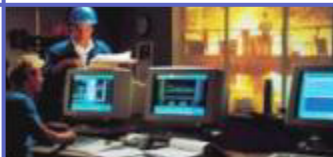


**Coordinating Process
Improvement in Multiple
Geographically Dispersed
Development
Organizations
Using CMMI**

**Aldo Dagnino
and
Andrew Cordes**

**ABB Inc.
US Corporate Research
Center
Raleigh, NC**



ABB

- Leader in power and automation technologies
- Enable utility and industry customers to improve performance while lowering environmental impact
- The ABB Group of companies operates in more than 120 countries and employs approximately 120,000 people
- ABB became the first company in the world to sell 100,000 robots
- A vast majority of products at ABB have software and hardware components



ABB's Organizational Structure

- Power Technologies Division

- Power Systems
- Medium-Voltage Products
- High Voltage Products
- Transformers
- Utility Automation Systems



- Automation Technologies Division

- Automation Products
- Manufacturing Automation
- Process Automation



Product Development at ABB

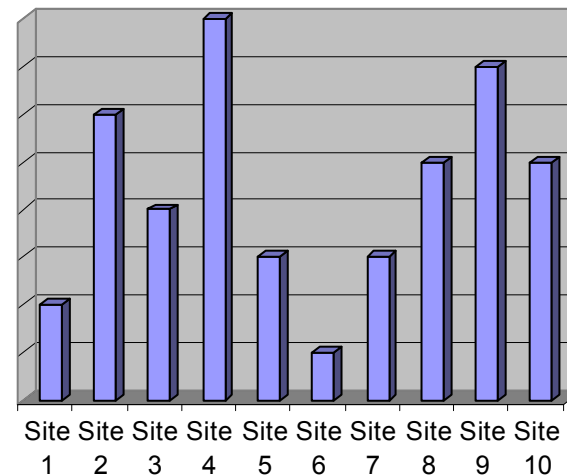
- Distributed product development
 - Project teams spread across different regions and time zones
 - Development in one region and manufacturing in other regions
 - Global company where customers are geographically dispersed
- Common business decision model for product development
- Large percentage of products contain hardware and software components

Heterogeneous Environment

- Development centers in different countries
 - Different cultures, languages, work habits, and ways of doing business



- ABB – a “Federation of Companies”
 - Each comes with its own culture, habits, and procedures
 - Each at varying levels of process maturity



Various Maturity Levels



ASPI - CEPG Mission

- To assist ABB organizations to improve their product development processes by implementing a sustained continuous process improvement culture using the Capability Maturity Model Integration (CMMI)



- This mission is achieved by employing:
 - The **Capability Maturity Model Integration (CMMI)** and **IDEAL Model** for continuous process improvement



Cultural Differences at ABB Sites

- Swedish tend to make decisions by consensus
- Germans are hierarchically oriented
- Indians are very obedient and process-oriented
- Chinese are extremely hard workers
- Italians leave things until the last minute
- Europeans at ABB have lots of vacation time
- Americans are very direct

ASPI – Evolution of ABB CEPG

1999 → 2000 → 2001 → 2002 → 2003 → 2004

| | | | | | |
|--------------------------------|-----------------------------------|---|--------------------------------------|--------------------------------|--------------------------------|
| ASPI Begins in SE, CH, DE, US | ASPI CEPG 80% Complete | ASPI CEPG 100% Complete | Maintain ASPI CEPG Structure | Maintain ASPI CEPG Structure | New ASPI CEPG CE, SE, US |
| SW CMM and IDEAL Adopted | SW CMM and IDEAL Used for Support | SW CMM and IDEAL Adopted CMMI evaluated | Support CMMI, SW CMM, and IDEAL | Transition to CMMI and IDEAL | Support CMMI and IDEAL |
| Extensive ASPI CEPG Training | Begin BU Diagnostics & Training | ASPI CEPG CMMI Training | Begin BU Diagnostics & CMMI Training | CMMI BU Training & Diagnostics | CMMI BU Training & Diagnostics |
| 4 Pilot Projects in ABB Europe | 6-8 BUs Supported Globally | 8-12 BUs Supported Globally | 12-18 BUs Supported Globally | 22 BUs Supported Globally | 35 BUs Supported Globally |

