Institutionalizing Resource Planning and Management
Part II
10-15-05
Agenda

• Background and Problem Statement
• Part I: Define a Resource Management Process
• Part II: Managing the Second Project
  – Impact of the First Project on the Second
  – Process Improvements
  – Dealing with Interruptions
Resource Allocation and Management Process (RAMP)

Resource Plan

Monitor and Control Resource Plan

Make Adjustments

Assign Resources

Monitor Utilization

Assess Project #1

Assign Resources

Monitor Utilization

Assess Project #2

Resource Mgmt - Root Cause
- More Training Required
- Unclear Responsibilities
- Gap in Skill Sets
- Overcommitted

Resource Mgmt - Symptoms
- Lack of Resources
- Resources were late
- Resources were frequently pulled back
- Resources were constantly interrupted

Root Cause
- Poor Project Execution
- Poor Process Execution

Resource Flow
Getting Buy-in for Change

• Process Improvement is not always Supported
  – Sometimes considered a deterrent to meeting deadlines
  – Two groups need to buy-in
    • Management
    • Engineers
  – Use Models to show the COST OF DELAYS
Planning Project #1

Engineering Models

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Small Embedded System

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Total Man-months: 22.5
Total Cost ($6K/Mo): $135K
The Cost of Delays

Project #1, Phase 1 runs one month long.
COST: $19.5K/Month (14%)

Project #1, Phase 2 runs one month long.
COST: $24.0K/Month (18%)

Project #1, Phase 3 runs one month long.
COST: $27.0K/Month (20%)

Project #1, Phase 4 runs one month long.
COST: $27.0K/Month (20%)

Project #1, Phase 5 runs one month long.
COST: $21.0K/Month (15.5%)

Project #1, Phase 6 runs one month long.
COST: $16.5K/Month (12%)
Planning Project #2

Resources Planning
Allows for Recovery

- Project #1
- Project #2
- Total Resources

Man-months

1 2 3 4 5 6 7 8 9 10 11 12

Months
Project Scenarios

• Three Scenarios
  – Project #1, Phase 1-4 are late
  – Project #1, Phase 5 and 6 are late
  – Project #1 requires redesign
Effects of Project #1: Scenario 1

- A one month delay in Project #1, Phases 1 through 4 will delay Project #2 the same amount.

Project #1, Phase 1-4 runs one month long.
COST: $27K/Month (20%)
Effects of Project #1: Scenario 2

- A one month delay will in Project #1, Phase 5 and 6 will reduce the number of resources to start Project #2 by 50%.

Project #1, Phase 5-6 runs one month long.
COST: $21K/Month (15.5%)
Effects of Project #1: Scenario 3

- Project #1 requires Redesign, Project #2 delayed 3 Months.

During Phase 5, it’s determined Project #1 requires redesign. COST: $75-80K (55-60%)
Why Phase 1, 2 and 3 Push Out?

- Decomposition of Requirements
  - Added Requirements
  - Missing Requirements
- Underestimating
  - Estimates did not account for decomposition
  - Estimates did not use proper skill levels
- Proof of Concept (POC) Problems
  - Poor POC Results delay final requirements
  - When finalized, some redesign required
Why Phase 4 Pushes Out?

- Implementation Problems
  - Unable to work independently (weak design)
  - Large number of coordination meetings
  - Poor execution (gaps in skill/training)
  - Inadequate tools and equipment
- Poor Vendor Selection
- Underestimated
  - More work than estimated (lines of code)
  - Estimated for wrong skill level
- Late Parts Procurement
Why Phase 5 and 6 Push Out?

- System/Product starts to come together
  - Uncover new requirements
  - Uncover missing requirements
  - Identify changes to original requirements
  - Vendor deliveries are late and don’t integrate well
Why Product needs Redesign?

• Doesn’t Meet Expectations
  – Invention
  – Errors in original requirements
  – Implementation drifts from original requirements
  – Vendor can not deliver
# Where do you feel the impact?

