GENERAL DYNAMICS
Land Systems

Successful Integration of an Engineering Organization Across Geographic Locations Achieving CMMI level 3

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Agenda

- General Dynamics Land Systems Overview
- Process Improvement History
- Recent Process Integration
- Recent Appraisal Efforts
- Future Activities
- Questions

GDLS Mission

General Dynamics Land Systems provides a full spectrum of land and amphibious combat systems, subsystems and components worldwide

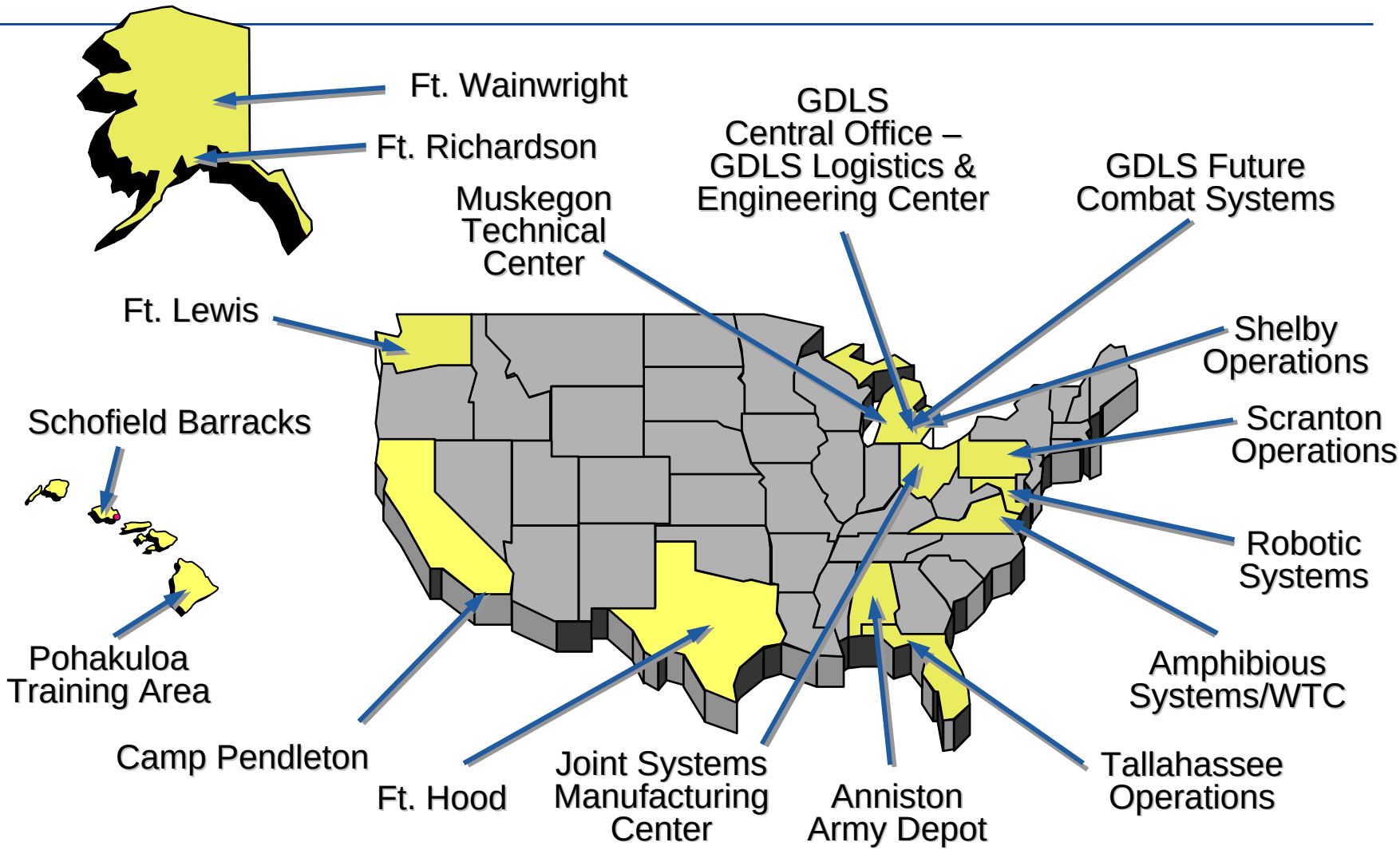
Our strengths are world-class design and systems integration, superior production and innovative life cycle support

We will deploy these strengths to meet our customers' needs in a changing world

Engineering Design and Development (ED&D)

Focused on the Customer and the Shareholders
Changing and Responding to the Business Climate
Strategically Thinking Leadership
Talented and Innovative People
A Legacy of Great Products
A Rich History and Experience Base