Glossary

CEPG Corporate Engineering Process Group

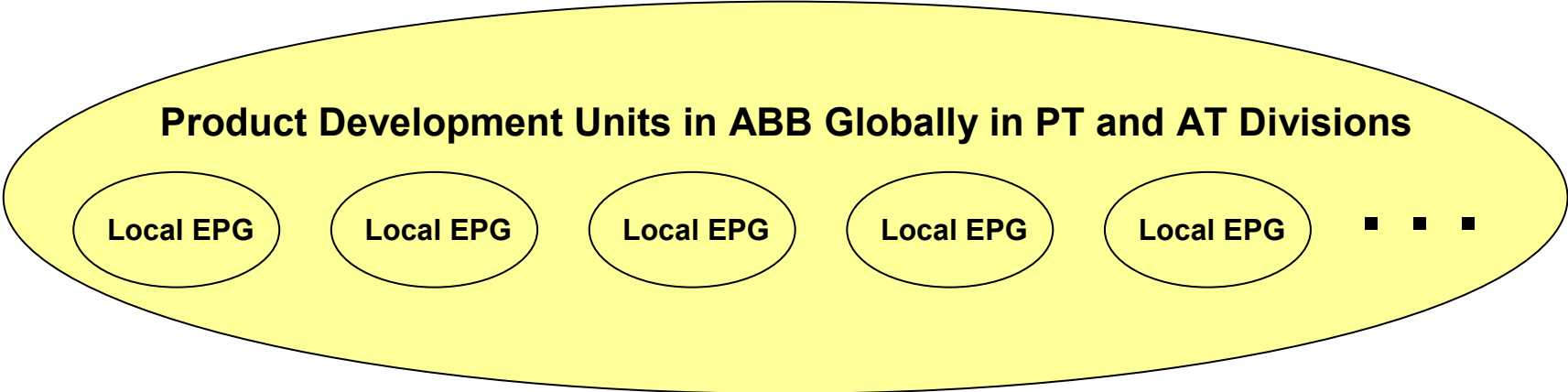
IDEAL Model for continuous process improvement

