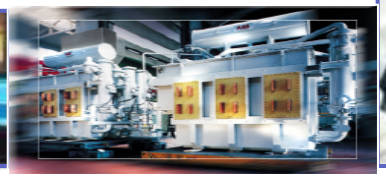
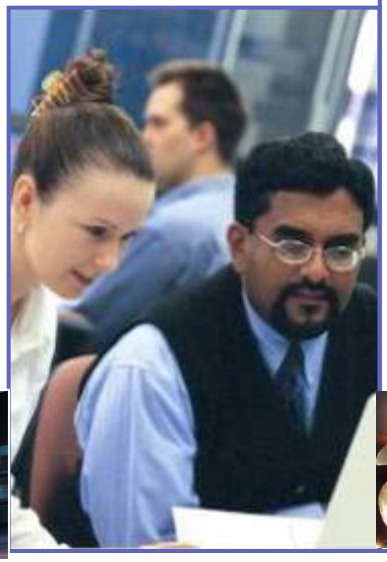
Coordinating Process Improvement in Multiple Geographically Dispersed Development Organizations Using CMMI

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

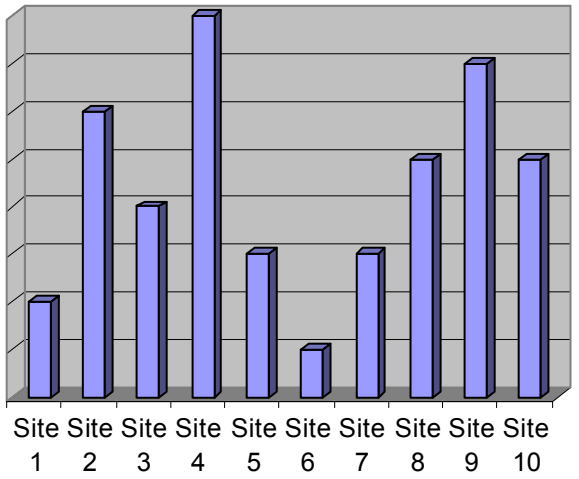
Product Development at ABB

- 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	2000 → 2001	2001 → 2002	2002 → 2003	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

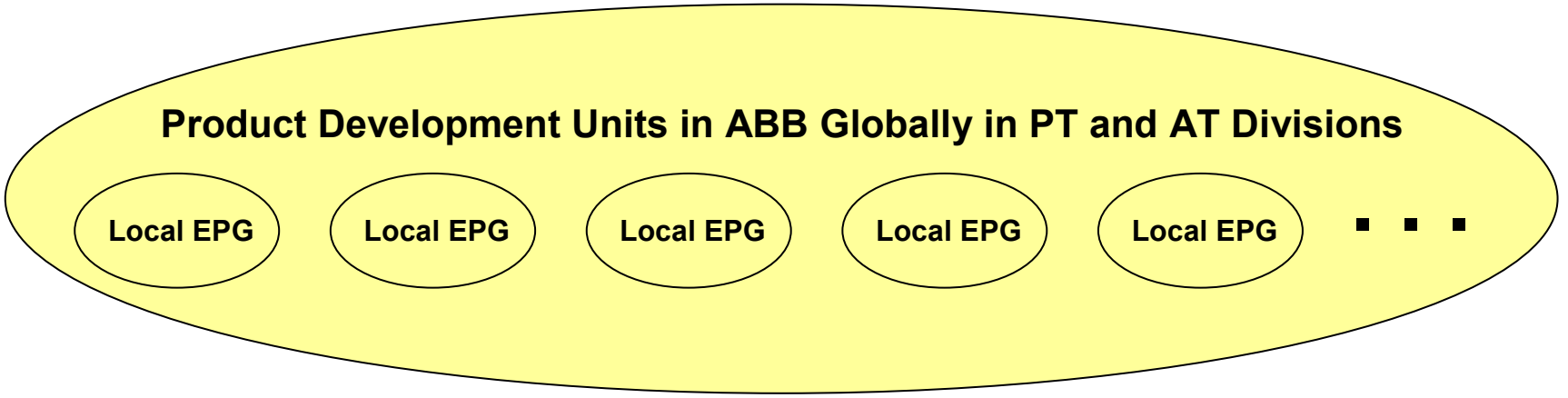
CEPG Corporate Engineering Process Group