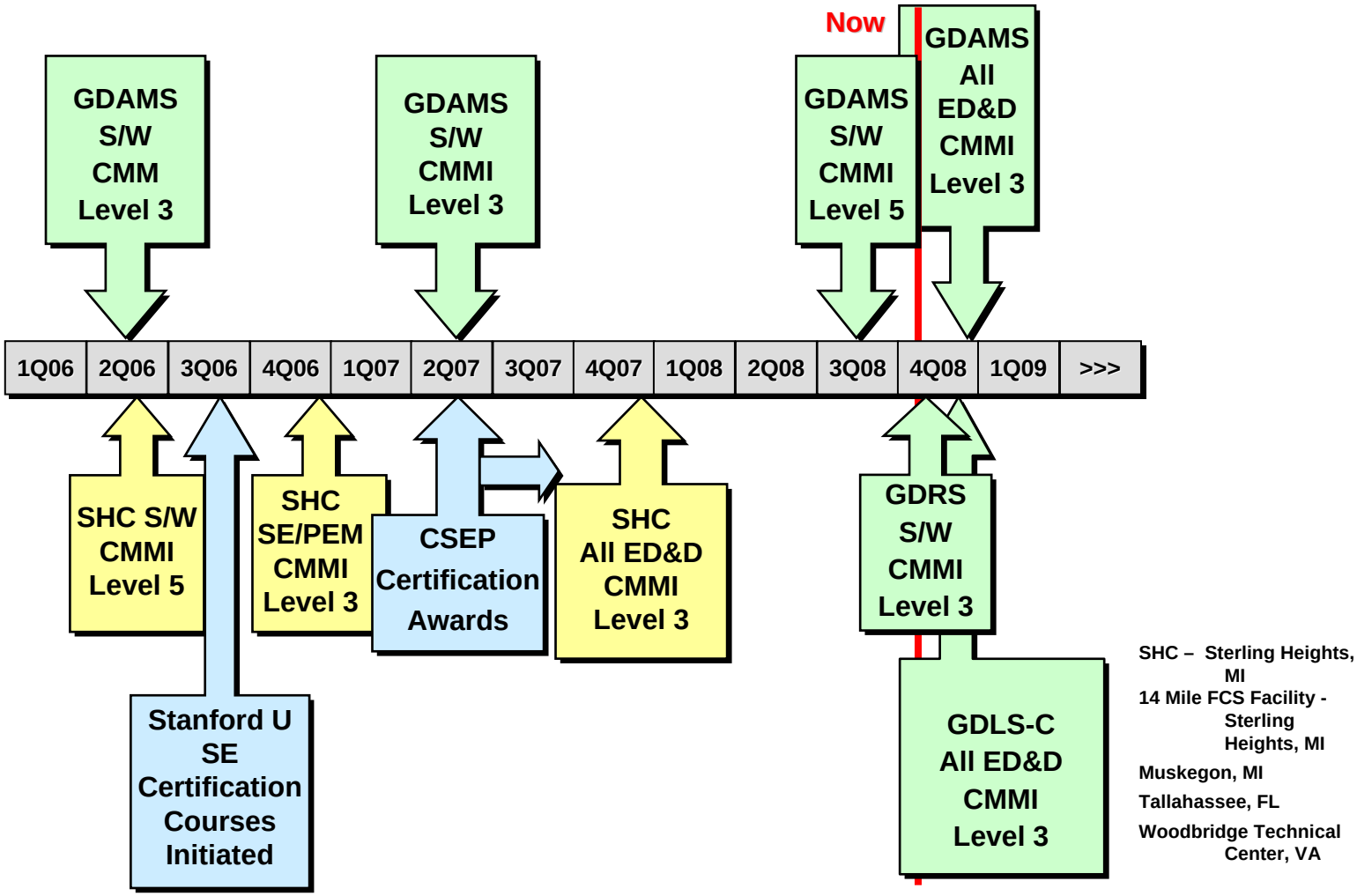
U.S. Locations



ED&D Overview

- Approximately 3000 people in Engineering Design & Development
  - 2000 people in the Organizational Unit for the 2007 Appraisal
    - 4 geographic locations
    - Full Lifecycle of Engineering Product Development represented
      - Systems Engineering
      - Hardware & Software Development
      - Logistics Engineering & Product Test