CPI Continuous Process Improvement

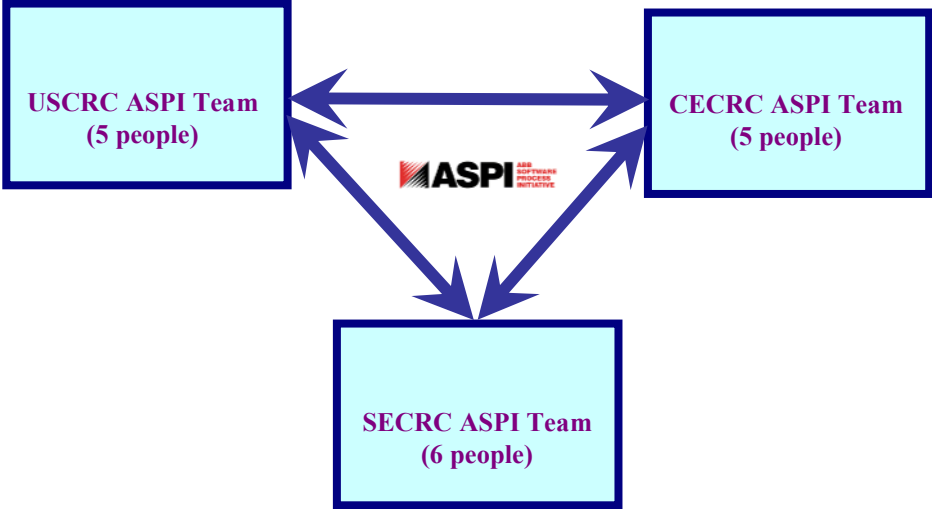
BU Development Business Unit



ASPI Support

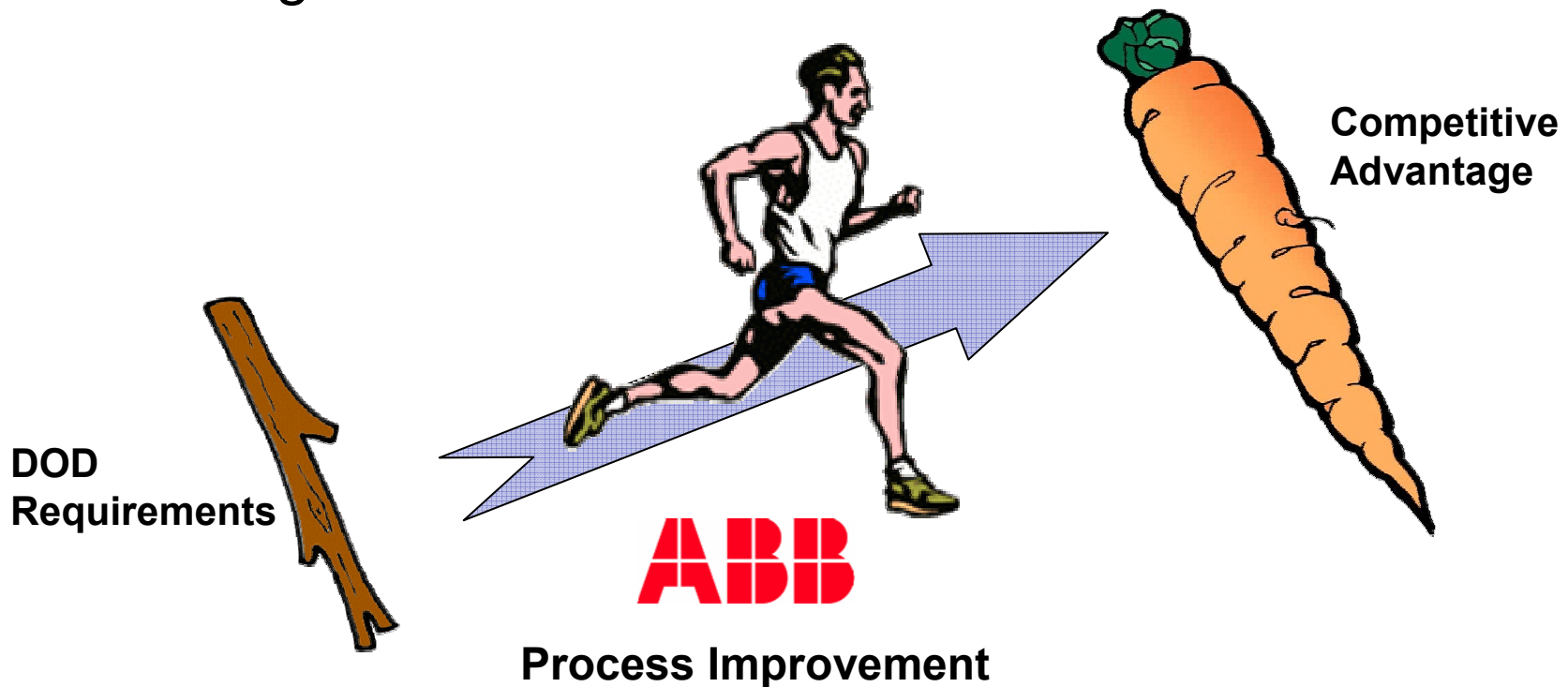


Support ABB Development Units in the Continuous Improvement of their Product Development Processes



Process Improvement Motivation at ABB

- Primary customers of ABB are commercial
- Motivation to improve not DOD-driven, but competitive-advantage-driven