IDEAL Model for continuous process improvement

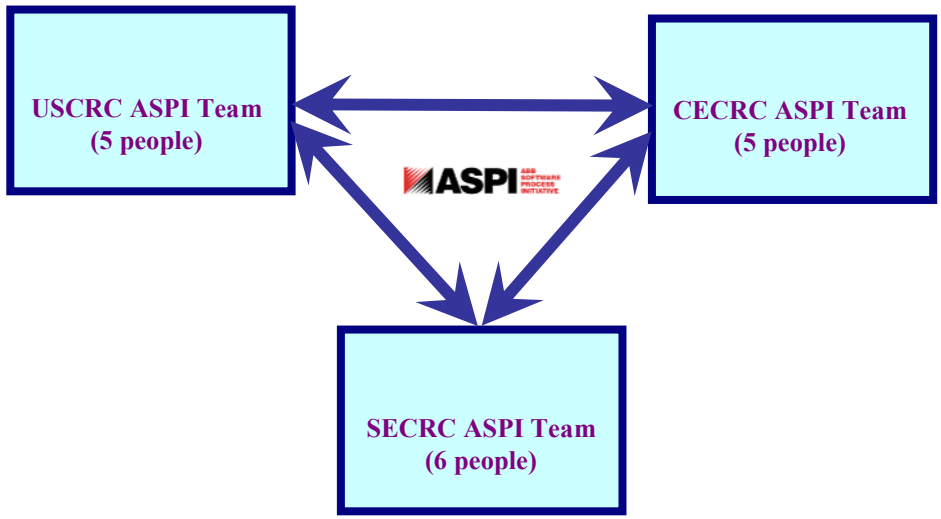
CPI Continuous Process Improvement

BU Development Business Unit

ASPI Support

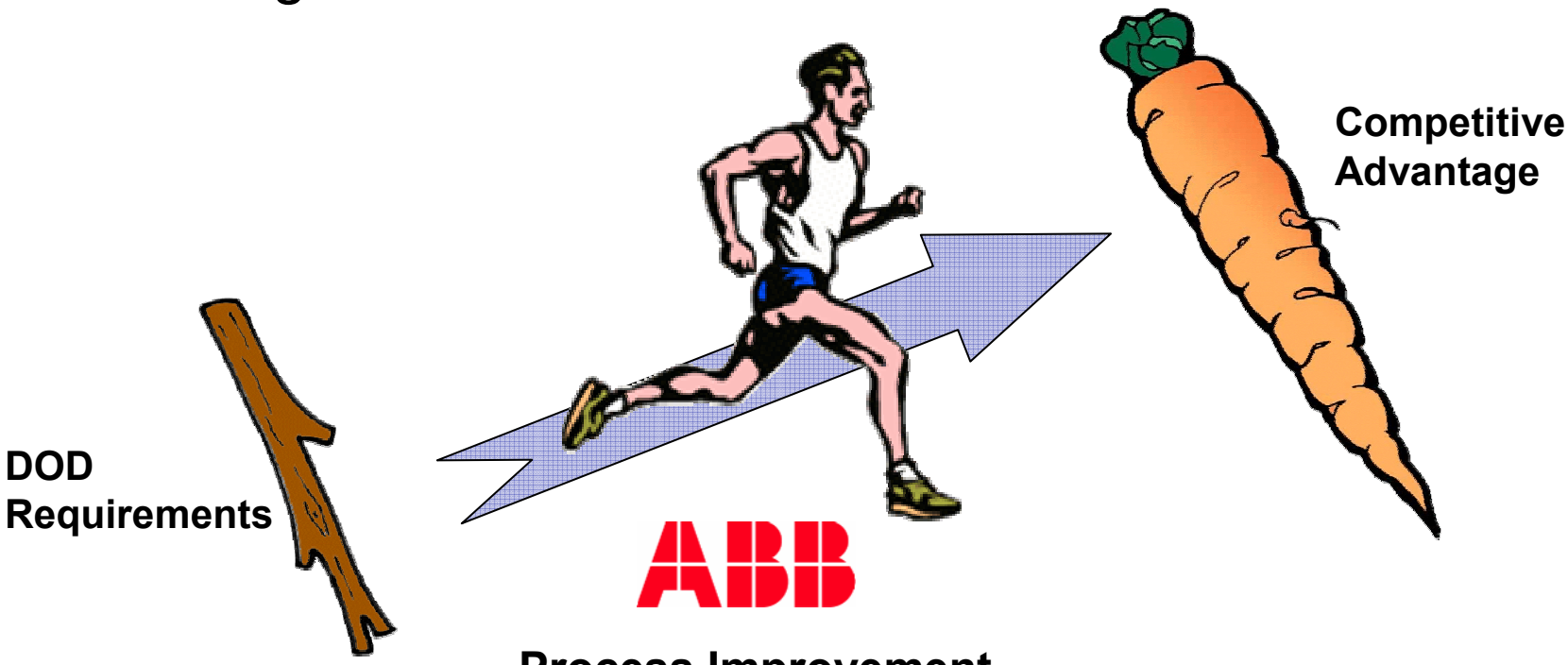


Support ABB Development Units in the Continuous Improvement of their Product Development Processes



