be Moved Backwards Reducing The Business Benefits of Earlier Releases
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System Development - Overview

Vision

- Vision Document
- Needs
- Features
- Software Requirements

Requirements

- Use Case Model
- Supplementary Specifications
- UI

Architecture

- Analysis, decision, definition
- Blueprint
- Design Elements
- Design Mechanisms
- Run-Time Arch.

Develop

- Buy a Vendor Product
- Availability of resources
- Availability in market

Modify an Existing System

- Usage of Legacy
- Usage of Developed Facility
- Aligning with policy

Usage of Developed Facility

- Usage of Legacy
- Usage of Developed Facility
- Aligning with policy

Implementation

- Build
- Enhancement
- Integration
- Testing

Deployment (Roll Out)

- Executables
- Roll Out
Iteration and Release Assessments

Project Budget → Target

Assessment
• Compare Financial Aspects
• Compare Quality Aspects
• Determine Risks Eliminated
• Update Project Plan
• Update Next Iteration Plan
• Revise Budget?

Realize the Dream?
• Balance Cost?
• Balance Schedule?
• Balance Content?
• Plan for Next?

Planned Actuals
Schedule Actuals

Quality Assessments
• Test results
• Defects
• Architecture Stability
Iterative and Incremental Development

Resource Time Pattern

Architecture:
- Inception: 40%
- Elaboration: 15%
- Transition: 15%
- Construction: 15%

Development:
- Inception: 5%
- Elaboration: 25%
- Transition: 20%
- Construction: 50%

Management:
- Inception: 50%
- Elaboration: 10%
- Transition: 10%
- Construction: 10%

Assessment:
- Inception: 5%
- Elaboration: 15%
- Transition: 55%
- Construction: 25%
Iterative and Incremental Development: Life Cycle Measurement

Waterfall/Conventional Life Cycle
- Work Completed
- Cost
- Schedule
- Quality

Iterative and Incremental Life Cycle
- Build to Budget
- Project Velocity
- Quality

Disciplines
- Business Modeling
- Requirements
- Analysis & Design
- Implementation
- Test
- Deployment
- Configuration & Change Mgmt
- Project Management
- Environment

Phases
- Inception
- Elaboration
- Construction
- Transition

Iterations
- Initial
- Elab #1
- Elab #2
- Const #1
- Const #2
- Const #N
- Tran #1
- Tran #2
Iterative and Incremental: Time Value and Benefit Realization

Conventional → Single Point: Late Benefits, all in one Single Chunk
- Start
- Deploy
- End
- Develop
- Rework
- PV = $

Iterative and Incremental → Continuous: Early Benefits in Small Chunks
- Start
- Deploy
- Deploy
- Deploy
- Deploy
- Deploy
- PV = $ + $ + $ = $ (Sum of all Benefits)
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Project Lifecycle: Iterative and Incremental - Features

- Provides periodic opportunities to adjust the project due to changes in requirements, risks, or whatever
- Risk Oriented
  - Each Iteration/Release addresses some number of risks
- Changes can always be incorporated in the next Iteration/Release
- Duration of Iteration/Release can be weeks or months
  - Depends on what is to be done
- Each Iteration/Release produces and executable which
  - Can be demonstrated
  - May be dropped to achieve the date
- If a deadline of a Iteration/Release is not met then some tasks are removed from the current to a later Iteration(s)/Release(s)
<table>
<thead>
<tr>
<th>Project to start - Inception Phase</th>
<th>Project Running - Elaboration Phase</th>
<th>Project Running - Construction Phase</th>
<th>Project to end - Transition Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Cost estimation as a basis for make-or-buy-decisions</td>
<td>• Associate costs, benefits, and uncertainty with architectural decisions</td>
<td>• Asses Latent Capacity, Scalable Capacity, Availability of Architectural Configuration</td>
<td>• Assess the likely effects of architectural modifications on the running target system</td>
</tr>
<tr>
<td>• Calculation of the project’s cost budget</td>
<td>• Determination of cost information for deciding adjustments within the project</td>
<td>• Determination of cost information for deciding adjustments within the project</td>
<td>• Cost Monitoring and Cost Variance Analysis to improve realization for next release or for future projects</td>
</tr>
<tr>
<td>• Calculation of cost budgets referring to milestones</td>
<td>• Ongoing budget control</td>
<td>• Ongoing budget control</td>
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</table>
Parameters for Allocating Funds