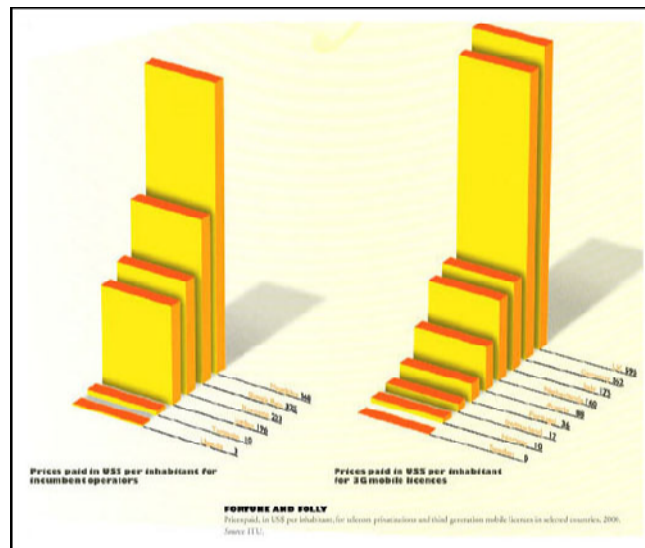
Approaches to Process Improvement at ABB

- Implementing a Continuous Process Improvement Program using CMMI without the primary goal of demonstrating a Maturity Level
- Demonstrating a CMMI Maturity Level
- Both approaches are aimed at increasing competitive advantage



Implementing Continuous Process Improvement

- Define organization's yearly Business Goals
- Define Process Improvement Plan (PIP)
- Conduct internal CMMI Appraisal
- Develop Strategic Action Plan (SAP) prioritizing process improvement activities using Business Goals
- Implement PIP and SAP
- Monitor ROI
- Re-start cycle



CMMI Maturity Levels and Competitive Advantage

- Increased CMMI awareness by ABB's customers
- Increased development of mission critical systems associated with basic infrastructure, and with high-quality and security requirements
- Competitors are using CMMI and claiming Maturity Levels
- Internal competition among development units to demonstrate a Maturity Level
- Internal threat of shifting/outsourcing of work among ABB development units

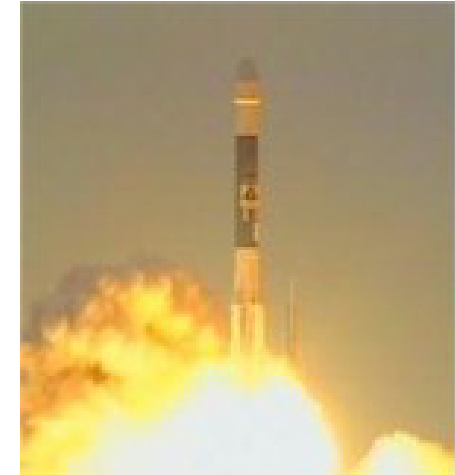


Prioritization of Development Units

- Criteria employed to prioritize support for development sites:
 - Sites that develop software intensive products
 - Size of development unit (sales, products, and people)
 - Site readiness to implement continuous process improvement
 - Presence in diverse geographic regions
 - Strategic importance for ABB

Use of IDEAL - Initiation

- Identify Sponsor and Change Agent
- Perform site readiness assessment
 - Sponsor readiness
 - Change Agent readiness
 - Organization's relevant stakeholders readiness
 - Expertise level in CMMI and process improvement
- Identify organization's business goals
- Develop Process Improvement Plan (PIP)
- Discuss initial infrastructure required for process improvement
 - Internal site organization required to support process improvement project (Change Agent, MSG, EPG, teams, etc.)
 - ASPI support (ASPI Local Project Leader, Responsible ASPI member)
 - Define mechanism to report progress of process improvement activities



Use of IDEAL - Diagnosing

- Class A through Class C appraisals
 - Class A – SCAMPI (external SEI Authorized Lead Appraiser)
 - Class B⁺, B & C – using the ABB Appraisal Methodology
- Appraisal team participation includes ASPI members, development site personnel, external CMMI lead appraisers (A's and some B's, when appropriate)
 - SEI approved Intro to CMMI training course is required for all appraisal team members



