Embedded System
Design

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LAN System Block
Diagram (Rev 1)

Embedded Traits
- Jumping from Design to Building too fast
- Abdication of responsibility to be part of the project management team
- Acceptance of lousy tools for lousy reasons
- Poor Detail management
Disciplined Development

• Seduction of the keyboard
  – Deadlines make people drop process
• Firmware costs around $20-$40/line of debugged code

Process Makes the Difference
CMM - Capability Maturity Model - How Mature are your design processes?
• Level 1 - Initial - Ad hoc and Chaotic
  – Few processes defined
  – Success depends on individual heroics rather than team effort

CIM continued
• Level 2 - Repeatable - Intuitive
  – Basic Project Management Processes
  – Planning and managing is based on experience with similar projects
CIM Level 3

- Level 3 - Defined - Standard and Consistent
  - Processes for management are:
    - Documented
    - Standardized
    - Integrated into the organization
  - All projects use approved process standard

CIM Level 4

- Level 4 - Managed - Predictable
- Detailed Software Process
  - Quality Metrics establish a quantitative evaluation foundation
  - Variations from process performance can be distinguished

CIM Level 5

- Level 5 - Optimizing - Characterized by Continuous Improvement
  - Quantitative Feedback Systems
  - Identifies Process Weakness and improves them
  - Project Teams analyze defects
  - Processes are updated and improved
The CIM stuff works

- 37% gain in productivity
- 18% more defects found pre-test
- 19% reduction in time to market
- 45% reduction in customer found defects

To make CIM work

- Deep management commitment is absolutely necessary
- Path from level to level is long and tortuous

How can you start CIM in a company?

- Buy and use a version control system
- Institute a software standards manual
- Start doing code reviews and inspections
- Create a quiet environment conducive to thinking
Environment

<table>
<thead>
<tr>
<th>Question</th>
<th>1st Quartile</th>
<th>3rd Quartile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is it Private?</td>
<td>62% Yes</td>
<td>19% Yes</td>
</tr>
<tr>
<td>Can you divert calls?</td>
<td>76% Yes</td>
<td>19% Yes</td>
</tr>
<tr>
<td>Can you turn off phone?</td>
<td>52% Yes</td>
<td>19% Yes</td>
</tr>
<tr>
<td>Is it Quiet?</td>
<td>57% Yes</td>
<td>29% Yes</td>
</tr>
<tr>
<td>Dedicated workspace?</td>
<td>74.6 sq ft</td>
<td>94 sq ft</td>
</tr>
</tbody>
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The Number 1 Myth!

- Cubicles add to software productivity!

Cost of Offices

- Cost of 100 Sq Ft Office
  - $3000/year = 100sqft X $30/ft/year
  - One engineer = $120,000 (with overhead)
  - Office represents 2.5% cost of engineer
  - Productivity improvement can be as much as 260%
Assignment

• Nothing until next Tuesday!