Process Improvement Motivation at ABB

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

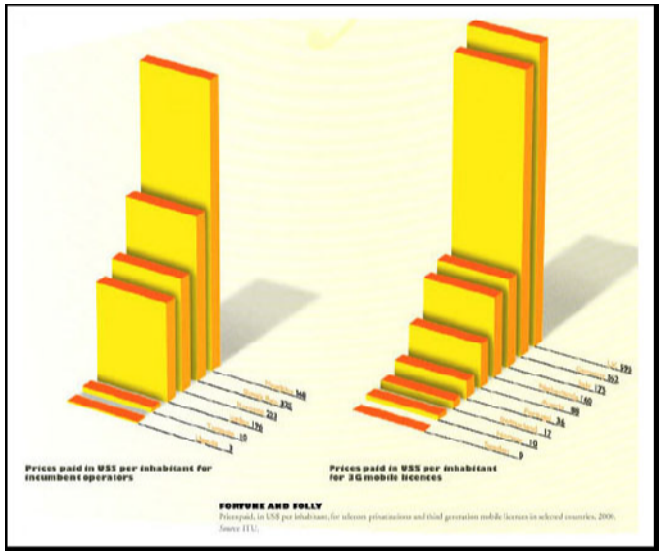


Approaches to Process Improvement at ABB

- 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



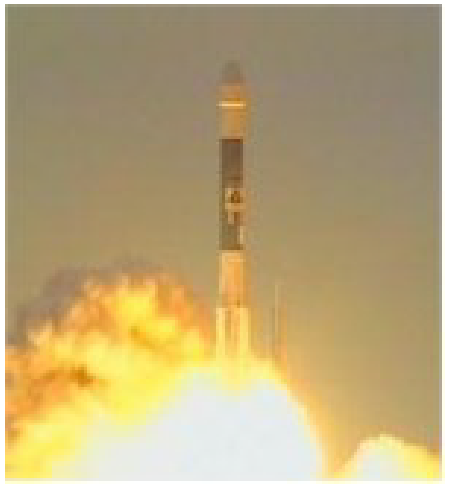
CMMI Maturity Levels and Competitive Advantage