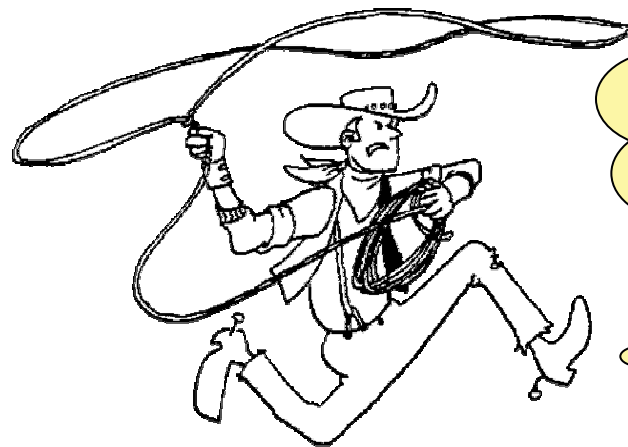
Use of IDEAL - Establishing

- Local change agent leads the process improvement project at each site
- Improvement Plan prepared:
 - Strategic Action Plan (SAP) developed by the site
 - SAP activities are prioritized using the organization's business goals
 - Senior Management approves SAP
 - Creation of an official internal process improvement project
- ASPI team member responsible for the site mentors change agent, assists in reviewing the SAP, monitors commitment, ensures SAP is in line with PIP



Use of IDEAL - Acting

- Site responsible ASPI member supports change agent, MSG and EPG (if they exist)
 - Assists in monitoring progress against the SAP
 - Engages sponsor if necessary to help eliminate roadblocks or re-energize slow-moving improvement activities
 - Provides CMMI training/guidance as needed to Process Improvement Team members
 - Provides subject matter expertise as required
- Local ASPI Project Leader interfaces with Sponsor to monitor progress against the PIP



**Keep the improvement teams
together and heading in the
right direction**



Use of IDEAL - Learning

- Year/Cycle end Meeting
 - Review progress with respect to SAP
 - Review progress with respect to PIP
 - Review process improvement project
 - Review updated process improvement metrics
 - Discuss economic benefits of process improvement activity reviewing metrics and organization's business goals
 - Discuss what worked
 - Discuss what did not work
 - Discuss how to make corrective actions for things that did not work
 - Begin plans for next cycle



Showing Progress: The IDEAL Database

- Employed to track progress in process improvement activities at each development site supported by ASPI team
- Items Tracked include:
 - Appraisal activities
 - PIP's, SAP's
 - Activity Logs
 - Progress Follow-up using IDEAL cycle

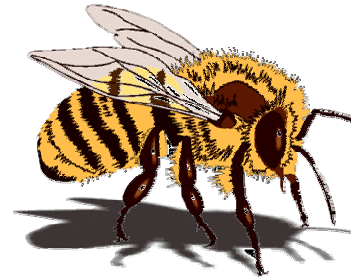
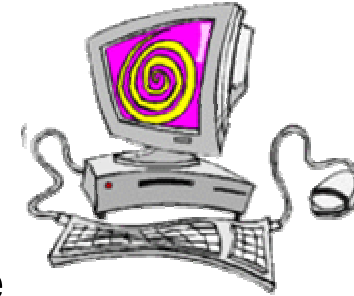
Sharing Experiences

- With ABB Units

- Development Practices Newsletter
- Product Development Knowledge Base
- Standardized Training Offerings
- Cross Pollination

- Inside ASPI

- Frequent Teleconferences
- Team Training
- Lotus Notes TeamRoom
- Formal ASPI meetings (2-3 times per year)
- Cross Pollination



Sharing Experiences With ABB Units: Development Practices Newsletter

- Purpose:
 - “Provide insight into good product development practices”
- Issued quarterly via rich-text e-mail
- Concise, easy-to-digest
- Contents:
 - Conference reports
 - Brief summaries of new technologies
 - Successful ABB development practices
 - Development/Process Improvement cartoon
 - Etc.

