Software Process Improvement at Madison Research Corporation:

The Road to Level 2, and Beyond

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Agenda

- Describe:
  - organizational framework,
  - history (briefly), and
  - activities

of MRC's progress to CMM Level 2, and then…

- Discuss:
  - observations and benefits from the experience
  - gearing up for Level 3

MRC Organizational Background

- Founded 1986, in Huntsville Alabama
- Consistent, substantial annual growth
- Currently about 300 employees in 9 sites, headquartered in Huntsville
- 8(a) corporation, to complete transition from the program in 2002

Software Engineering at MRC

- Software Engineering is one of five operational business units at MRC.
- In Huntsville in 1998, SE professionals were distributed across several projects:

Payload Launch Vehicle

Integrated System Test Capability

Independent Verification & Validation

Automated Rendezvous & Capture

Microgravity Research

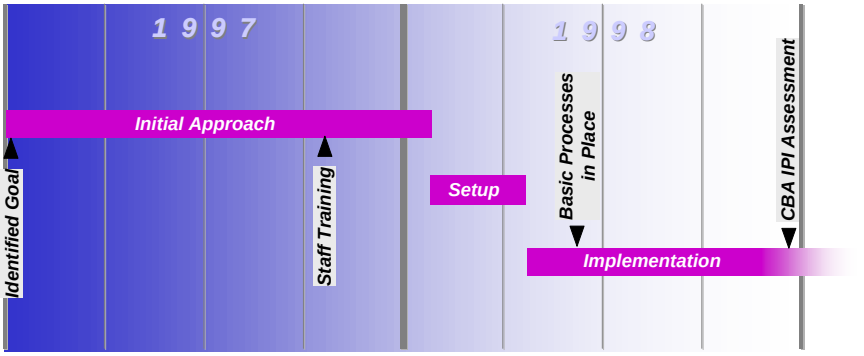
INSIGHT

- Wide range of project types
- Varying levels of control over software processes

Why We Initiated Software Process Improvement

- Competitive edge, growth
- Improved professional capabilities and opportunities
- More responsive and reliable customer service
- Better products

Phases of Action



Getting Started: 1997

- Formed Software Process Improvement Team
- Surveyed quality models:
  - ISO-9001
  - SEI CMM
  - SPICE
  - TickIT
- Model requirements:
  - Initially feasible
  - Potential benefit to MRC software projects
  - Sustainable
- Selected SEI CMM after crosswalk with ISO-9001for software
  - CMM and ISO were the most widely recognized schemes
  - CMM covered more of ISO than vice versa
  - Process development orientation of CMM more directly addressed MRC project needs
- Provided orientation for all MRC software personnel

Gathering Forces: Early 1998

- To prepare, conducted a “bootstrap” process audit in Fall 1997.
- Obtained senior management commitment and support.
- Identified and assigned a staff member to coordinate the effort.
- Engaged a consultant.
- Generated a schedule for Level 2 achievement and certification:
  - *June 1998!*

Beginning Implementation: February / March 1998

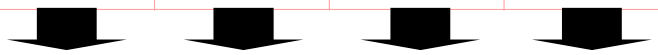
- Instituted corporate policies for all CMM Level 2 Key Process Areas, plus Training (a critical area for this and later process improvement phases).
- Acquired basic training for 12 core personnel in CMM.
- Developed procedures and standards required by Level 2.
- Established central SQA / SPI function and direct contact with each software project.

On the Road: March - May 1998

- Initially focused on project SDPs.
- Requirements management (RM) was taken “out of sequence”:
  - Needed to establish basic project performance and management parameters, provide “hooks” for all project description.
  - Projects were already well underway, reducing the importance of addressing requirements first.
- Task estimates and metrics collection were established on a project-by-project basis.
- Training was provided in software team meetings and with individual projects, as new aspects of process control were introduced.
- Meetings with projects evolved into standardized audits.

Issues Facing SPI Implementation

ISSUES	Small, unrelated software projects	Variable potential for process control	Variable customer support for SPI	Tough schedule
MITIGATIONS	High effort per person Tailoring	CMM interpretation Tailoring	Tailoring	Work fast Don't make mistakes



High Cost / Benefit Ratio
High Risk

Consolidation: June - December 1998

- Solidified processes that were begun by the end of May.
- Performed substantial tailoring of procedures and standards:
  - Project constraints and capabilities became clearer.
  - "Organic" familiarity with CMM became stronger, more widespread.
- Coming of the assessment provided focus, galvanized attention.

Approaching the CBA IPI: December 1998

- Assessment team training (November).
- Obtained and verified senior management vision of assessment goals:
  - Reduce the cost of developing and maintaining software products.
  - Improve time to market for software products.
  - Improve quality of software products.
  - Improve cost, timeliness, and reliability of software development services.
- Settled assessment logistics and site coordination requirements.
- Ensured that project staff understood and were articulate about their existing processes.