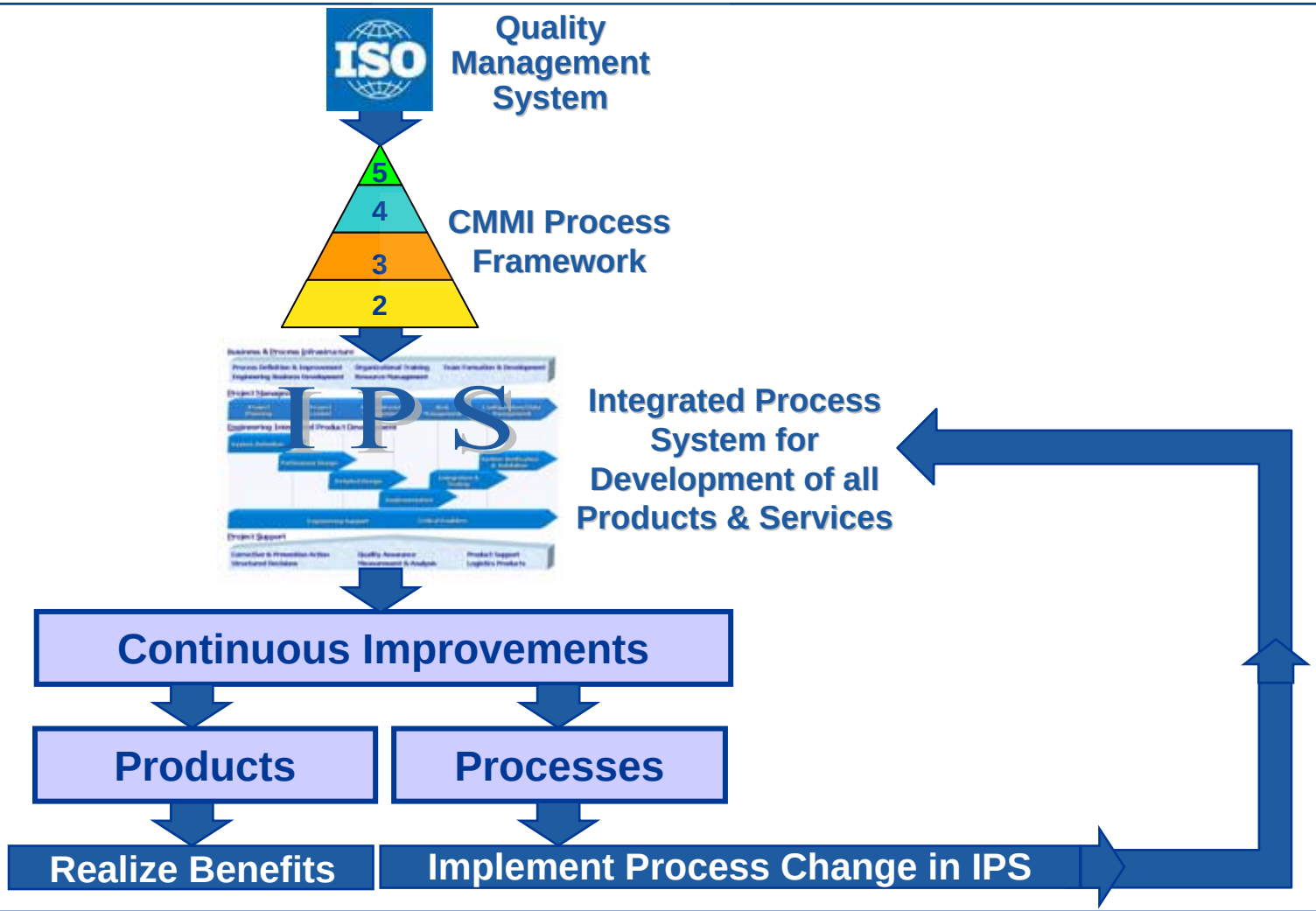
GDLS ED&D Capability Improvement Ongoing



Where We Came From

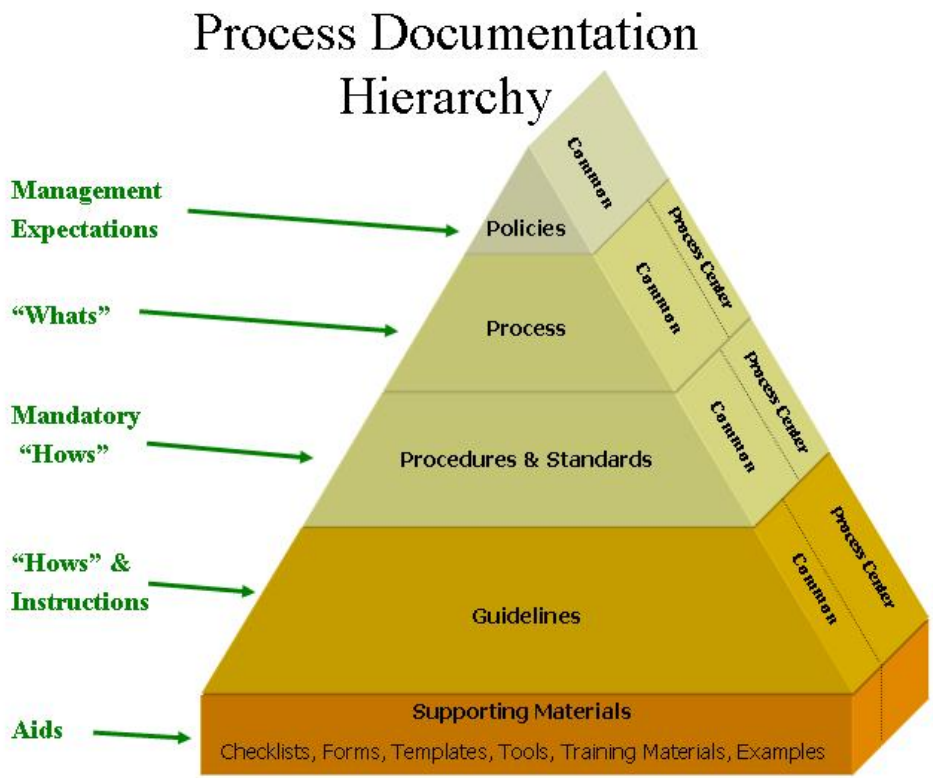
- At our Central campus, ISO 9001 effort developed and improved engineering processes but issues existed
  - ↗ Stovepipe/department focused
  - ↗ Duplication & redundancy
  - ↗ Difficulty ‘finding’ applicable directives
  - ↗ Created metrics that weren’t necessarily useful
  - ↗ Rework driven by department reorganizations