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The 7 Common Reasons impact the project late in the development.
Effects of Project #1

- Find the balance for Phase 1 through 4
  - Too many short cuts will lead to redesign and add significant cost to Project #1 and significantly impact the start of Project #2
  - Too much upfront work will delay and add cost to Project #1 and delay the start of Project #2
# Case Study: 10 Projects

Though a low occurrence, when Requirements were not traced, the result was redesign.

## Resource Problems

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### Resource and Requirement Problems correlated to late projects

### Added Requirements

### Missing Requirements

### Interruptions

### Underestimating

### Process

### Requirements not Traced

### Result

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### Months Late

| | 9 | 12 | 9 | 4 | 12 | 4 | 4 | 6 | 3 | 3 |
Adding Requirements

• Problem
  – Phase 1-4: Requirements typically added by the development team as the product gets further broken down and analyzed.
  – Phase 5 and 6: New requirements get added…
    • By the team when the product starts to come together.
    • By Sales, Marketing and Customer as they start the demo/use the new product.
    • Adds significant delay.
  – Redesign: Maybe. If added requirement is a big change.
Missing Requirements

• Problem
  – Phase 1-4: Missed requirements typically found by the development team as the product gets further broken down and analyzed.
  – Phase 5 and 6: Missed requirements are found…
    • When the product starts to take shape and stakeholders see the product.
    • Adds significant delay
  – Redesign: Maybe. If missing requirement is a big oversight.
Requirements not Traced

• Problem
  – Phase 1-4: Derived requirements and subsequent designs may drift or alter Product Requirements.
  – Phase 5 and 6: If not traced, drifting requirements are found …
    • When the product verification and validation is performed.
    • Adds significant delay
  – Redesign: Yes. If requirements have departed significantly from the original requirements.
Dealing with Requirements

• Solution
  – Develop and document as complete a set of requirements upfront as you can
  – Requirements Development (RD)
    • SG1 - Develop Customer Requirement
    • SG2 - Develop Product Components
    • SG3 - Analyze and Validate Requirements
  – Find the balance
    • You may need to move forward without all the requirements
Dealing with Requirements

- **Solution**
  - Requirements Management (REQM)
    - Obtain Understanding of Requirements
    - Obtain Commitment to Requirements
    - Manage Requirement Changes
    - Maintain bi-directional Traceability
  - Use the Trace Matrix as the basis for all design reviews
Dealing with Requirements

• Solution

– Risk Management (RSKM)

Assess the technical risk of each requirement of each project.

High Risk
Develop a Mitigation Plan

Monitor Regularly

Add 3rd Dimension to determine where the risk is mitigated

Integration Plan required to mitigate risk early in Phase 4 or 5

Low Risk

Medium Risk

Low Risk

Medium Risk

High Risk

Develop a Mitigation Plan

Monitor Regularly

Add 3rd Dimension to determine where the risk is mitigated

Integration Plan required to mitigate risk early in Phase 4 or 5
Dealing with Requirements

• Solution
  – Product Integration (PI)
  – Define Incremental Configurations
    • Define 2 to or more Configurations for Incremental Deliveries
    • Integrate high risk requirements in first configurations
      – Proof of Concept or Repeat POC results
      – System or Software Architectures
      – New protocols, outsourced technology
      – New user Interface or features
      – Installation Requirements
  • Integrate lower risk requirements second
# Case Study: 10 Projects

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Underestimating

- **Problem**
  - Phase 1-4: Underestimating is due to…
    - Missing key process steps
    - Aggressive or optimistic estimates
    - Tip of the iceberg. Decomposition reveals more work.
  - Phase 5 and 6: Underestimating is due to…
    - Poor Integration Planning.
    - Does not take into account requirement changes.
  - Redesign: Underestimating normally doesn’t cause redesign.
Underestimating

• Solution
  – Project Planning (PP)
    • Establish the Scope of the Project (i.e., WBS)
    • Establish Estimates for Work Products (i.e., Lines of Code, Number of Requirements, PCB Complexity)
    • Determine Estimates of Effort and Cost
    • Develop Models based on Past Estimates
Underestimating

