SIEMENS

NORTHROP GRUMMAN

DEFINING THE FUTURE

What the CMMI Doesn't Say About Training (But Should!)

CMMI Technology Conference & User Group
14-17 November 2005

Rick Hefner, Ph.D.
Northrop Grumman Corporation

Sree Yellayi
Siemens Corporate Research

Agenda

- **Key questions on Organizational Training (OT) capability**

- **Introduction to OT in CMMI**

- **CMMI requirements for the OT process area**
  - The Kirkpatrick model

- **CMMI requirements for the Training generic practice**

- **Strategies for Organizational Training**

Key Questions in Establishing an Organizational Training Capability

- **How much training is enough?**

- **Should training be developed in-house or bought from a vendor or university?**

- **How should training be paid for?**

- **How do you determine whether training is effective?**

- **How does the training needs of project personnel, staff groups, and management differ?**

- **Are alternatives to classroom training (informal mentoring, web-based training, guided self-study, on-the-job training) effective? Under what conditions?**

- **How do you address technical, process, organizational, and contextual knowledge?**
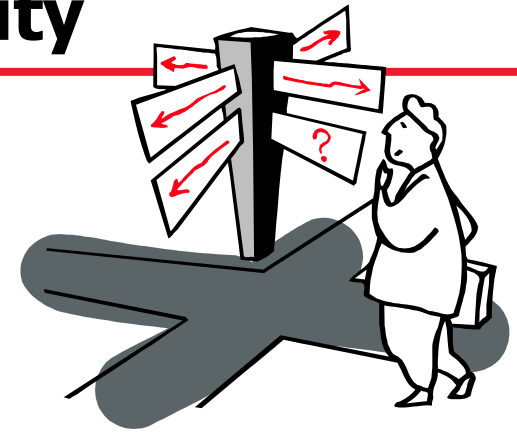
The CMMI provides guidance based on industry best-practices

SIEMENS

NORTHROP GRUMMAN

Organizational Training - Level 3 Process Area

Level	Focus	Process Areas
5 Optimizing	*Continuous process improvement*	Causal Analysis and Resolution Organizational Innovation and Deployment
4 Quantitatively Managed	*Quantitative management*	Quantitative Project Management Organizational Process Performance
3 Defined	*Process standardization*	Organizational Process Focus Organizational Process Definition Organizational Training Integrated Project Management Risk Management Decision Analysis and Resolution Requirements Development Technical Solution Product Integration Verification Validation Organizational Environment for Integration Integrated Teaming Integrated Supplier Management
2 Managed	*Basic project management*	Requirements Management Project Planning Project Monitoring and Control Supplier Agreement Management Measurement and Analysis Process and Product Quality Assurance Configuration Management
1 Performed		

SIEMENS

NORTHROP GRUMMAN

Organizational Training Process Area

- **Purpose**
  - Develop the skills and knowledge of people so they can perform their roles effectively and efficiently

- **Key actions**
  - Identifying the training needed by the organization
  - Obtaining and providing training to address those needs
  - Establishing and maintaining training materials
  - Establishing and maintaining training records
  - Assessing training effectiveness

Training Scope

- **Skills and knowledge may be:**
  - Technical – ability to use the equipment, tools, materials, data, and processes
  - Organizational – behavior within and according to the employee's organization structure, role and responsibilities, and general operating principles and methods
  - Contextual – self management, communication, and interpersonal abilities needed to successfully perform in the organizational and social context of the project and support groups

- **Training options**
  - Classroom training
  - Web-based training
  - Guided self study
  - Formalized on-the-job mentoring

Is the Staff Qualified to Do Their Work?

An organizational responsibility!

- **What are the minimum skills and knowledge needed to perform their job function?**

- **Does each individual possess these skills?**
  - If not, training is expected to address the gaps

How does the organization maintain
a skilled and knowledgeable workforce?

Organizational Training Goals

- **SG 1 Establish an Organizational Training Capability**

   A training capability that supports the organization's management and technical roles is established and maintained.

