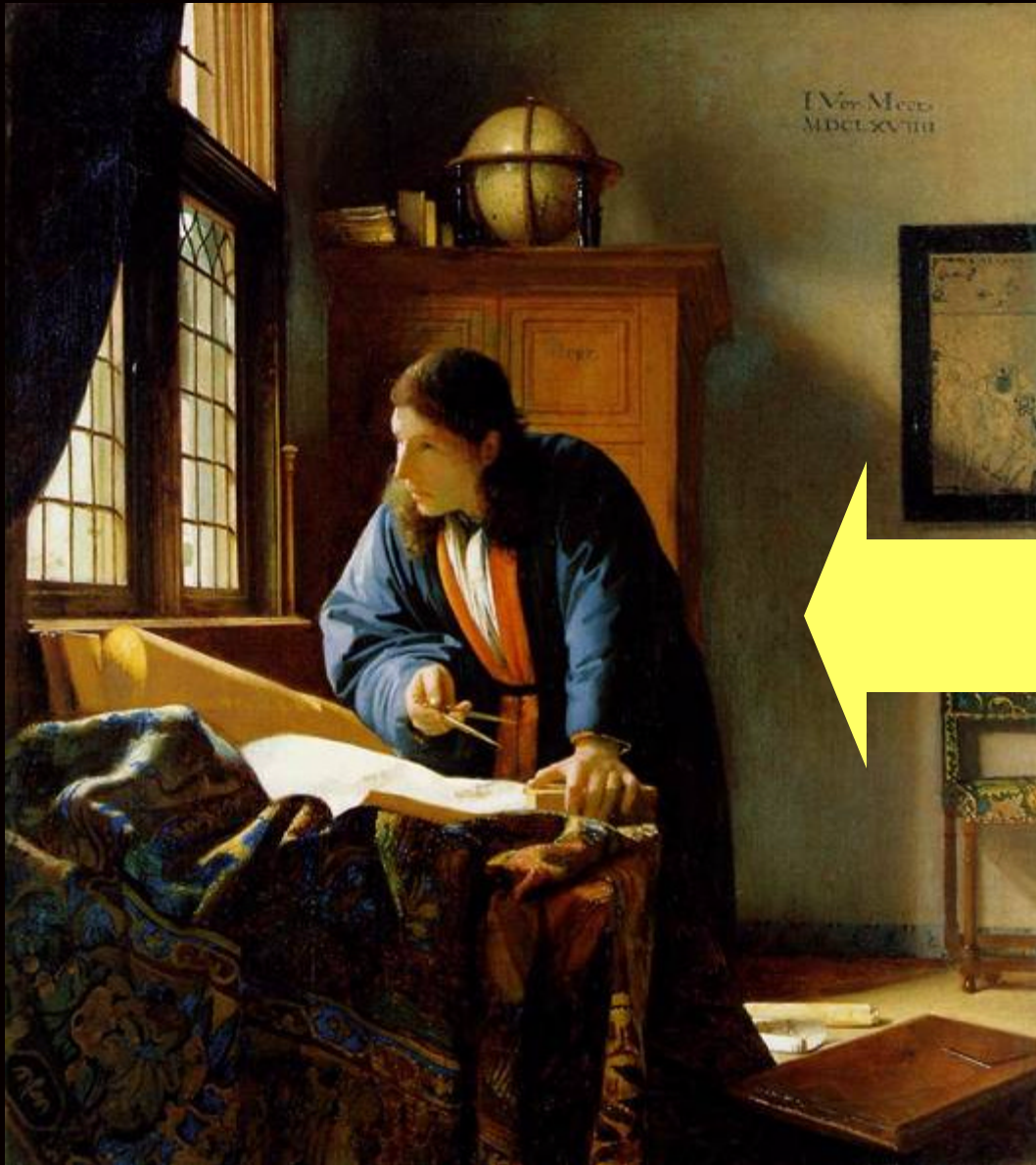


CMMI Impact on Higher Education



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

The needs of education

The needs of industry

Educating with CMMI

The GW experience



- **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

The needs of industry

Educating with CMMI

The GW experience



- **Widely-applicable frameworks**
- **Flexible courseware**
- **Bodies of Knowledge**
- **Integrated approaches**