Development Practices Newsletter

July 2004 - Volume 1, Issue 2

ASPI ABB SOFTWARE PROCESS INITIATIVE

Contents


1. Welcome
2. 9th European Software Engineering Process Group Conference Report
3. Security in Products
4. Agile Software Development In Large Organizations
5. Food for Thought
6. Subscription Information

▼ Welcome

Welcome to the Development Practices Newsletter. This newsletter will be published on a quarterly basis and will provide insight into good product development practices for ABB employees associated with product development.

▼ 9th European Software Engineering Process Group Conference Report

EUROPEAN SEPG 2004



The ninth European Software Engineering Process Group conference was held in London in June. Almost 400 attendees had the opportunity to take part in a program that included a Project Management Symposium, a Metrics Symposium, a number of tutorials, and the main conference sessions.

Three themes were observed: security and safety, engineers and process improvement, and finally metrics. All three themes are also connected. Security is of high importance for many applications. In the conference, it was obvious that the banking sector is in need of more secure solutions. Safety puts similar demands on software development and the conclusion that many draw from the problems is that products need to be designed with security and safety in mind. This leads to the fact that each engineer needs to understand the importance of quality and be involved in the process improvement efforts. A key for this is to define and use the right metrics, useful also for the engineers so that the individual can get valuable feedback on the work performed.



Sharing Experiences With ABB Units: Product Development Knowledge Base

- One-stop web-based source for Product Development Resources and Best Practices
- Target Audience: Change Agents, QA, Project Managers
- Monthly reminder e-mails listing new additions
- Top contributors recognized
- Weekly metrics collected and analyzed to gauge the effectiveness of the knowledge base

The screenshot shows the ABB Product Development Knowledge Base website. At the top, there is a navigation bar with 'ABB Group', 'Divisions', 'Countries', and 'My inside'. The date 'Thursday, October 14, 2004' is displayed. A search bar is located on the right side with the text 'SEARCH THE KNOWLEDGE BASE' and a 'Submit Query' button. Below the search bar, there are 'SHORTCUTS' and 'TOP CONTRIBUTORS' sections. The main content area features a 'Product Development Knowledge Base' header and a description of the knowledge base. A central diagram illustrates the 'Project Management Layer' with various stages and processes. Below the diagram, there are 'Other topics' and a footer with contact information and copyright details.

Product Development Knowledge Base

The Product Development Knowledge Base provides a repository of resources, reference, and links - useful to any ABB team involved in product development. Browse through the knowledge base, review by category by clicking below on your area of interest, or enter a detailed search request to the right.

Project Management Layer

| Definition | Planning | Execution | Close |
|---------------------------------------|--|-----------|-------|
| Requirements Development | Requirements Management | | |
| Project Planning | Project Monitoring and Reporting | | |
| Subcontract Planning | Subcontractor Monitoring and Reporting | | |
| Configuration Management | | | |
| Process and Product Quality Assurance | | | |
| Product Audits | Process Audits | | |
| Measurement and Analysis | | | |
| Risk Management | | | |
| Verification/Validation | | | |
| Peer Reviews | | | |
| Testing | | | |
| Product Integration | | | |

Other topics

- Product Creation Fundamentals
- Mapping the ABB Gate Model to Software Development Lifecycle Models
- Industrial IT Pilot Project Execution Guidelines
- Development Models/Methodologies

Created by Andrew Cordes/ETMUSTRA/ABB 2002-09-24
Updated by Andrew Cordes/AUSRC/ABB 2004-08-03

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Sharing Experiences With ABB Units: Product Development Knowledge Base – Resource Page

- Resource pages organized by CMMI Process Area
- Main content area contains:
 - Description of the PA
 - Links to presentations on fundamental practices
 - ABB experiences in the PA
 - ABB procedures and guidelines
 - Sample templates used by ABB development groups
- Right side contains:
 - Knowledge Base-specific search form
 - Link for submitting new contributions
 - Links to external references related to the PA