- 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

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

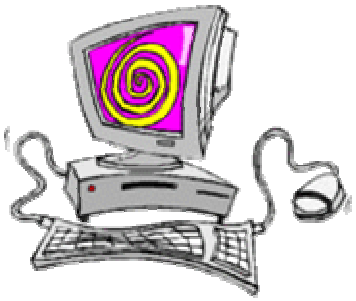
Showing Progress: The IDEAL Database

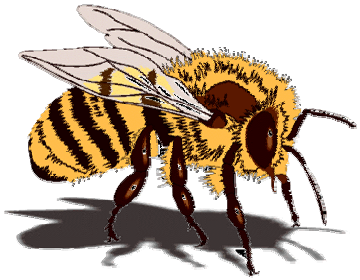
- Employed to track progress in process improvement activities at each development site supported by ASPI team

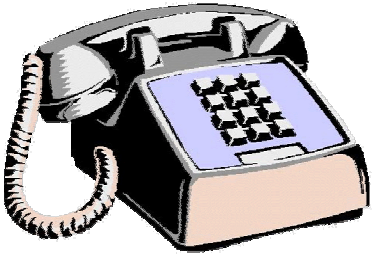
- Items Tracked include:
  - Appraisal activities
  - PIP's, SAP's
  - Activity Logs
  - Progress Follow-up using IDEAL cycle