- **SG 2 Provide Necessary Training**

   Training necessary for individuals to perform their roles effectively is provided.

- **GG 3 Institutionalize a Defined Process**

   The process is institutionalized as a defined process.

Expected Practices - Goal 1 (Establish an Organizational Training Capability)

- **SP 1.1 Establish the Strategic Training Needs**
  Establish and maintain the strategic training needs of the organization.

- **SP 1.2 Determine Which Training Needs Are the Responsibility of the Organization**
  Determine which training needs are the responsibility of the organization and which will be left to the individual project or support group.

- **SP 1.3 Establish an Organizational Training Tactical Plan**
  Establish and maintain an organizational training tactical plan.

- **SP 1.4 Establish Training Capability**
  Establish and maintain training capability to address organizational training needs.

- **Strategic needs** address long-term maintenance of a qualified work force

- **Tactical plans** address this year's training

- The organization may choose to meet some needs, and leave other to individual projects

- Capability includes
  - Classrooms
  - Training materials
  - Instructors
  - Administrative staff

SIEMENS

NORTHROP GRUMMAN

Instructor Qualification

- **Qualify Instructors**
  - Based on their knowledge, experience and skills
  - Have a process for approving instructors before they start teaching

- **Maintain a list of qualified instructors**
  - Show who is qualified to teach which course
  - Update the list to include new instructors from time to time