Industry Environment

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



- 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

Attributes of Engineering Managers

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

- 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

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

- 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



CMMI As Part of Curricula

The needs of education
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Educating with CMMI
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- **Systems Engineering**
- **Software Engineering**
- **Technical Management**
- **Organizational Development**



CMMI in Education Supports Educators

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

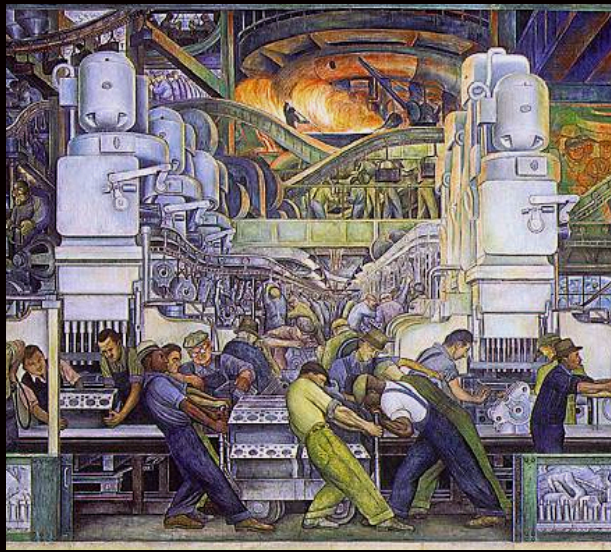


- Provides broad, tailorable engineering framework
 - No specific methodology
 - Applicable to many engineering domains
 - A Knowledge Infrastructure (per Steve Cross)
- Provides real-world insight into technical management activities in context
- Informative material provides examples and work products
- Generic practices are a technical manager's checklist

CMMI in Education Supports Industry

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

- 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



Some Barriers

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



- 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

George Washington University

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

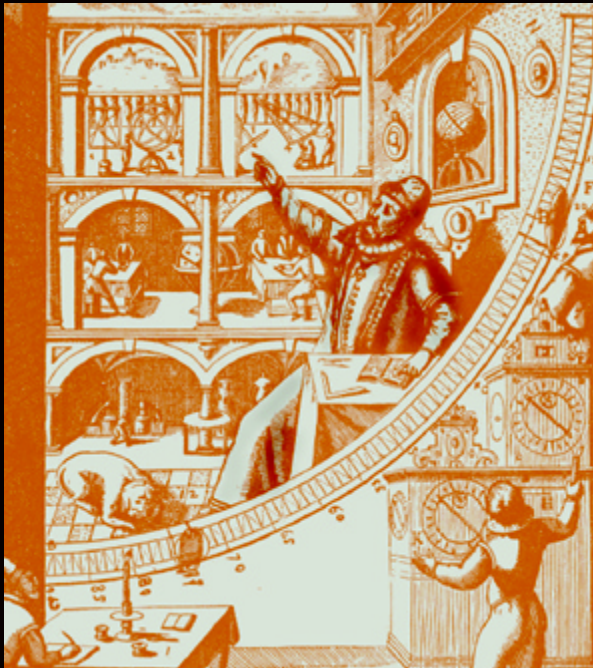


- Serves the Washington, DC metro area
- Students from all level of engineering and development firms
- Cohort programs in companies and government organizations
- Wants to meet industry and government needs
- Two relevant departments currently looking at CMMI
 - Engineering Management and Systems Engineering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

Engineering Management

The needs of education
The needs of industry
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



EMSE-283 Systems Engineering I

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



- 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

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

- 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

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

- **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