- **Corporate View**
  - Assessment of Benefits in terms of financial metrics ROI, NPV, IRR and Payback Period
    - Identify, Quantify and Schedule Inputs and Outputs
  - Balance of Needs and Available Resources
    - Analyzing Cash Flow
      - Expenditure Amounts and Timing
      - Income Amounts and Timing
      - Projecting a Net Cash Flow
    - Cost Accounting
      - Expenditure Accounting
      - Expenditure Analysis
      - Cost Accounting
  - Measuring the impact of project’s on corporate financials
    - Evaluate uncertainty and risks
    - Weigh the economic and financial criteria with other corporate objectives and criteria
Estimating and Budgeting

- An Introduction

• Estimating - A quantitative assessment of the cost of all resources required to complete a project
  – Top-down Estimating
    ▪ Estimating the costs of higher level tasks first
    ▪ Using the estimates to constrain the estimates for lower level tasks
  – Bottom-up Estimating
    ▪ Identifying all constituent tasks
    ▪ Working out the resources and funding required by each
  – Iterative Estimating
    ▪ Estimating the costs for each task of an Iteration
    ▪ Estimating the overall project costs
      ➔ Inception and Elaboration Iteration (s) == Time and Material
      ➔ Construction and Transition Iteration (s) == Fixed Price

• Budgeting - Represents a plan for obtaining the necessary financial resources for implementing a project
## Issues - Iterative and Incremental

- **Project Estimates**
  - Continuously adapts the coming Iteration(s)/Release(s) based on previous Iteration(s)/Release(s) feedback.
  - Each Iteration consists of Activities (associated with Disciplines); Weight of activities differ from an Iteration/Release to another Iteration/Release.

<table>
<thead>
<tr>
<th>What Software Cost Estimation Methods to use</th>
<th>What Metrics?</th>
</tr>
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<tbody>
<tr>
<td>• Algorithmic</td>
<td>• Knowledge oriented metrics</td>
</tr>
<tr>
<td>• Estimation by Analogy</td>
<td>• Oriented to tracking the process to evaluate</td>
</tr>
<tr>
<td>• ...</td>
<td>• Predict or monitor some part of the process</td>
</tr>
<tr>
<td>• COCOMO (one of the most widely used methods)</td>
<td>• Achievement oriented metrics</td>
</tr>
<tr>
<td></td>
<td>• Oriented to measuring some product aspect</td>
</tr>
<tr>
<td></td>
<td>• Related to some overall measure of quality of the product</td>
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</tbody>
</table>
The Principal Task of Cost Management is Optimum Governance of Operational Costs by means of Cost Planning and Cost Control.

Aims of Cost Planning:
- Cost Forecasting
- Calculation of Cost Objectives

- Issues of Cost Forecasts
  - Can only be made when Project has made some reasonable progress
  - Common trend is to base the forecast by arranging the project activities in traditional approach - Requirements, Analysis, Design, Implementation, Integration, Test, Deployment
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How to get there?

- **Release Planning:** Customer/Stakeholder selects the scope of a release and subsequent releases.
- **Iteration Planning:** Project team decides what to include in which order.

**Chalk out a Release Plan**

- One Inception Iteration, One to Three Elaboration Iteration(s), One to Three Construction Iteration(s), One Transition Iteration.

<table>
<thead>
<tr>
<th>Zero (R0)</th>
<th>Inception Iteration Zero (I0)</th>
<th>-</th>
<th>-</th>
<th>-</th>
<th>&lt;mm/dd/yy&gt; 0A</th>
<th>&lt;mm/dd/yy&gt; 0B</th>
<th>Project Plan, Iteration Plan (s)</th>
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<table>
<thead>
<tr>
<th>Release</th>
<th>Iterations</th>
<th>Start Date</th>
<th>End Date</th>
<th>Release Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inception</td>
<td>Elaboration</td>
<td>Construction</td>
<td>Transition</td>
<td></td>
</tr>
<tr>
<td>One (R1)</td>
<td>1 (E1, E2)</td>
<td>3 (C1, C2, C3)</td>
<td>1 (T1)</td>
<td>&lt;mm/dd/yy&gt; 1A</td>
</tr>
<tr>
<td>Two (R2)</td>
<td>1 (E3, E4)</td>
<td>3 (C4, C5)</td>
<td>1 (T2)</td>
<td>&lt;mm/dd/yy&gt; 2A</td>
</tr>
</tbody>
</table>
Budgeting Each Release Plan