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

ASPI ABB SOFTWARE PROCESS INITIATIVE

July 2004 - Volume 1, Issue 2

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

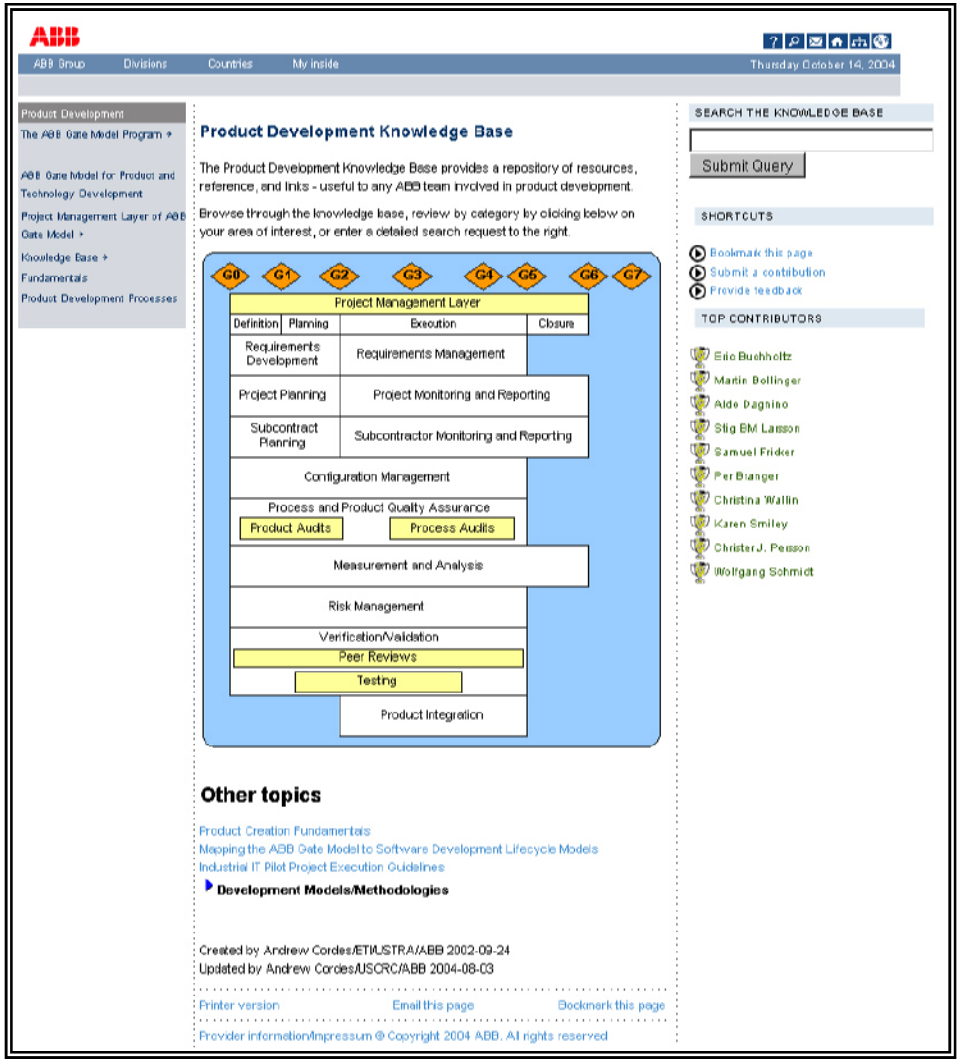
EUROPEAN SEPG 2004

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

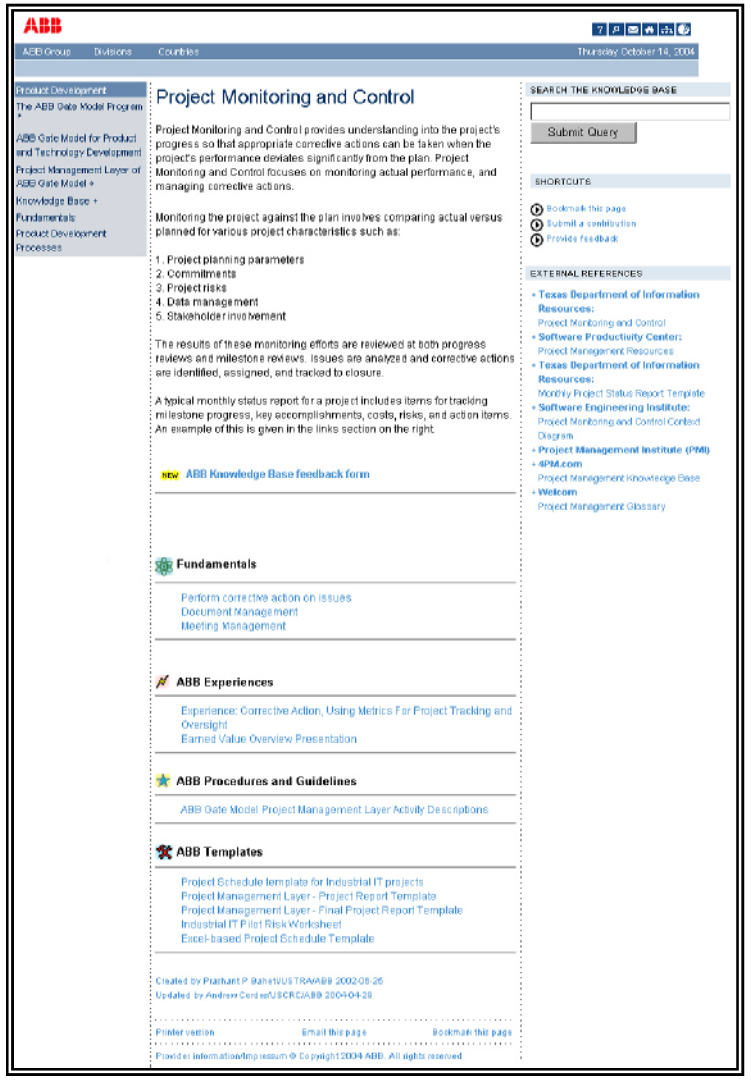
Sharing Experiences With ABB Units: Product Development Knowledge Base