Objectives of the Assessment

- Validate MRC software processes against CMM Level 2.
- Obtain data for planning and implementing software process improvements toward CMM Level 3.
- Promote organizational buy-in to sustain the process improvement effort.
- Measure progress against MRC's Software Process Improvement Plan.

Outcomes of the Assessment

- Final Report, issued February 23.
  - Captured strengths and weaknesses.
  - Weighed them for assessment of CMM Key Process Areas.
  - Made recommendations for further process development.
  - Effectively produced consensus on where we are in process maturity, and where we need to go.
  - Developed solid core of people with intimate knowledge of MRC software process characteristics and potential.
- Indirectly: Action Plan, based wholly on Final Report recommendations.
  - Action Plan does not stand alone: It is placed in context by the MRC Software Process Improvement Plan.

Observations: Goal Setting

- Achieving the rating is critical, but it is not the game-winner.
  - The rating pertains only to the model - and the model, at least at Level 2, does not necessarily require that processes be good.
  - If processes do not stand to reason, the approach to a rating will generate a poor attitude toward software process improvement.
  - A "stand-alone" Level 2 rating leaves you with:
    - payoffs that are local to projects
    - dependency on fragile conditions - stability of champions and projects
- …And yet, everyone will focus on the clear, measurable rating goal.
- Solution: MRC involved ***all*** organizational levels in a commitment to ***continuous*** process improvement, and "talked it up" constantly.

Observations: Sponsorship

- Senior management must direct the effort.
- Senior management must support direction of corporate resources toward process improvement goals.
- Senior management must be kept up-to-date on process improvement.
  - Periodic software quality assurance reports.
  - Sitting-in on designated SEPG meetings.
  - Any ad hoc opportunity that arises.
- Senior management must sponsor process improvement goals.
  - Ensures that process improvement is considered a central part of each person's job.
- Senior management must specify and sponsor assessment goals.

Observations: Process Champions

- Select a process champion, but distribute implementation responsibility.
  - Get everyone into the SEPG "boat" early, and give each an oar.
  - Individual viewpoints sharpen with responsibility.
  - More and better viewpoints increase the likelihood of objectivity.
  - Training responsibility is closer to the point of use, making it more effective.
  - The team will identify *itself*, not just a particular agent, with process improvement.

Observations: Deadlines

- You need to work against a deadline, but a deadline can work against you.
  - The engineering paradigm has its limits when applied to process improvement.
  - Make time, staffing, and other resource estimates realistic.
  - Do not assume that you simply need to "brush up".
    - Unless your organization has ***enforced*** process controls ***recently***, you probably are not close.
- Do not respond to schedule crisis simply by working harder:
  - Either the schedule is unrealistic, or you're doing something wrong.
  - Figure out what it is, fix it, document the lesson learned, and go on.

Observations: Sequence of Activities

- Focus on process elements first, then build more complex structures.
  - Early MRC focus on SDPs produced frustration and documents of varying utility.
  - A better approach: Focus on individual processes (such as estimates and metrics), and build to the SDP.
  - Recovery was successful, but costly.
- Gather project information early, before designing the process improvement approach and setting schedules.
  - "Native" information can lack objectivity, and may not be comparable across projects.

Observations: Training

- Assessment team training is invaluable. Do it early if you can, refresh it as often as you have to, by whatever means you need. Benefits:
  - Knowledge of standards you must meet.
  - Awareness of how CMM fits together as an organic whole, at least within KPAs.
  - Core of internal "consultants", intimate with project behavior and able to relate it in detail to CMM requirements.
- Homegrown process training can be expensive, can be incomplete, and can tend to tell people what they already know.
  - Learn about local, external training opportunities. Sufficient lead time before assessment tends to reduce costs. (See *Deadlines*.)
  - Network with others who have been through a similar process.

Compounding Assessment Benefits: Moving Forward

- Aiming for Level 3: December 2000.
- Implementing the Action Plan derived from assessment Final Report recommendations.
  - Ensured that Final Report recommendations pointed clearly toward action.
  - Lost no time in developing the Plan.
- Extending software process improvement beyond the MRC Huntsville Site.
- Focusing on process improvement orientation and training.
- Identifying intergroup coordination requirements.

Software Process Improvement Benefits

- Explicit, ever-present emphasis on quality products
- Increased corporate visibility and customer understanding of MRC capabilities - attracts interest of more diverse potential customers
- Clear response to marketplace trend toward quality
- Role of the CBA IPI assessment:
  - Software staff consensus on requirements for a “culture” of process quality - essential to Level 3
  - Raised awareness of process quality at the corporate level, with related business units and remote sites
  - Clear direction on areas for further process improvement and consolidation of recent gains