- **Solution**
  - Implement Process Templates for Estimating
  - Tie Estimates to the Process

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| 3    | Develop Product Requirements | Technical Leader | 2, 3, 4 | Customer Requirements | - Review Customer Requirements  
- Develop Functional Specification  
- Develop Performance Specs  
- Develop Operational Scenarios  
- Verify Industry Standards, Certification and Compliance Requirements  
- Develop Product Requirements  
- Analyze and Validate Requirements | Product Requirements | 160 hrs |
# Case Study: 10 Projects

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As Requirements Management improved, Parts became a problem.
Parts Procurement

- Problem
- Late Parts will hold up Product Integration
  - Phase 1-4: Phase 1-4 may be delayed due to…
    - Technology and Vendor selection
    - Poor planning
    - Waiting for the entire design to be complete
  - Phase 5 and 6: Late Parts Procurement is due to…
    - Poor execution of Phase 1-4
    - Requirements change impacts material on order
  - Redesign: Late Parts normally don’t cause redesign.
## Parts Procurement

- **Solution**
  - Drive Parts to the Product Integration Plan
  - Use Bill of Material (BOM) as the WBS
- Revision Levels used to track progress

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# Case Study: 10 Projects

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As Requirements Management improved, Vendor Selection became a problem.
Vendor Selection

• Problem
  – Phase 1-4: Vendor selection delays project due to…
    • Underestimating the evaluation/selection process
    • Underestimating the monitor and control.
    • Poor Vendor Execution
  – Phase 5 and 6: Vendor Deliveries delay the project due to…
    • Poor Integration Planning.
    • Not meeting requirements.
  – Redesign: Too often poor vendor selection requires redesign
Vendor Selection

- Solution
  - Supplier Agreement Management (SAM)
    - Determine Acquisition Type
    - Develop potential Supplier List
    - Evaluate potential Suppliers
    - Select Supplier and Establish Agreement
Vendor Selection

- Solution
  - Request for Proposal (RFP)

Request for Proposal Outline

1. Introduction
2. Proposal Guidelines and Evaluation
3. Confidentiality
4. RFP Questions and Submittals
5. Corporate Profile
6. Geographic Location of Sites
7. Scope of Work
8. Requirements
9. Appendix A: Intent to Bid Form
10. Appendix B: Non-disclosure Form
11. Appendix C: Integration Guidelines
12. Appendix D: Coding Guidelines
13. Appendix E: Diagnostic Guidelines
15. Training Requirements
Vendor Selection

- Solution
  - Decision Analysis and Resolution (DAR)

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Getting Buy-in for More Change

- Two groups need to buy-in
  - Management
  - Engineers
- Use History to show the SAVINGS created by changing
Assessing Performance

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**Total Savings for Improvements**
- Saved 21 Months
- Saved $1M

**New Features:** Compare new performance to old.
- Saved 3 Months
- Saved $108K
- Saved 5 Months
- Saved $150K
- Saved 6 Months
- Saved $252K
- Saved 1 Month
- Saved $24K
- Saved 9 Months
- Saved $432K

**New Tools:** Compare new performance to old.
- Saved 3 Months
- Saved $108K

**6 Projects in 24 Months**

**3 Projects in 24 Months**
Getting Started

- Don’t wait to start to gather data
- Capture this information at any time
  - Meet with projects groups and have then fill out the survey on the last few projects.
  - Data will be compiled from memory making it less reliable, but will serve as a starting point.
  - Compile metrics and identify an improvement plan.
Improving Process Mid-stream
Improving Process Mid-stream

- If Project was started with ad hoc Practices, Confront the 6 Problem Areas
  - Adding Requirements
  - Missing or Incomplete Requirements
  - Requirements not Traced
  - Project Underestimated
  - Parts Procurement (Integration Plan)
  - Vendor Selection
Improving Process Mid-stream

