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

• Background and Problem Statement
• Part I: Define a Resource Management Process
  – Develop a Project Roadmap
  – Develop a Resource Plan
  – Monitor the Resource Plan
• Part II: Managing the Second Project
Background

• Organization Overview
  – 40 Engineers:
    • 25 Technologists, EEs, MEs, Designers
    • 15 Software Engineers
  – Overcommitted lead to late deliveries
  – Late deliveries lead to shortcuts
  – Short Cuts lead to poor quality
  – Poor quality lead to escalations and chaos
Background

• Qualitatively captured the common reasons why projects were 2 or more months late.
  – Captured:
    • Number of Months Late
    • Result: Schedule Delay versus Product Redesign.
  – Captured the reason(s) why the project was late in percent.
## New Tool #1

<table>
<thead>
<tr>
<th>Cause of Problem/Delay</th>
<th>Description</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Invention</td>
<td>Project problems and delays were due to the normal challenges of invention: “haven't done this before”.</td>
<td>15%</td>
</tr>
<tr>
<td>Resources</td>
<td>Project problems and delays were due to not getting personnel and/or equipment when needed, resources did not have the right skill set or resources did receive necessary training.</td>
<td>25%</td>
</tr>
<tr>
<td>Missing Requirements</td>
<td>Project problems and delays were due to poorly defined requirements or requirements were missing.</td>
<td>15%</td>
</tr>
<tr>
<td>Added Requirements</td>
<td>As the project progressed, the project was delayed due to adding features to the original requirements.</td>
<td>15%</td>
</tr>
<tr>
<td>Requirements Not Traced</td>
<td>Project problems and delays were due to design and implementation tasks that deviated from the requirements during the course of the development.</td>
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</tr>
<tr>
<td>Development Process</td>
<td>Project problems and delays were due to poor development practices that resulted in unnecessary delays.</td>
<td>10%</td>
</tr>
<tr>
<td>Underestimating</td>
<td>The project complexity and/or time estimates were underestimated from the start of the project.</td>
<td>20%</td>
</tr>
<tr>
<td>Parts Procurement</td>
<td>Project problems and delays were due to parts were not ordered when they could have due to lack of documentation, BOMs or Purchasing over-sights.</td>
<td>0%</td>
</tr>
<tr>
<td>Vendor Selection</td>
<td>Project problems and delays were due to the vendor selected by either contract talks, development methods, technology and/or product delivery</td>
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</tr>
<tr>
<td>Interruptions</td>
<td>Project problems and delays were due to frequent interruptions from other projects and customer field escalations.</td>
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</tr>
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</table>
### Determine Improvements Areas

#### Identify 10 common reasons why a project is late:

- Underestimating
- Interruptions
- Missing Requirements
- Added Requirements
- Parts Procurement
- SW Project #1
- New Feature #1
- New Feature #2
- New Feature #3
- Improvement #1

#### Determine Improvements Areas

<table>
<thead>
<tr>
<th>Resource Problems</th>
<th>Vendor Selection</th>
<th>Invention</th>
<th>Parts Procurement</th>
<th>Added Requirements</th>
<th>Missing Requirements</th>
<th>Interruption</th>
<th>Underestimating</th>
<th>Interruptions</th>
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<th>Added Requirements</th>
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</table>

#### Record how many

- Resource Problems: 25%
- Vendor Selection: 55%
- Invention: 5%
- Parts Procurement: 5%
- Added Requirements: 20%
- Missing Requirements: 20%
- Interruption: 10%
- Underestimating: 10%
- Resource Problems: 10%
- SW Project #1: 15%
- New Feature #1: 15%
- New Feature #2: 15%
- New Feature #3: 15%
- Improvement #1: 15%
- New Tool #1: 15%
- New Tool #2: 15%
- New Tool #3: 15%
- SW Project #2: 15%
- New Feature #4: 15%

#### Record the result:

- “S” Schedule delay only
- “R” Redesign required

#### Result:

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<tr>
<th>Result</th>
<th>S</th>
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<th>S</th>
<th>S</th>
<th>R</th>
<th>S</th>
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### Project Timelines

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<th>New Tool #1</th>
<th>New Feature #1</th>
<th>Improvement #1</th>
<th>New Feature #2</th>
<th>Improvement #2</th>
<th>New Tool #2</th>
<th>SW Project #2</th>
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<th>New Tool #3</th>
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</tr>
</tbody>
</table>

**Create a high level graphic of project timelines.**

- Projects developed using ad hoc practices.
- Projects start to run smoothly.
- Improvements start to have a positive impact.
- Redesign completed using new improvements
- Missed Critical Requirement.
- Redesign combined with New Tool #3.
- Minimal Impact

**Indicate the Project Results.**

- Months Late
- Result were unacceptable. Redesign required.
- Resources Pulled to work on New Tool #1.