Standardized Processes – CMMI Framework



Directive Hierarchy

- Created documentation hierarchy to support integration across organization
  - Policy – Management Expectations
  - Process – “What” needs to be done (required “shalls”)
  - Procedure/Standard – Mandatory “How To” do something/make something
  - Guidelines – Helpful “How To” do something
  - Other Supporting material – other aids to getting the job done



Process Integration

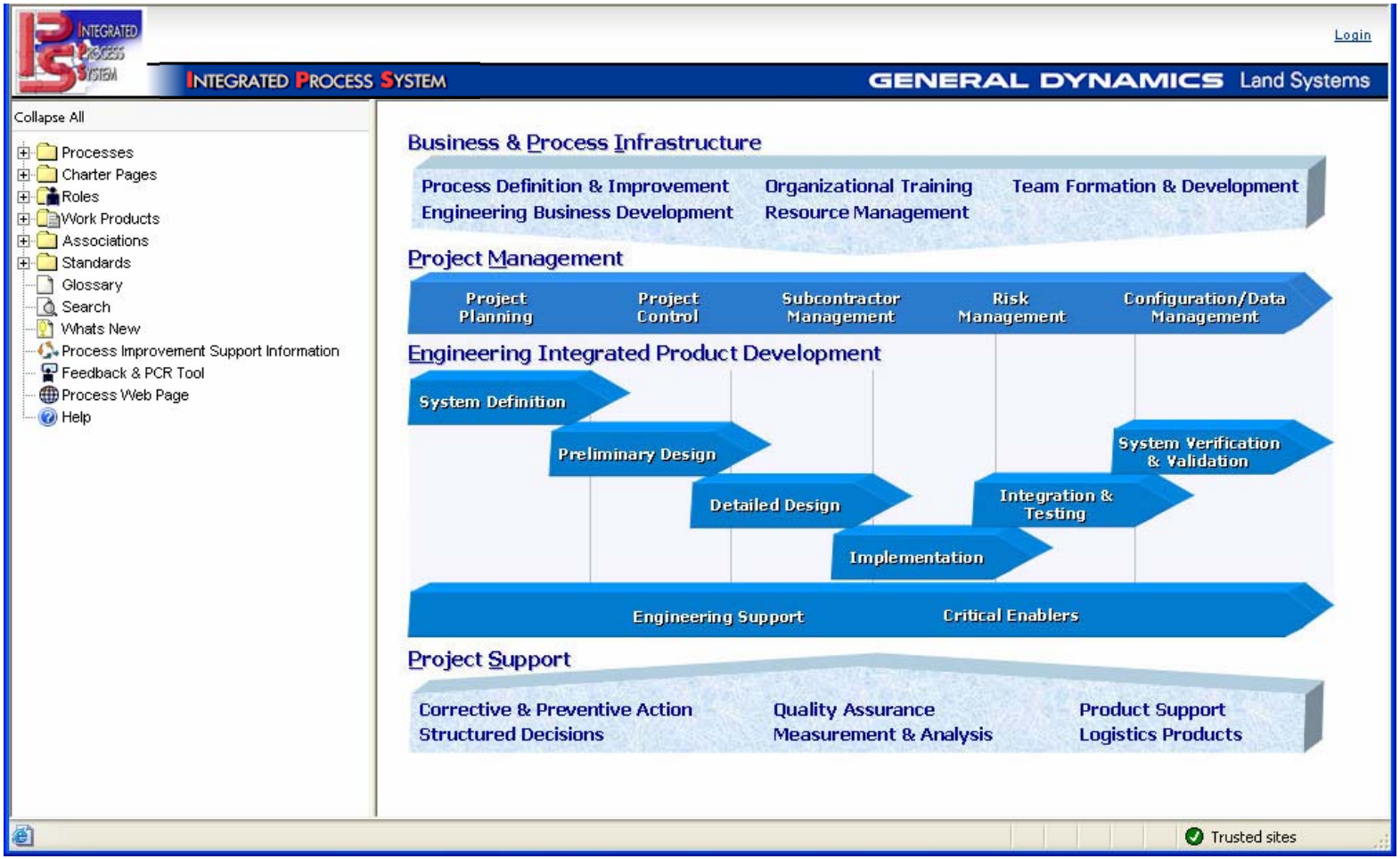
- Started integration activities at Central Campus
  - ↗ Integrated various Department directives
  - ↗ Established architecture, tool, hierarchy guidance
- Integration activities expanded to encompass other Geographic locations
  - ↗ Legacy directives mapped well into established architecture

Integrated Process System (IPS)

- Repackaging of directives based on activities, not organizational chart
  - ↗ Reduction in redundancy
  - ↗ Enhanced connectivity between processes

- Software Database Tool developed to house directive information to provide access via our intranet and full html linking
  - ↗ Windows navigator-like interface

Integrated Process System



Four IPS Process Areas

- Process Infrastructure – Directives pertaining to Maintaining and Improving IPS and those involving Organizational Training, Proposal Development, Resource Management, Team Formation and Operational Support
- Project Management - Directives involving Project Management, Project Technical Management & Control, Risk Management, Subcontractor Management and Configuration/Data Management
- Engineering – Directives pertaining to System Definition, Preliminary & Detailed Design, Implementation, Integration & Test and Verification & Validation
- Project Support – Directives involving Measurement & Analysis, Structured Decision Making, QA, Corrective Action, Preventive Action and Logistics Support

