CMMI Impact on Higher Education

I propose, that like our geographer, CMMI (in education) can provide a map for future exploration.
Today's Offerings (e.g. the outline)

• The needs of education
• The needs of industry
• Educating with CMMI
• The GW experience
Higher Education Environment

The needs of education
The needs of industry
Educating with CMMI
The GW experience

• Rapidly changing technology
• Higher degree of specialization
• More diverse student backgrounds
  – Cultural
  – Academic
• More adult students with significant life/work experience
Systems Engineering

• Systems Engineering is a broad discipline
  – Fundamental principles
  – Techniques
  – Specialty engineering
  – Domains...

• Systems Engineering is a broadly applicable discipline
  – Product systems
    • Hardware
    • Software
  – Management systems
    • Project management
    • Organizations
Educational Needs

The needs of education
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• Widely-applicable frameworks
• Flexible courseware
• Bodies of Knowledge
• Integrated approaches
**Industry Environment**

- Rapidly changing technology
- Higher degree of specialization
- Global corporations
- Multiple standards
- Complex systems of systems
  - Software is ubiquitous
  - Everything is a software-intensive system
  - Everything needs to talk to everything
- Integrated teams and processes
- “Fluid” business environment

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Attributes of Engineering Managers

• Rapid decision making
• Maintain broad understanding of numerous disciplines
• Technical, organizational, and financial savvy
• Ability to build and manage process-informed organizations
• Act as leaders/coaches
• Perform in an integrated project environment
Industry Needs

• Well-educated, well-rounded staff
• Experience in a process-based environment
• Managers and engineers who
  – Understand process concepts
  – Understand systems engineering principles
  – Understand software principals
  – Work across discipline

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CMMI As Part of Curricula

- Systems Engineering
- Software Engineering
- Technical Management
- Organizational Development

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CMMI in Education Supports Educators

• Provides broad, tailorable engineering framework
  - No specific methodology
  - Applicable to many engineering domains
  - A Knowledge Infrastructure (per Steve Cross)

• Provides real-world insight into technical management activities in context

• Informative material provides examples and work products

• Generic practices are a technical manager’s checklist

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CMMI in Education Supports Industry

- Provides process-aware graduates
- Provides real-world insight into technical management activities in context
- Supports adoption through familiarity
- Encourages research in integrated processes and PI
- Ideas introduced in class are often influential at work (if allowed) and so support transition

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Some Barriers

• Industry needs to enable process-competent grads
• Academia must educate, not indoctrinate
• Academia is much slower to change than industry
  – Publish or perish (refereed journals)
  – Tenured (ancient?) faculty

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George Washington University

- Serves the Washington, DC metro area
- Students from all level of engineering and development firms
- Cohort programs in companies and government organizations
- Wants to meet industry and government needs
- Two relevant departments currently looking at CMMI
  - Engineering Management and Systems Engineering
  - Management Sciences

The needs of education
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Educating with CMMI
The GW experience
• School of Applied Science and Engineering
• Students from all engineering disciplines
  - Civil
  - Mechanical
  - Electrical
• Two-course series in Systems Engineering
  - First course (required) covers SE Principles
  - Second course is a project-based course
• Currently using two texts by Howard Eisner
• Couples systems engineering with project management
• Based on MIL-STD-499 and Howard’s 30 key elements
• Briefly addresses SW-CMM and SE-CMM
• Recently taught using EIA-731 as an outline
Management Science

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- School of Business and Public Management
- Management courses
  - Technical management
  - Organizational development
  - Information systems
  - CIO certification
- Process improvement
  - SW-CMM mentioned
  - ISO standards mentioned
Proposed Experiments at GWU

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- EMSE-283 Systems Engineering I
  - Pilot based on CMMI
  - CMMI Distilled supplemental text
  - Chris Miller (SPC)
  - Richard Turner, Howard Eisner (GW)
  - Possible textbook based on course

- MGT-280 Information Systems Development and Applications
  - Pilot based on CMMI
  - Under consideration
Conclusions

• CMMI in education can benefit both industry and academia
• CMMI is an effective map for knowledge transfer in academia
• Process-informed management is a critical success factor for PI
• Process-informed graduate workforce eases adoption and performance of process improvement