- **Re-train the instructors**
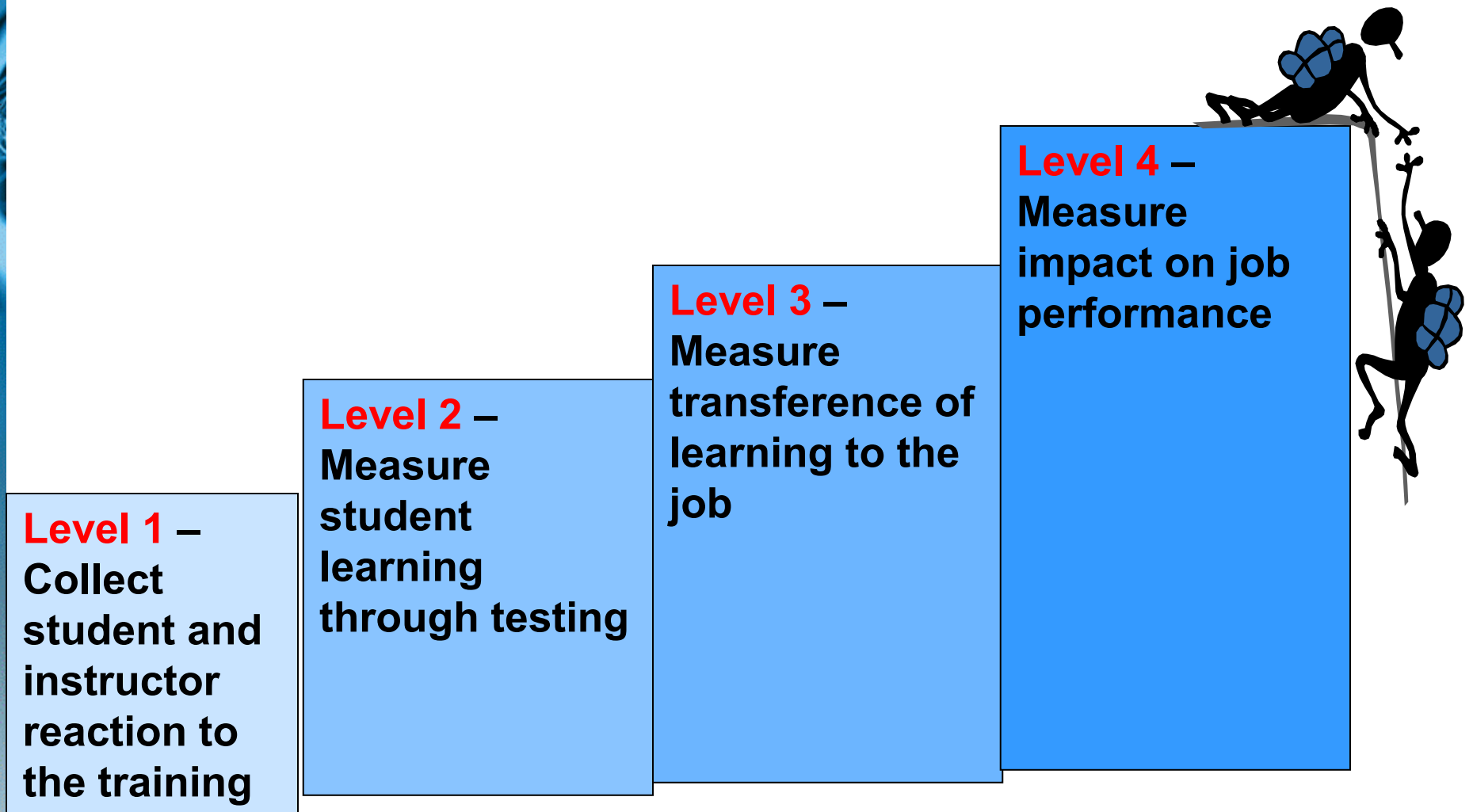
SIEMENS

NORTHROP GRUMMAN

Expected Practices - Goal 2 (Provide Necessary Training)

- **SP 2.1 Deliver Training**
  Deliver the training following the organizational training tactical plan.

- **SP 2.2 Establish Training Records**
  Establish and maintain records of the organizational training.

- **SP 2.3 Assess Training Effectiveness**
  Assess the effectiveness of the organization's training program.

Training Feedback form taken at the end of training course is <u>not</u> measuring effectiveness

---

- **The purpose of training records is to:**
  - Determine who is qualified for each assignment
  - Determine how many people still need to take each required training course (drives budgets)

- **Effectiveness – how well did the training impart the desired skills and knowledge?**

SIEMENS

NORTHROP GRUMMAN

Effectiveness – The Kirkpatrick Model

Level 1 – Collect student and instructor reaction to the training

Level 2 – Measure student learning through testing

Level 3 – Measure transference of learning to the job

Level 4 – Measure impact on job performance

SIEMENS

NORTHROP GRUMMAN

Expected Practices – Generic Goal (Institutionalize a Defined Process)

- GP 2.1 Establish an Organizational Policy
- GP 2.2 Plan the Process
- GP 2.3 Provide Resources
- GP 2.4 Assign Responsibility
- GP 2.5 Train People
- GP 2.6 Manage Configurations
- GP 2.7 Identify and Involve Relevant Stakeholders
- GP 2.8 Monitor and Control the Process
- GP 2.9 Objectively Evaluate Adherence
- GP 2.10 Review Status with Higher Level Management
- GP 3.1 Establish a Defined Process
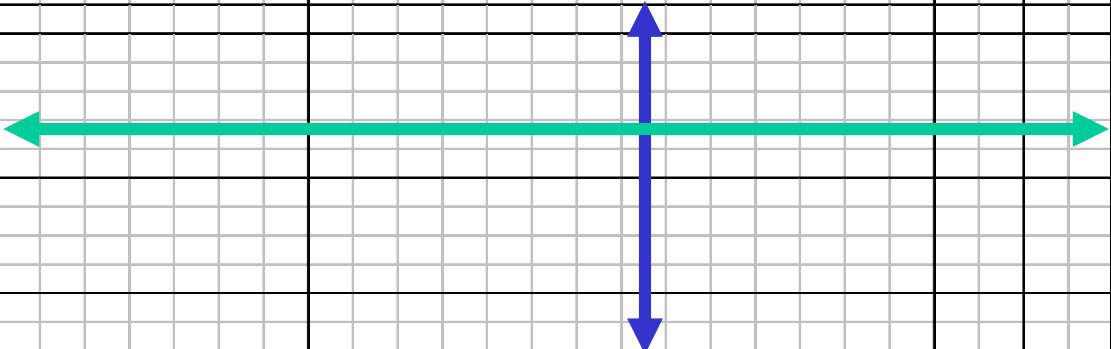- GP 3.2 Collect Improvement Information

- **Often neglected areas:**
  - Training for instructors and administrative staff
  - Configuration control of course materials, student records
  - Process and product audits
  - Defined processes for needs identification, student selection, course revisions, etc.