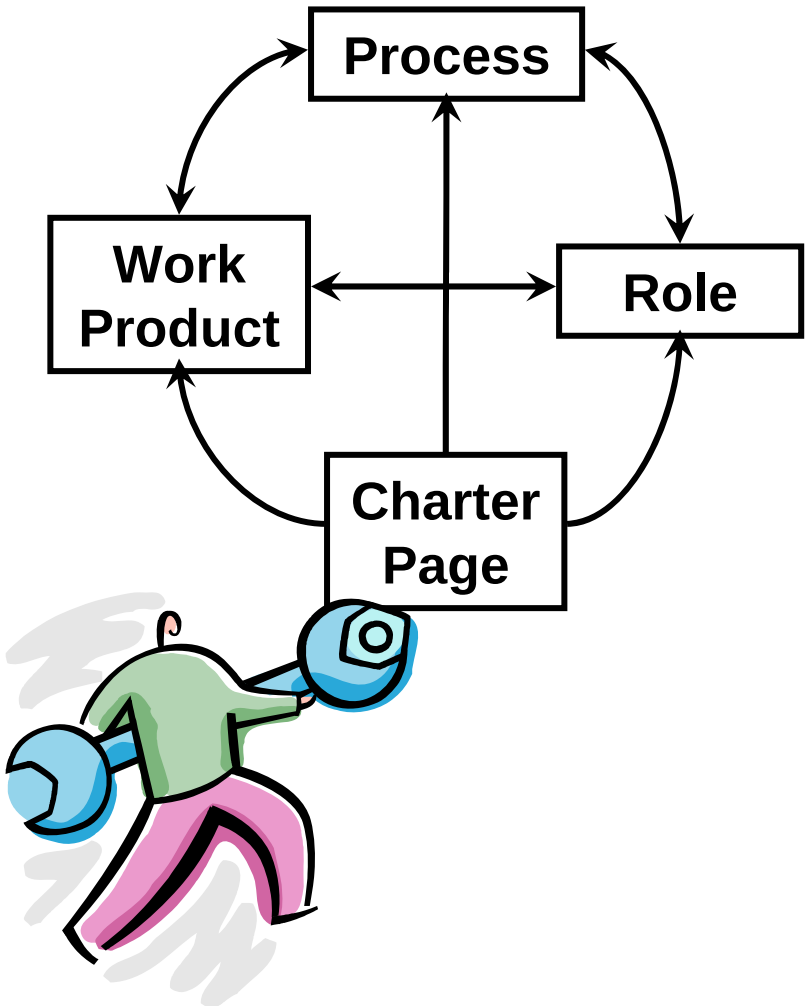
Multi-site integration

- Mapped legacy processes into process framework
- Assembled teams to determine possible outcomes
  - Live with IPS process and retire legacy asset
  - Modify IPS process to include additional material from legacy asset
  - Modify behavior to include additional provisions in IPS process
  - Occasionally, site specific processes or procedures were required to account for site specific activities

Characteristics of IPS Directives & Framework

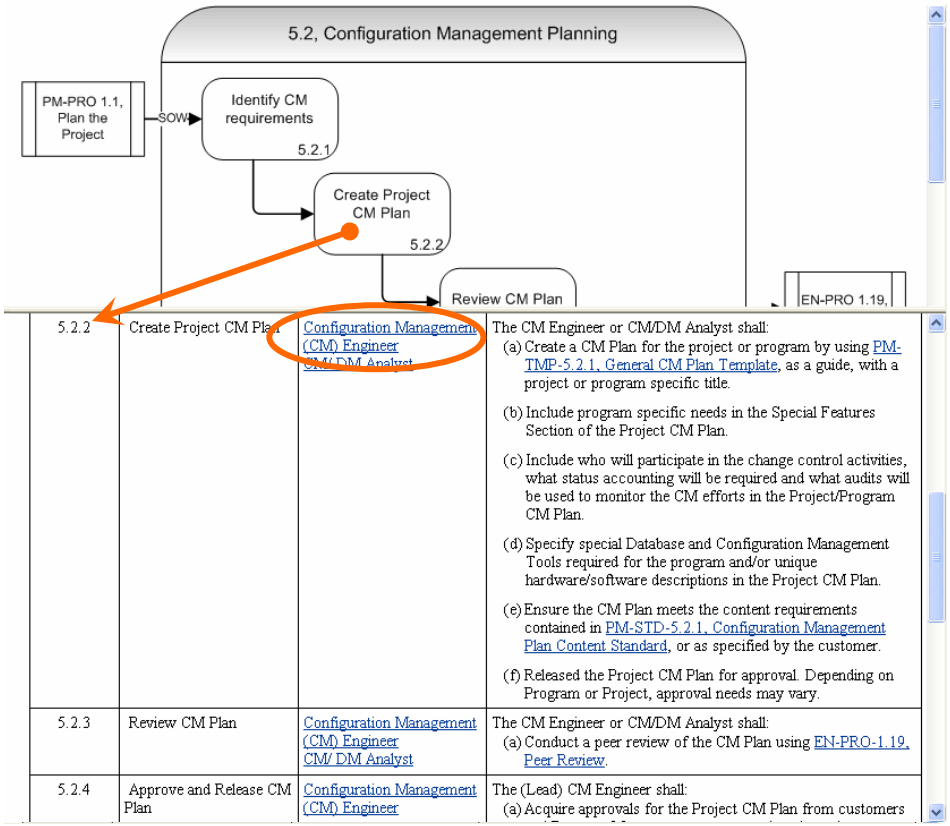
- Integrated view of Engineering Activities
- Inputs and Outputs clearly specified, integrated with other processes
- Activities defined that are tied to Roles and Work Products
- Required activities (“shall” statements) separated from step-by-step instructions and helpful hints (supporting material)
  - ↗ Provides for creativity and flexibility in **how** to execute