**Projects developed using new improvements**

- Redesign required.
Resource Problems

- Too Many Projects/Missing Projects
- Frequently Changing Priorities
- Wrong Skill Set/Lack of Training
- Unclear Responsibilities
A Successful Resource Management Process should...

Provide a view of all projects to minimize and eliminate over commitment

Manage shared resources across multiple projects and product lines

Define methods to overcome these obstacles

Improve skills for greater flexibility and career growth

Reveal the obstacles that impact resource planning

Improve resource flow to create a rapid and effective product development environment

A Successful Resource Management Process should...

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Improve resource flow to create a rapid and effective product development environment
CMMI Generic Practices

- **GP2.3 – Provide Resources**
  - Provide adequate resources for performing the process, developing work products, and providing the services of the process.

- **GP2.4 – Assign Responsibility**
  - Assign responsibility and authority for performing the process, developing the work products, and providing the services of the process.

- **GP2.5 – Train People**
  - Train the people performing or supporting the process as needed
Common Pitfalls

- Plan Resources once a Year for Budgets
- Roll all the Project Gantt Charts up into a Master Plan
Resource Allocation and Management Process (RAMP)

- **Project Roadmap**
  - Assign Resources and Responsibility
  - Monitor Utilization
- **Resource Plan**
- **Monitor and Control Resource Plan**
  - Make Adjustments
- **Project #1**
  - Assess Project #1
  - Resource Mgmt - Root Cause
    - Resources Underestimated
    - Unclear Responsibilities
    - Gap in Skill Sets
    - More Training Required
    - Overcommitted
Fundamentals

• Develop a Project Roadmap
  – Develop a Project List
  – Develop Project Resource Models
    • Project Planning-PA: Estimating Models
  – Develop a Project Priority List
  – Develop a Staffing Plan
  – Analyze and Validate the Roadmap
Fundamentals

- Develop the Resource Plan
  - Develop Job Descriptions
  - Develop a Skills Inventory List
    - Project Planning-PA
  - Develop Performance Models
  - Assign Names to the Roadmap
  - Analyze and Validate the Resource Plan
Develop a Project Roadmap

• Develop a Project List
  – Identify ALL the known projects and commitments and new product ideas.
    • New Product Ideas
    • New Development Projects
    • New Features
    • Sustaining Activities
    • Internal Improvement Projects
  – Identify hard and soft dates for the listed projects.
Develop a Project Roadmap

• Develop Project Resource Models
  – Review projects conducted for the past year to establish models for typical development projects
    • Number of Months in each Development Phase
    • Number of Engineers in each phase
  – Develop Models for each Project Size
    • Category 1 – Small Correction/Improvement
    • Category 2 – New feature requiring one discipline
    • Category 3 – Medium effort with multiple disciplines
    • Category 4 – Large project, all disciplines
Develop a Project Roadmap

• Using Timesheets to Develop Resource Models
  – Time sheets indicate the total man-hours to complete the project
  – Time sheets do not indicate the project length
  – Time sheets are best used to:
    • Improve proposal estimates
    • Determine if project length is too short
## Develop a Project Roadmap

- Develop a 2 Dimensional Project Priority List

<table>
<thead>
<tr>
<th>Priority</th>
<th>Ranked Examples</th>
<th>Priority = 1</th>
<th>Priority = 2</th>
<th>Priority = 3</th>
<th>Priority = 4</th>
<th>Priority = 5</th>
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<tbody>
<tr>
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<td>Safety Issue Quarterly Shipments</td>
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<td>Customer escalation Critical Shipment Product develop – A</td>
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<td>3 - Medium</td>
<td>Non-critical Shipment Critical Obsolete Part Product develop – B</td>
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<tr>
<td>4 - Low</td>
<td>Product develop – C Non-critical Obsolete Part</td>
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</tr>
</tbody>
</table>

- Priority List will serve as a decision making tool during development
Using EXCEL to develop a Project Roadmap
Roadmap Committee

- Background
- 6 Members
- Manual Planning – EXCEL
  - Captured the project length – One cell per month
  - A Phase number was placed in cells (1 through 6)
  - Each Cell with a Phase Number was colored (Red through Green)
# Manual Roadmap

## Product Line #1

<table>
<thead>
<tr>
<th>Project</th>
<th>Jan</th>
<th>Phase 1: Requirements</th>
<th>Phase 2: Concept</th>
<th>Phase 3: Design</th>
<th>Phase 4: Implementation</th>
<th>Phase 5: Integration</th>
<th>Phase 6: Validation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project A</td>
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<td>4</td>
<td>4</td>
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</tr>
</tbody>
</table>