• Inception Iteration Zero (I0 \(\rightarrow\) R0)
  - Cost estimation for Identifying Architectural Significant Requirements, and Outlining Architecture (aligning with Enterprise Architecture Guidelines)
  - Cost estimation for Build/ Buy/ Re-Use (Internal)/ Usage (External facility) decisions for a part of vision or for entire vision
  - Cost Estimation to prepare Project Plan, Iteration Plan (s), and Release Plan (s)
  - Calculation of Project's Cost Budget (high level)

• Inception Iteration (s) \(\rightarrow\) I1 (R1), I2 (R2), ...
  - Cost estimation for reviewing Architecture for a Release
  - Cost estimation for Identifying Architectural Significant Requirements, and Outlining Architecture (aligning with Enterprise Architecture Guidelines)
  - Calculation of Release Cost Budget referring to milestones (Elaboration Iterations, Construction Iterations, and Transition Iterations)
  - Calculation of Benefits Elements: NPV, IRR, ROI
Analyze Uncertainty

- **Scope and Architecture**
  - What all Functionality (Use cases) planned in a Release
  - Whether Architecture is sufficient for the Software Developers who will use it
  - What will be the Consequences of Architectural Decisions in light of Business Goals

- **Schedule**
  - What happens the End Date of an Iteration is not met

- **Resource**
  - Technology
    - What happens when Technology associated with a functionality becomes obsolete
    - How to cope with Up gradation of Life Cycle Measures
  - Human
    - What happens when Key Personnel (s) changes (+ or -)

- **Revenue**
  - What happens if there are changes in Corporate Strategies
Effecting Changes in Release Plan Budget - After Execution of E/ C/ T Iteration (s)

- After Execution of E/ C/ T Iteration (s)

Scope Of Release (n)
Risk Lists

Execution of Elaboration/ Construction/ Transition Iteration (s)

Assessment
1. Refocusing, Removing Requirements
2. Refocusing Physical environment
4. Quantifying Architecture in terms of Risks, Tradeoffs, and ROI
5. Assessing the likely effects of Architectural Modifications on Target System (before and after Deployment)
   - Associate Costs, Benefits, and Uncertainty with Architectural Decisions

Some Tasks Too big/ Low Risks; Need Review with Customer on estimates; and Devise Revised Scope for Next/ Subsequent Release (s)

Estimate Tasks; Compile Benefits

Revise Unfinished and Do-again Task (s) Lists;

Choose Tasks Based on Estimates and Velocity, and Choosing Release Date
Compose Release Financial Plan

- Compose Assumptions Table
  - Benefit Growth Rate, Expense Growth Rate
  - Discount Rate
  - Asset Depreciation Type
  - Release Life

- Compile Estimates
  - Capital Outlay (Environment, Technology)
  - Application Development Cost
  - On-Going Costs (Training, Travel, ..)
  - On-Going Support Cost
  (total Release Cost)
  - Expected Cash Flows

- Compile
  - Present Value of Release Expected Cash Flows
  - Compare the PV of the Release cash Flows to the Release Cost

- Compile
  - Payback Period
  - NPV
  - IRR
  - ...
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Adopting Activity Based Cost Management

✓ **Static Structure of RUP → Identifies Activities**
(Disciplines make up Activity Groups)
✓ **Dynamic Structure of RUP → Divides the Release Lifecycle into four Phases**

ë Iterations = Each phase has Iterations which (quantity) differ from Releases to Releases
ë Iterations = They determine activities needed to meet Release Requirements on Quantity Basis
ë Iterations = They make up the Cost Drivers

�� Task One = Figure out Iteration Rates (Quote the amount of Activity Costs triggered by the one-time execution of the Iteration)
  ➔ Determine the total number of Iterations required for all Releases Phase wise
  ➔ Add up the activity costs for each phase and divide by the number of Iterations for that Phase
�� Task Two = Account for the Activity-Independent Costs for each discipline; then amounting it phase-wise
Activity Based Cost Planning

- Calculation of planned total costs of activities of each Release
- Calculation of planned total direct costs (activity independent) of each Release
- Calculation of Net Present Value of each release
- Sum up the present value of all Release Costs resulting in Capitalized Value
  - Derivation of the Project Budget
Capital Allocating Process - Overview

- **Step One:** Assessing Projected Capital Available
- **Step Two:** Execution of Qualification Round
  - Attending Project Presentation
  - Assessing Project Properties
    - Strategy and Mission
    - Market Impact
    - Operational Impact
    - Financial Impact
- **Step Three:** Execution of Decision Round
  - Compiling and Tabulating
    - Demand
    - Sizing
    - Cost Analysis
Cost Controlling - Cost Adjustments