IPS Tool implementation



- Processes, procedures relating activities to roles, and work product generation
- Roles looking at all processes with activities for that role
- Work Products relating roles, processes, and templates, standards
- Charter Pages providing a mapping from org chart to roles, processes, other information

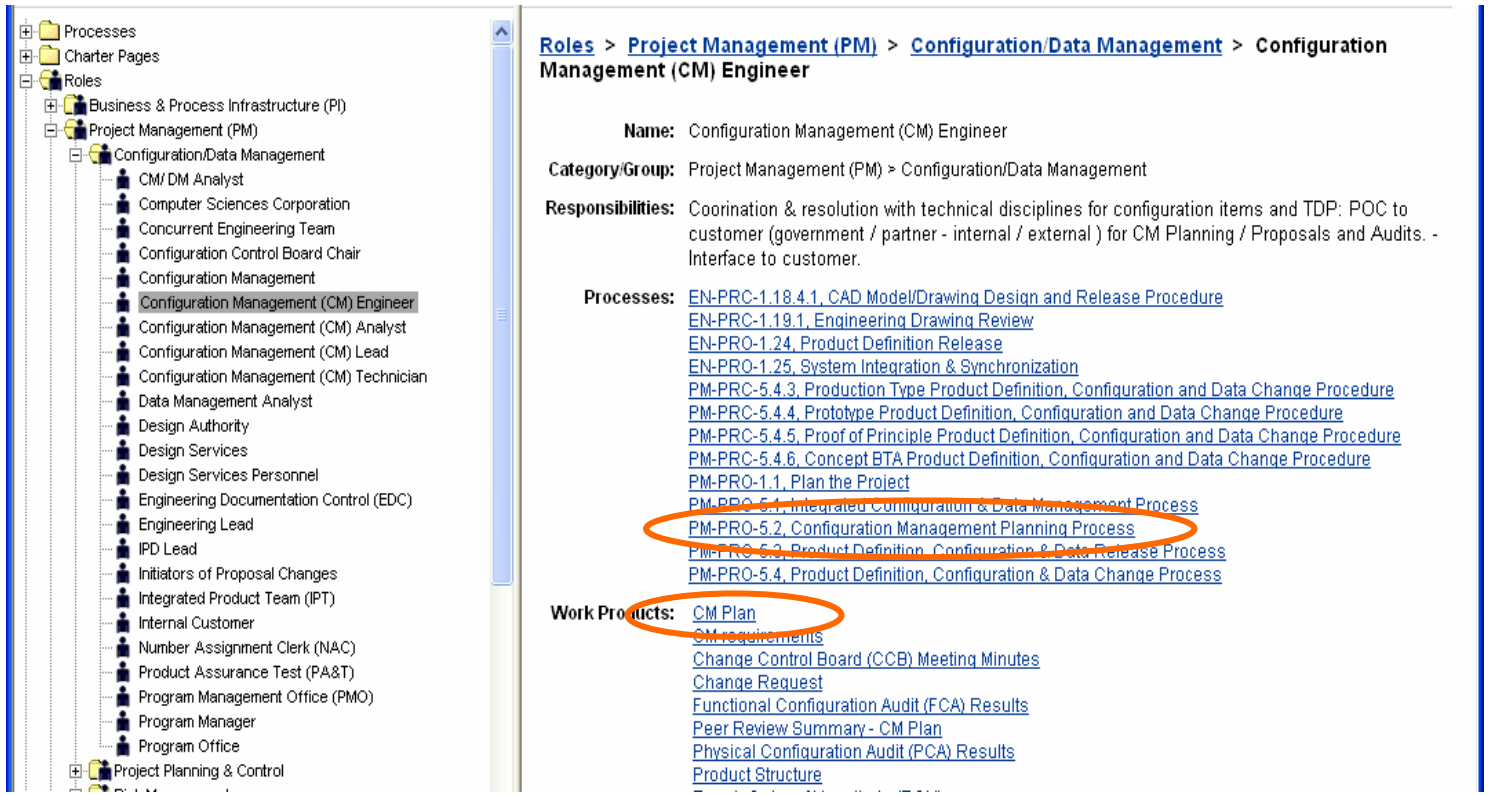
Hyper-linking in Processes



5.2.2	Create Project CM Plan	Configuration Management (CM) Engineer CM/ DM Analyst	The CM Engineer or CM/DM Analyst shall: (a) Create a CM Plan for the project or program by using PM-TMP-5.2.1, General CM Plan Template, as a guide, with a project or program specific title. (b) Include program specific needs in the Special Features Section of the Project CM Plan. (c) Include who will participate in the change control activities, what status accounting will be required and what audits will be used to monitor the CM efforts in the Project/Program CM Plan. (d) Specify special Database