The screenshot shows a web page titled "Project Monitoring and Control" from the ABB Product Development Knowledge Base. The page is organized into several sections:

- Product Development:** The ABB Gate Model Program, ABB Gate Model for Product and Technology Development, Project Management Layer of ABB Gate Model, Knowledge Base, Fundamentals, Product Development Processes.
- Project Monitoring and Control:** Provides understanding into the project's progress so that appropriate corrective actions can be taken when the project's performance deviates significantly from the plan. Project Monitoring and Control focuses on monitoring actual performance, and managing corrective actions. Monitoring the project against the plan involves comparing actual versus planned for various project characteristics such as:
 1. Project planning parameters
 2. Commitments
 3. Project risks
 4. Data management
 5. Stakeholder involvementThe results of these monitoring efforts are reviewed at both progress reviews and milestone reviews. Issues are analyzed and corrective actions are identified, assigned, and tracked to closure. A typical monthly status report for a project includes items for tracking milestone progress, key accomplishments, costs, risks, and action items. An example of this is given in the links section on the right.

- SEARCH THE KNOWLEDGE BASE:** A search bar with a "Submit Query" button.
- SHORTCUTS:** Bookmark this page, Submit a contribution, Provide feedback.
- EXTERNAL REFERENCES:** Texas Department of Information Resources: Project Monitoring and Control; Software Productivity Center: Project Management Resources; Texas Department of Information Resources: Monthly Project Status Report Template; Software Engineering Institute: Project Monitoring and Control Context Diagram; Project Management Institute (PMI); IPMA.com; Project Management Knowledge Base; Wikium; Project Management Glossary.
- Fundamentals:** Perform corrective action on issues, Document Management, Meeting Management.
- ABB Experiences:** Experience: Corrective Action, Using Metrics For Project Tracking and Oversight; Earned Value Overview Presentation.
- ABB Procedures and Guidelines:** ABB Gate Model Project Management Layer Activity Descriptions.
- ABB Templates:** Project Schedule template for Industrial IT projects; Project Management Layer - Project Report Template; Project Management Layer - Final Project Report Template; Industrial IT Final Risk Worksheet; Excel-based Project Schedule Template.

Created by Prithant P. Baheti/US TRAWBB 2002-08-26
Updated by Andrew Cordes/USBCR/ABB 2004-04-28

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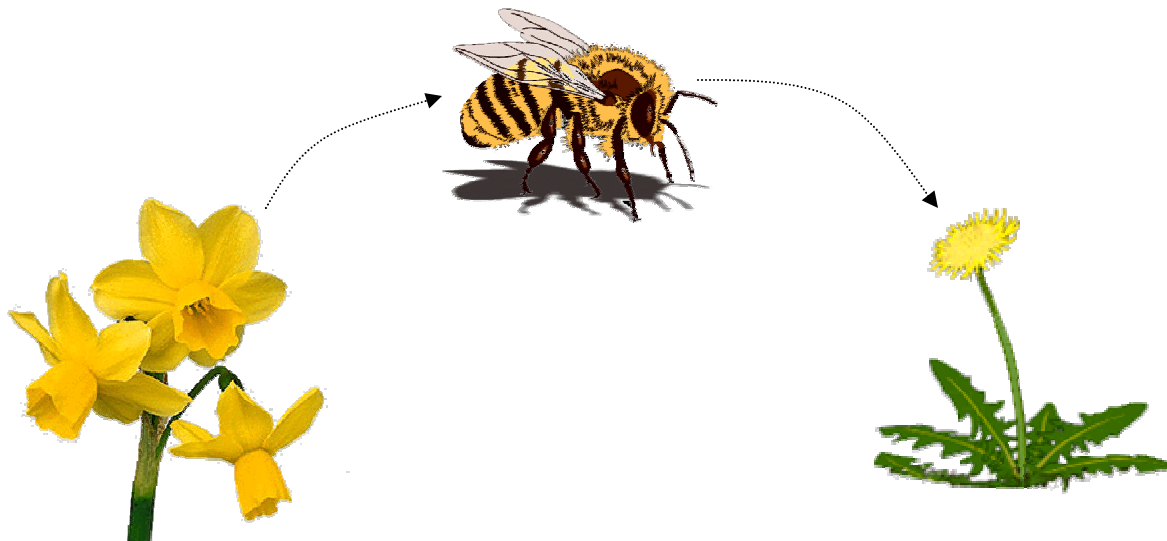
Sharing Experiences With ABB Units: Standardized Training Offerings