- Criteria for making adjustments to uncompleted Releases or Future Releases:
  - Changes in cost of Previous Completed Releases/Iterations
    - Lessons Learned
  - Changes in number of Iterations
    - Result of “on and/after” execution of Elaboration Phase Iteration(s)
  - Changes in scope of Iteration(s)
    - Result of "on and/after" execution of Elaboration Phase Iteration(s)
  - Changes in external factors
    - Price, Technology, ...
Cost Controlling - Ongoing Budget Control

- **Step One: Setting up Iteration-Cost-Targets**
  - Based on Phase-Iteration Milestone

- **Step Two: Setting up Release-Cost-Targets**
  - Based on Release End Date
  - Based on Release Estimate

- **Review of Cost-Targets**

- **Review of Revised estimate for future Release (s)**

- **Release of funds for future Release (s) if it is within allowable Corporate Tolerance**
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Project Control - Iterative and Incremental

- Scope Of Release
- Requirements and Risk Lists
- Project Plan
- Mid-Release Review

Environment

Release Execution

- Data Model, Test Plan
- Release Estimates
- Release Deliverable Checklist

Operations & Maintenance

- 1. Evaluate Post System
- 2. Decide/ Determine Project Discontinue?
Corporate Control - Teams - Expectations

• **Board of Directors**
  - Needs access to information so that it can make informed decisions in managing the business direction

• **Executive Team (CEO, CIO, CFO, …)**
  - Needs timely information so that they can make sound business decisions to lead the organization into the future

• **Organization (workforce)**
  - Members who perform the work should know how their work is impacting the organization
  - Needs a roadmap on how they can make a difference

<table>
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<th>Tools</th>
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<tr>
<td>Flexible</td>
<td>Balanced Scorecard</td>
</tr>
<tr>
<td>Evolutionary</td>
<td></td>
</tr>
<tr>
<td>Adjustable</td>
<td></td>
</tr>
</tbody>
</table>
Corporate Control - Issues - Delivered Values

Delivered Value Metric: NPV of Net Benefits

Project Cost ($$$ Spent)

Project Metrics?

Corporation Operation Metrics?

Value Stream (Benefits - Costs)
Corporate Control – Iterative and Incremental

- Organization Goals
  - Program/Project Vision
  - Architecture
    - Build/Buy/Re-use/Usage
    - Action Decisions
    - Action Conditions
    - Activity Sequencing
    - Activity Estimating

Risk Analysis, Understand Constraints

- Estimating
- Budgeting
- Project Planning & Iteration (s) and Release (s) Planning

Adjustments

- 1. Control of Costs
- 2. Continuous Understanding of Projects Status
- 3. Understanding new Challenges
- 4. Better Assessments of Benefits
- 5. Control Deployment
- 6. Better Understanding of Life-Cycle Measures
Corporate Control –
Iterative and Incremental (cont.)

- Approved Funds = Budget
- Release (s) Cost Planning
- Release (s) Cost Estimates
- Release (s) Schedules
- Time Based Release (s) Cost Plan
- Management Approval
- Release (s) Cost baseline

Release (s) Activities
Release (s) Resource Assignments
Cost Variance Analysis - End of a Release

- **Research into the causing effects of Cost Deviations**
  - **Quantity Variance**
    - Assessment that some activities were needed on a higher extent than expected
  - **Structural Variance**
    - Assessment that some activities was needed than those originally planned

- **Challenge to redesign the activities in future Iteration (s)/ Release (s)**
  - Facilitate Cost Reductions in future Release (s)
Corporate Control –
Iterative and Incremental - Highlights

• Provide Management Control over Schedule, Cost and Feature set(s)
  - Management gets regular update of estimates of time/ cost remaining to complete completion
  - Each successive Iteration/ Release decreases the variance of project’s benefits according to Iteration’s/ Release’s Outcome
    • Better Outcome $\rightarrow$ Probability of Better Outcome in Next One Increases
    • Bad Outcome $\rightarrow$ Probability of Better Outcomes in Next One Decreases

• Asks Management a better feel of Tradeoffs
  - Features versus Time
    • Features released in Increments will work
    • Managers get to balance the tradeoff between more time and more features

• Provides End-Users a better feel of their dream
  - Usable, and Quality Product
Questions
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Thank You

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