and Configuration Management Tools required for the program and/or unique hardware/software descriptions in the Project CM Plan. (e) Ensure the CM Plan meets the content requirements contained in PM-STD-5.2.1, Configuration Management Plan Content Standard, or as specified by the customer. (f) Released the Project CM Plan for approval. Depending on Program or Project, approval needs may vary.
5.2.3	Review CM Plan	Configuration Management (CM) Engineer CM/ DM Analyst	The CM Engineer or CM/DM Analyst shall: (a) Conduct a peer review of the CM Plan using EN-PRO-1.19, Peer Review.
5.2.4	Approve and Release CM Plan	Configuration Management (CM) Engineer	The (Lead) CM Engineer shall: (a) Acquire approvals for the Project CM Plan from customers

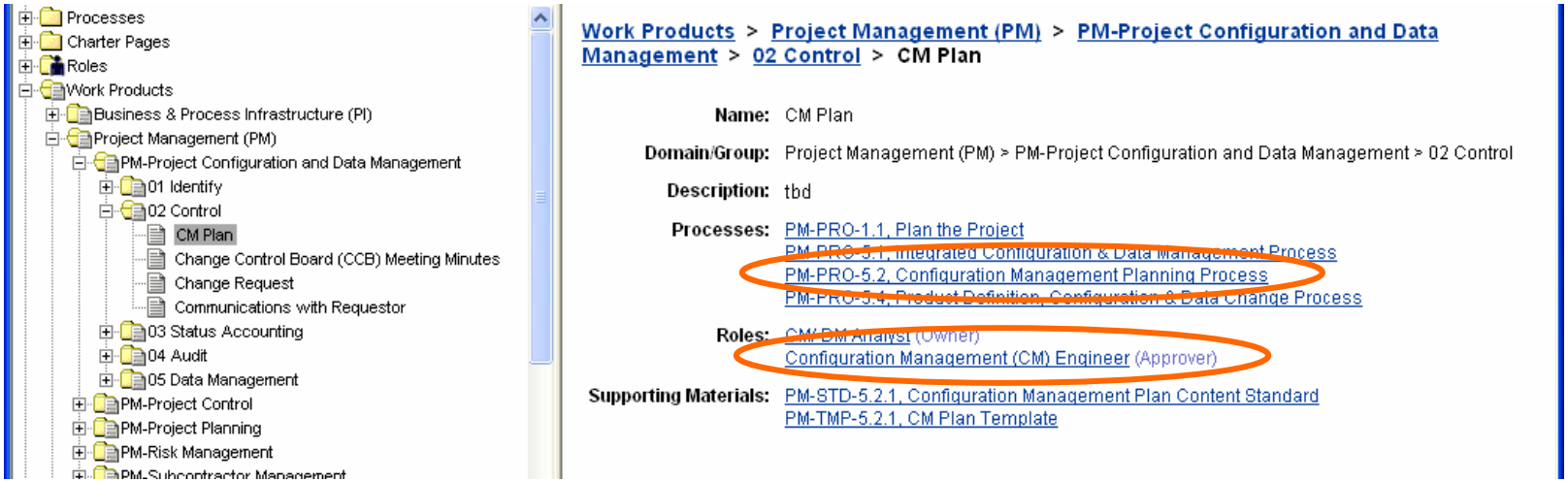
- Split window between process diagram and activity text.
- Linking between diagram and other processes.
- Linking between diagram and process activities.
- Linking to Roles and Work Products.