## Roadmap Committee

NexSummit LLC  
908-684-8914  
nexsummit.com
Roadmap Committee

• Problems Encountered
  – Many discussions with actions for next meeting
  – The Roadmap was difficult to maintain
  – The Roadmap was difficult to validate
  – The Roadmap was too aggressive and didn’t match project estimates

THERE MUST BE A BETTER WAY!
Roadmap Tools

• Develop a viable plan before resources are actually assigned to projects
  – Avoid Over-committing
  – Not Just Graphics but be tied to actual resources

• Easy to Understand
  – Important during kick-off
  – Important for monthly or quarterly reviews

• Easy to Change
  – Ideally: Develop roadmap to drive projects
  – Real life: Every project continues while Roadmap is being developed
  – Goal: Short implementation and approval cycle
EXCEL Roadmap

• Automated EXCEL Spreadsheet
  – Real-time Feedback
  – Real-time Decision Making
  – Very Good Charts and Graphs

• Recommended Tabs
  – Roadmap
  – Resource Targets for each Discipline
    • Systems, SW, EE, ME, etc..
  – Total Staffing
  – Project Summaries
Roadmap Worksheet

- Phase Definition
  - Phase 1: Requirements Phase
  - Phase 2: Concept Phase
  - Phase 3: Design Phase
  - Phase 4: Implementation/Verification
  - Phase 5: Integration/Verification
  - Phase 6: Validation /Product Transfer
### Roadmap Worksheet

#### Project List and Roadmap Setup

<table>
<thead>
<tr>
<th>Product Line #1</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
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#### Phase Length

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# Resource Targets Worksheet

## Resource Model for Each Discipline

<table>
<thead>
<tr>
<th>Product Line #1</th>
<th>Phase 1</th>
<th>Phase 2</th>
<th>Phase 3</th>
<th>Phase 4</th>
<th>Phase 5</th>
<th>Phase 6</th>
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**Resource Targets Worksheet**

### Assigning a Model to a Project

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<th>Mar</th>
<th>Apr</th>
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<th>Jun</th>
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<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
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</table>

Assign a Model to a Project by entering a “1”

### Electrical Engineering Model (Fixed)

<table>
<thead>
<tr>
<th>Product Line #1</th>
<th>Phase 1</th>
<th>Phase 2</th>
<th>Phase 3</th>
<th>Phase 4</th>
<th>Phase 5</th>
<th>Phase 6</th>
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</table>

### Project Roadmap (Fixed)

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## EE Resource Plan for Product Line #1

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Total Staffing Plan

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Overcommitted

Resource Summary

Total Resource Required
Total Resources Available
Leveling the Roadmap

Electrical Engineering Staffing Plan

- Leveled EE Resources
- Product Line #1 Resources
- Product Line #2 Resources
- Unplanned Activities

Resources Planned

- Product Line #1
- Product Line #2
- UnPlanned Projects
- Total Requests
Analyzing the Roadmap

- Resolving Over-commitment
  - Adjust Headcount
  - Adjust the Roadmap
    - Remove Projects
    - Remove Features
    - Change Deadlines
  - Outsource
  - Adjust Models

Resources required determined by integrating:
  - Roadmap
  - Resource Models
  - Priority List

Current Headcount

NEGOTIATE
Analyzing the Roadmap

- Resolving Under-Utilization
  - Add Projects
    - New Features
    - New Products
  - Training
  - Process Improvements
  - Adjust Models

Resources required determined by integrating:
- Roadmap
- Resource Models
- Priority List

Current Staffing Plan

Fill Resource Gap
Analyzing the Roadmap

- Validate Commitments
  - Determine the Backlog
  - Determine the “Commitment Backlog Date (CBD)”
  - Convey “CBD” on a regular basis
# Project Summaries

- Roll-up of all resources by project

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Develop a Resource Plan

- Develop Job Descriptions
- Develop a Skills Inventory List
- Develop Performance Models
- Assign Names to the Roadmap
- Analyze and Validate the Resource Plan
Develop a Resource Plan

• Develop Job Descriptions
  – Develop Job Titles
    • Engineer 1, 2, 3, 4
    • Associate, Engineer, Sr. Engineer, Principal
  – Develop Requirements for each Engineering Level
  – Assign a Job Title to each Resource
Develop a Resource Plan

- Develop a Skills Inventory List
  - Define a skills list for each discipline
  - Identify the skills of each Engineer (X)
  - Rate the Engineer’s skill level (1-4)
  - Evaluate each Engineer’s skill with respect to their job title