SIEMENS

NORTHROP GRUMMAN

Generic Practice for Training (Applies to all Process Areas)

- **GP 2.5 Train People**
  Train the people performing or supporting the process as needed.

			Requirements Management	Project Planning	Project Monitoring and Control	Supplier Agreement Management	Measurement and Analysis	Process and Product Quality Assurance	Configuration Management	Requirements Development	Technical Solution	Product Integration	Verification	Validation	Organization Process Focus	Organization process definition	Organizational Training	Organizational Environment for Integration	Integrated Teaming	Integrated Supplier Management	Integrated Project Management	Risk Management	Decision Analysis and Resolution	Organizational Process Performance	Quantitative Project Management	Organizational Innovation and Deployment	Causal Analysis and Resolution
GP 2.1	(CO 1)	Establish an Organizational Policy																									
GP 2.2	(AB 1)	Plan the Process																									
GP 2.3	(AB 2)	Provide Resources																									
GP 2.4	(AB 3)	Assign Responsibility																									
GP 2.5	(AB 4)	Train People																									
GP 3.1	(AB 5)	Establish a Defined Process																									
GP 2.6	(DI 1)	Manage Configurations																									
GP 2.7	(DI 2)	Identify and Involve Relevant Stakeholders																									
GP 2.8	(DI 3)	Monitor and Control the Process																									
GP 3.2	(DI 4)	Collect Improvement Information																									
GP 2.9	(VE 1)	Objectively Evaluate Adherence																									
GP 2.10	(VE 2)	Review Status with Higher-Level Management																									

SIEMENS

NORTHROP GRUMMAN

Strategies for Organizational Training - 1

- **Start by defining the key job functions in the organization**
  - E.g., project manager, software engineer, quality assurance specialist

- **Identify the requisite knowledge associated with each function**

- **Define a set of course modules that impart this knowledge**
  - Map modules to job functions
  - Some modules will be common to multiple job functions

- **Acquire training materials and trainers**
  - Should reflect the organization's policies and processes
  - Unlikely that standard vendor/university courses will fit

- **Ensure all the CMMI process areas are addressed**
  - Knowledge needed to perform the process, NOT a course about the CMMI requirements for that process area
  - Include performers of the process, and those that support the process

SIEMENS

NORTHROP GRUMMAN

Strategies for Organizational Training - 2

- **Identify each employee by their job function(s), map to required courses**
  - If the employee already has the identified minimum knowledge, they do not need to take the course

- **Establish student records**
  - Who has completed what course, waivers

- **Review required training with employees**
  - Career-planning, promotions, new hires

- **Where additional project-specific training is required (e.g., tools, methods), adopt a similar approach at the project level**
  - Project Planning SP 2.5 addresses project specific training

SIEMENS

NORTHROP GRUMMAN

References and Contact Information

- **CMMI: Guidelines for Process Integration and Product Improvement by Mary Beth Chrissis, Mike Konrad and Sandy Shrum**

- **CMMI Distilled by Dennis Ahern, Aaron Clouse and Richard Turner**

Thank You

Rick Hefner, Ph.D.
Northrop Grumman Corporation
One Space Park - R2/1136,
Redondo Beach
CA 90278
Phone: 310-812-7290
E-mail: rick.hefner@ngc.com

Sree Yellayi
Siemens Corporate Research
755 College Road East, Princeton
NJ 08540
Phone: 609-734-6583
E-mail: sree.yellayi@siemens.com

SIEMENS

NORTHROP GRUMMAN