- Review the methods used to develop Requirements, Estimates, Parts Procurement and Vendor Selection
- Determine Gaps in the Methods
  - Old versus New
- Make Adjustments Appropriately
- Re-negotiate where possible
Project Monitoring and Control

- Begin new Monitor and Control Methods
  - Identify roadblocks that will cause goals to be missed
  - Proactively address roadblocks
  - Try to minimize multitasking, keep sequential
- Start Weekly Reviews and Adjustments
  - Adjust assignments for roadblocks/interruptions
- Anticipate Interruptions from Quarterly Revenue Goals
Dealing with Interruptions
# Case Study: 10 Projects

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**First 3 Projects:** Interruptions (8.75%)

**Next 3 Projects:** Interruptions (3.3%)

**Next 4 Projects:** Interruptions (3.75%)

Interruptions are reduced as execution improves.
Interruptions

• Two Way Street
  – Improved Execution Reduces Interruptions
  – Controlling Interruptions, Improves Execution

• Must do both!
Interruptions

One, 4 hour Interruption each week

One, 16 hour Interruptions each week

Four, 4 hour Interruptions each week

Efficiency

Interruptions
Planning for Interruptions

- Evaluate the Performance of Previous Project
  - Do you expect Interruptions?
- If so, Keep Problems from Escalating
  - Develop method to report problems
  - Establish an Escalation procedure
  - Develop a single point contact
  - Plan problems
  - Dealing with Interruptions
Reporting Problems

- Define how to report a problem
- Define the content of the report
  - Description of the problem
  - Steps to reproduce
  - Frequency of occurrence
  - Severity
  - S/N, SW Version, Revision
- Define responsibilities
- Expected results and response
Escalation Procedure

- Clearly defines
  - What an escalation is
  - What an escalation isn’t
- Clearly define responsibilities
- Defines how to report the escalation
- Defines the expected results and response time
Single Point Contact

- Communicates the new methods
- Reviews problems and confirms the report
- Contact for escalations
- Negotiates deliverables
- Owner of the plan
- Proactively reports status and delay
Planning for Problems

- Estimating the Scope of Interruptions
  - Uncover Hidden Problems
- Estimating the Effort of Interruptions
  - Use Category Estimates
- Identifying the Risk due to Interruptions
  - Define the Severity of the Problem
  - Define the Probability
  - Set Priority
Planning for Problems

• Plan Resources to Handle Interruptions
  – Carry a constant resource level in Resource Plan, at least.
  – Use Skills Inventory List to select alternates

• Plan for Recovery
  – Treat Interruptions as a Project
  – If they are planned, they are no longer interruptions
Dealing with Interruptions

• Structure Your Project to Deal with Interruptions
  – Establish Core and Floating Resources
  – Look for Commonality
  – Break Project into Smaller Tasks
  – Don’t let Interruptions hold up Material
Interruptions will Occur

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**Setup**

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**Phase Length**

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<th>3</th>
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<th>5</th>
<th>6</th>
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<tbody>
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## Assign Resource 1

### Model 1

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<th>Phase 4</th>
<th>Phase 5</th>
<th>Phase 6</th>
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### Model 2

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<tbody>
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### Model 3

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<tbody>
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### Model 4

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### Unplanned Model

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<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
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<th>Model</th>
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<tr>
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</tbody>
</table>

**Assign Resource 1 to the Escalations**
Predict the Impact

Plan Predicts the Impact on the Project

Escalations Subtract from Plan

Project A

Utilization

Planned

Actual

Months

Resource

NexSummit LLC
Conclusions

• Focus on process improvements that will reduce surprises late in the project
  – Requirements Development
  – Requirements Management
  – Risk Identification and Mitigation
  – Product Integration
  – Project Planning
    • Better Estimating and Material Management
  – Supplier Management
Conclusions

- Use models from the Resource Plan to gain support for changes and improvements
  - Cost of Delays
  - Cost of Savings
- Plan Interruptions as a Project.
- Include Interruptions in the Roadmap as a “negative” and predict impact.
Contact Information

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  – www.nexsummit.com