- Offerings:
 - The ABB Gate Model
 - Product Creation Fundamentals
 - Project Management
 - Requirements Development
 - Software Testing
 - Peer Reviews
 - The list grows...
- ASPI team members provide the training
- Requests for training from business units drives the creation of new courses



Sharing Experiences With ABB Units: Cross-Pollination

- Change agents from one unit participate on appraisal teams for other units
- Units are encouraged to share templates, procedures, and experiences through the Product Development Knowledge Base and the Development Practices Newsletter



Sharing Experiences Inside ASPI: Teleconferences and TeamRoom

- Due to the distributed nature of ASPI, weekly teleconferences are held
- Supplemented with application sharing sessions for presentations
- Globally accessible ASPI TeamRoom established:
 - Repository for ASPI products under development
 - Facilitates ASPI project management
 - Provides a controlled environment for reviewing and maintaining ASPI documents



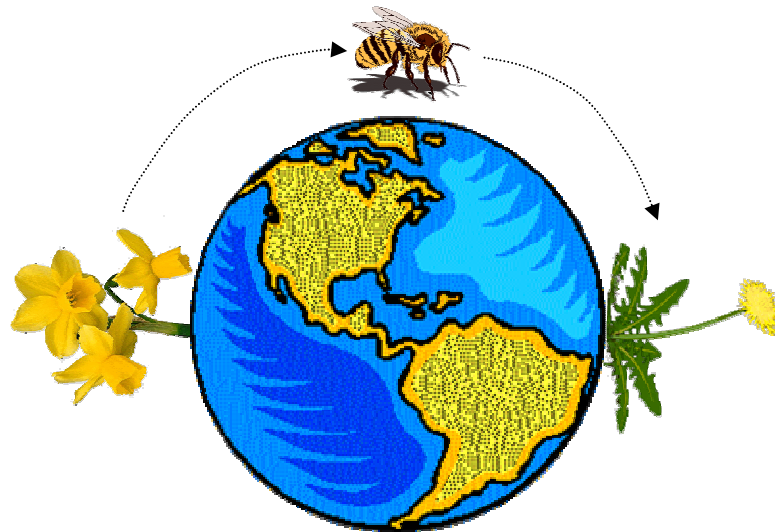
Sharing Experiences Inside ASPI: Formal ASPI Meetings and Team Training

- Formal meeting of the entire ASPI team is held 2-3 times per year to:
 - Share experiences
 - Provide status on current tasks
 - Plan for upcoming tasks
 - Team-building
- Team training
 - Typically performed during the formal ASPI meetings
 - Topics that increase certain skills important to ASPI team members
 - Internal Appraisal methodology training
 - Change Agent training
 - Etc.



Sharing Experiences Inside ASPI: Cross-Pollination

- ASPI team members from one country will participate on CMMI appraisals held in another country
- ASPI products are typically developed by distributed team members
- Job rotations



Lessons Learned

- ASPI group needs to operate at a higher level of maturity than the rest of the organization
- Development sites require different type of support
 - Mentoring change
 - Subject matter expertise
 - Training
 - Process diagnostics (Appraisals)
 - Etc.
- It is essential that development sites take responsibility and ownership of their own process improvement project
- Process improvement activities must be driven by clear business objectives
- Demonstrating return on investment (ROI) maintains the process improvement alive in commercial organizations
- Awareness and sensitivity to cultural differences is essential for success in a multi-national organization like ABB



Questions ?

ABB