- 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



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

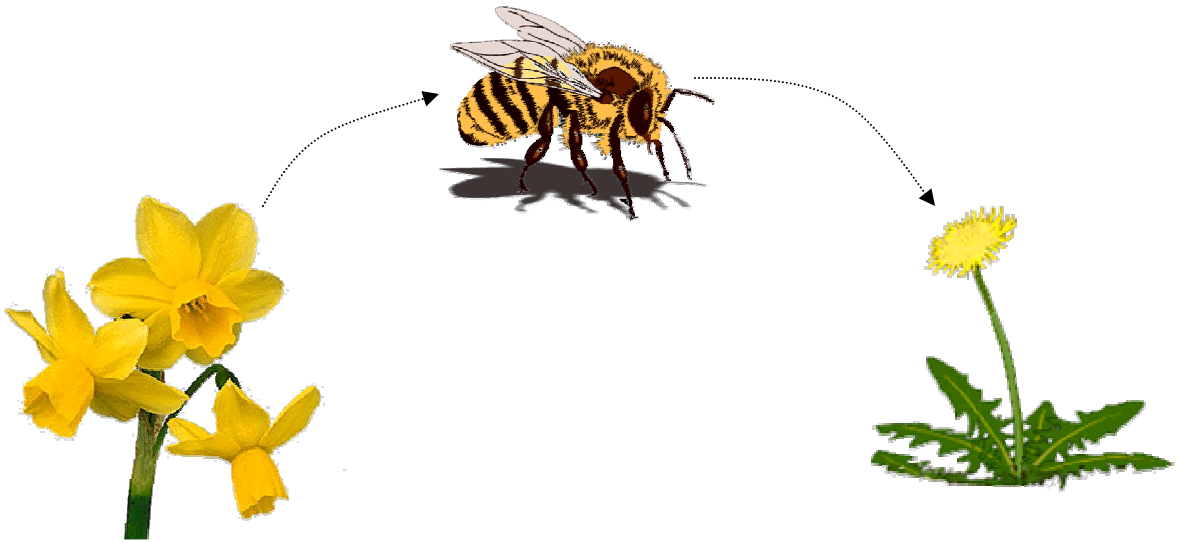


Sharing Experiences With ABB Units: Standardized Training Offerings

- 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

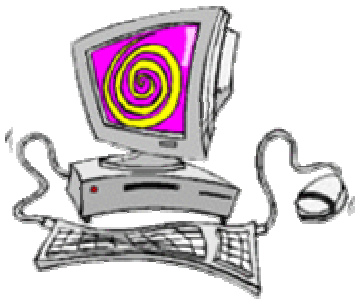
Sharing Experiences With ABB Units: Cross-Pollination

- 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



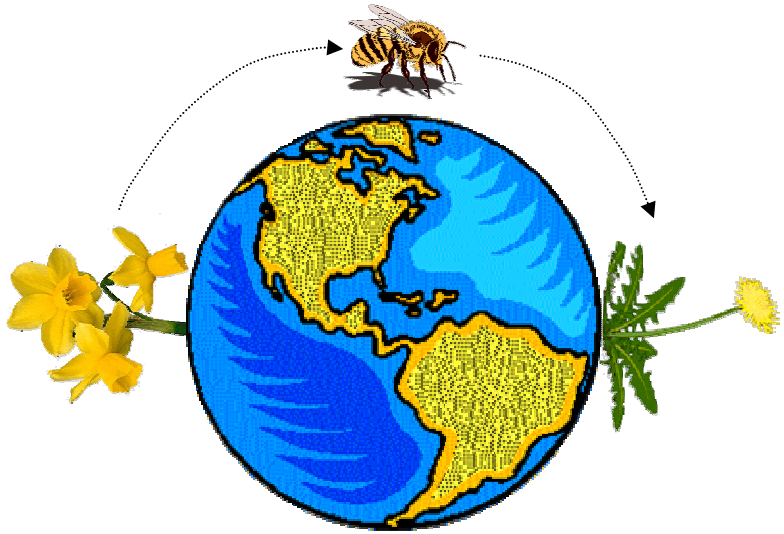
Sharing Experiences Inside ASPI: Formal ASPI Meetings and Team Training

- 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 ?