Role-based Views



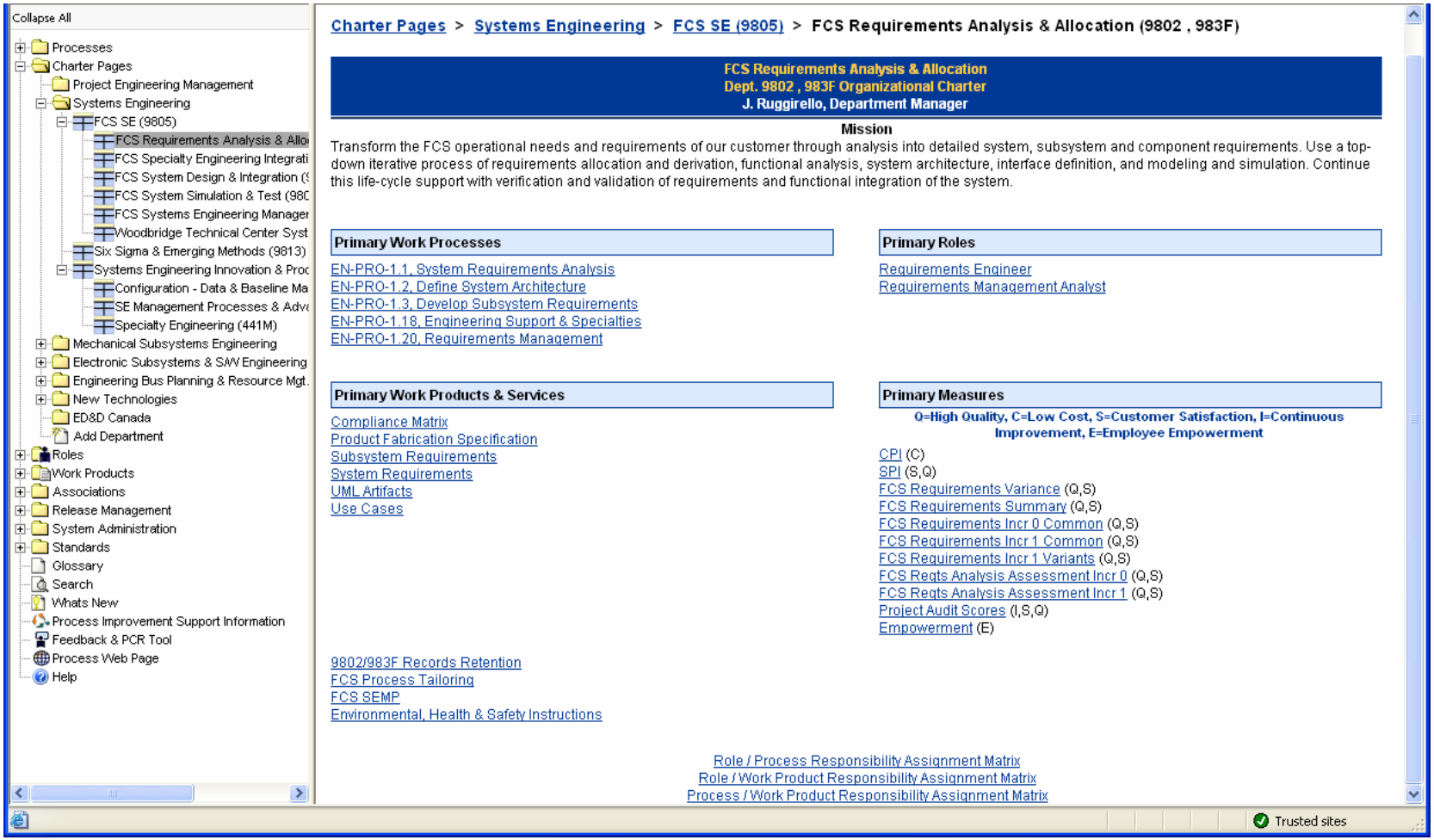
- Role responsibilities are defined and include links to associated processes and work products.

Work Product-based Views



- Work products defined and include links to
  - ↗ Processes
  - ↗ Roles (Owner, Participant, SME, Reviewer, Approver, Customer)
  - ↗ Supporting materials (Templates, Standards, Guidelines, etc).
- IPS Hierarchy aligned with Project Repository Standard.

Managed Charter Pages



Recent Appraisal Efforts

- Using IPS, we conducted a successful CMMI V1.1 appraisal of the Systems Engineering and Project Engineering Management organization in 2006
  - ↗ Approximately 800 individuals affected
- Conducted successful CMMI V1.2 appraisal of Integrated Engineering activities (Central Campus and 3 sites) in 2007
  - ↗ Approximately 2000 individuals affected

Geographic Challenges

- Adequate representation in appraisal
  - ↗ Projects, Interviews, artifacts, team members
- Preparation activities require more coordination
- Need local points of contact and ‘champions’
- Frequent visits and communication
  - ↗ Communication is more challenging
- Avoiding Sites feeling isolated

Lessons Learned – People & Team

- Top Management Must Take An Active Role In Regularly Scheduled Meetings To Energize Their Areas
- Establish Small Core Team To Lead Effort
  - ↗ Listen To What They Say & Act On It
- Need To Assign First String Employees To Project
  - ↗ Appraisal Team, Artifact Gathering, Process Authoring
- Appraisal Team Members Need Relief From Everyday Tasks
- Project Leaders need to be heavily involved

Lessons Learned - Preparation

- Enforce The Use Of Standard Project Repositories
- Don't Underestimate The Time Required For Artifact Gathering
  - Constant Contact Between Artifact Gathering Team And Appraisal Team Is A Must
  - Publicize Examples Of Artifacts

- Understand Lead Appraiser's Interpretation Of The Model
- Constant Communication At All Levels
  - Walkthrough Of Interview Process With Interviewees Beneficial

Lessons Learned – Appraisal Conduct

- Close Coordination of Appraisal Activities And Schedule
  - ↗ Especially Interview Groups, Facilities Issues

- Single Point of Contact (Librarian) With Appraisal Team for Information Updates During Appraisal
- Consistent Project Overview Templates

Future Activities

- Since the 2007 Appraisal, we have:
  - ↗ Enhanced IPS to encompass Canadian Engineering site
    - Legacy process assets mapped into IPS
    - Undergoing appraisal at level 3 this year
  - ↗ Enhanced IPS to cover IPPD
  - ↗ Enhanced IPS to cover High Maturity practices
  - ↗ Continue integration across other ED&D sites
- Exploring integration of remaining two sites
- Planning CMMI level 5 appraisal of Software
- Planning CMMI level 5 appraisal across ED&D

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