- Set Expectations and Career Growth
## Develop a Resource Plan

### Skills Inventory List Example

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Develop the Resource Plan

- Assign Names to the Project Roadmap to create a Resource Plan
  - Use the Skills Inventory List to Assign Alternate Resources to the Resource Plan
  - Evaluate the resource assignments with the resource requirements of the Roadmap
Using EXCEL to Develop a Resource Plan
EXCEL Resource Plan

• An EXCEL spreadsheet should be developed for each discipline

• Recommended Tabs
  – Resource Requests (Targets)
  – Resource 1 through “n”
  – Staffing Plan
  – Project Assignments
# Resource Requests

- Links to the Resource Targets from the Roadmap

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<th>Mar</th>
<th>Apr</th>
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Resource 1 through “n” Worksheet

• A Separate Tab for Each Resource that includes:
  – Resource Assignment Table
    • Table to indicate whether the resource has been assigned to the Roadmap Projects
  – Individual Performance Model
    • Models the individual skills to each project phase
    • Can be Job Title based or unique for each Engineer
## Resource 1 Worksheet

### Resource Assignment Table

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### Individual Performance Model

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**Project A starts at Phase 4**

Assign This resource to a Project by entering a “1”
Resource 1 Worksheet

- Use EXCEL Chart Wizard to Level Resources

[Chart showing Resource 1 with variance and months]
Analyze Loading on each Resource

- **Resource 1**: Under-utilized. Assign more work.
  - Opportunity for Training

- **Resource 2**: Probably OK based on Average Loading

- **Resource 3**: Under-utilized
  - Opportunity for Training

- **Resource 4**: CBD
  - Assign New Project

- **Average Loading**: CBD

- **Variance**: Resource 1, Resource 2, Resource 3, Resource 4

- **Months**: 1 to 12
Staffing Plan

- This is the Current Headcount and Hiring Plan for the Year
- Can be linked to the Roadmap when leveling

<table>
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<th>Resource</th>
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Staffing Plan: 6 6 6 6 7 7 7 7 8 8 8 8

- Hire a new Engineer in May
- Hire a new Engineer in September
Analyze Loading to the Roadmap

Staffing Plan

Roadmap Requirements

Opportunity for Process Improvement

Total Loading

- Staffing Plan
- Resource Requests
- Assigned Resources

- Freeze New Hires
- Reduce Roadmap
- Adjust Resource Plan
- Adjust Performance Models
- Could be OK.

Could be OK.

One Resource Pad

Opportunity for Process Improvement
# Project Assignments

- Summary of the total resources assigned to the project

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<th>Product Line #1</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>Jun</th>
<th>Jul</th>
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Resource 1
Analyze Project Coverage

Perfect!

Resource Arrives Late

Make an Adjustment to the Plan

Perfect!
Monitoring the Resource Plan

• Maintain the Resource Plan based upon Project Execution
  – Resource Plan should drive Projects
  – Real-time Feedback

• Frequency
  – Monthly Goals (ACTIVE)
  – Weekly Progress Reviews (PASSIVE)
  – Quarterly Updates and Management Reviews
# Monthly Goals

**Review Progress and Update Roadmap - MARCH**

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**Setup**

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**Phase Length**

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- Project A, Phase 4 does not wrap up. Incremented from 2 to 3 months.
- Project F, Phase 5 does not wrap up. Incremented from 2 to 3 months.
Impact of Schedule Push-outs On Roadmap

Increased resources required to recover from Project A, Phase 4 and Project F, Phase 5 push-outs.
Monthly Goals

Impact of Schedule Push-outs on Resource Plan

Resource Plan shows no real problem from Project A, Phase 4 and Project F, Phase 5 push-outs.
Monthly Goals

- Review progress against the previous monthly goals
- Identify the task and activities for the upcoming month and update goals.
- Identify the probability of completion.
- If probability of completion is low (<75%), identify roadblocks that cause low confidence.
- Proactively address roadblocks for low the confidence tasks/goals
- Save, Publish and Communicate the Monthly Plan
Weekly Meetings

- Review Progress with respect to the Monthly Plan and Goals
- Identify gaps and outline an Action Plan
- Follow through on the Plan
Quarterly Management Review

- Update the Roadmap and Level the Resource Plan
- Review changes and impact of the updated Resource Plan
- Review Project Backlog
- Review “Commitment Backlog Date”
- Identify concerns with the new plan
- Develop Action Plan
Conclusions

• An automated Roadmap, tied to resources, creates a viable plan before asking Vertical Managers to staff the Roadmap.

• An automated Resource Plan allows Vertical Managers assign and level resources before resources are assigned to development projects.

• The Roadmap and Resource Plans can be proactively managed with traditional project management techniques.
Contact Information

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  - www.nexsummit.com