Transitioning to CMMI from the SW-CMM: Shifting Gears from a Software Process Focus to a Project Management Focus

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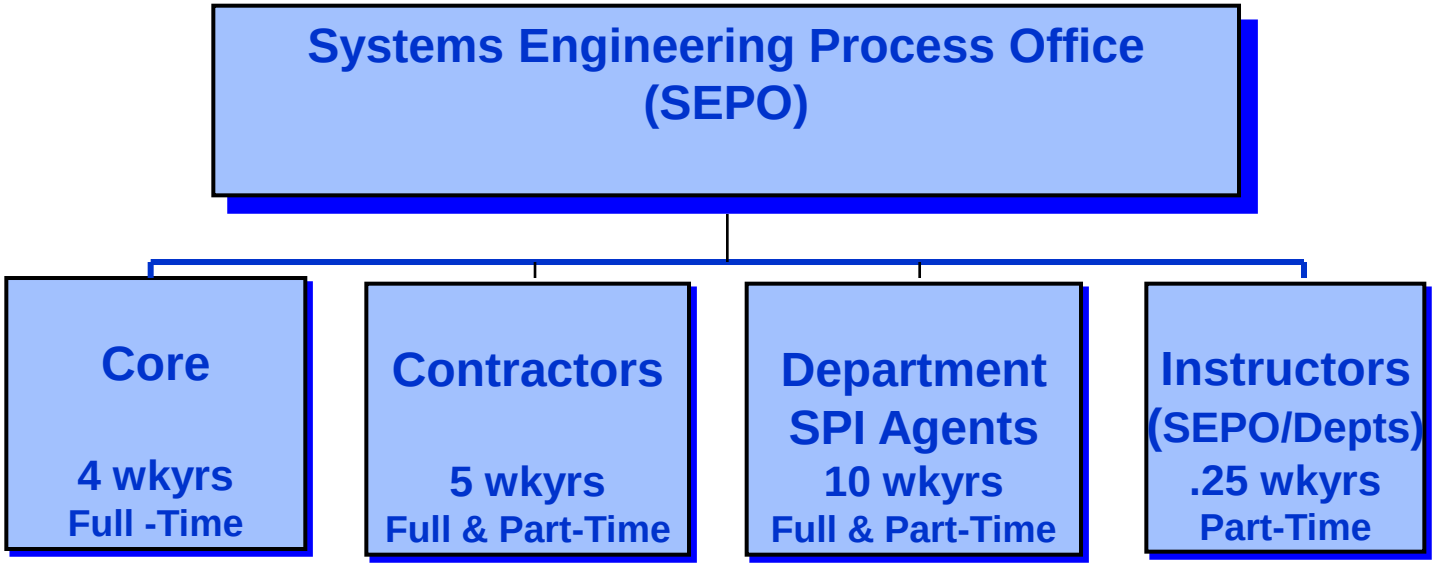
Objectives of the Briefing

- Provide overview of SSC San Diego and SEPO
- Discuss the current CMMI transition efforts at SSC San Diego
  - Transition challenges
  - Transition approach

Space and Naval Warfare Systems Center San Diego (SSC San Diego)

- Mission: to be the Navy's RDT&E, engineering and fleet support center for command and control, communications, ocean surveillance, and the integration of those systems which overarch multi-platforms
- Vision: to be the nation's pre-eminent provider of integrated C4ISR solutions for warrior information dominance
- ~3,500 civilians, 70 military, and several thousand contractors
- Actual funding for FY 03 was ~$1.3 billion
- Attained SW-CMM Level 3 in Oct 2000; reassessed at Level 3 Aug 2003

SSC San Diego Process Improvement Organization



-Funded by overhead

SEPO Products and Services

- Maintains SSC San Diego's Process Asset Library (PAL): Comprehensive web page of software and systems engineering material: at http://sepo.spawar.navy.mil/
- Facilitates systems process improvement across all SSC San Diego Departments
- Conducts training courses
- Assists with both internal and external appraisals on organizations and projects to determine best practices and areas for improvement
- Maintains Software Community Alias: Email alias with over 800 members for announcements, requests for assistance
- Facilitates Systems Process Improvement Working Group (SPIWG): periodic meetings, seminars, lectures, debates, demos about systems engineering issues
- Maintains SEPO Library: Software-engineering related books, guidelines, standards, products, processes, publications, proceedings, articles, videos
- Performs Community Liaison: Interface with the software community outside of SSC San Diego, both government and commercial

SSC San Diego Organizational PAL:http://sepo.spawar.navy.mil/

SSC San Diego PAL - Microsoft Internet Explorer provided by Navy Marine Corps Intranet

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Address http://sepo.spawar.navy.mil/sepo/index1.html Go

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SPAWAR Systems Center San Diego

- SSC San Diego PAL
  - Finding Information on the PAL
  - Whats New
  - Hot Topics
  - SEPO
  - Guidance
  - Process Improvement
  - Project Management
  - Systems Engineering
  - Software Engineering
  - Policy/Processes by CMM KPA
  - Department PALs
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Space and Naval Warfare Systems Center San Diego

A CMM Level 3 Organization

Systems Engineering Process Office

SEPO

Process Asset Library

This is an official U.S. Navy web site.
This US Government system is subject to monitoring.
Please review the Privacy and Security Notice, External Links Notice, and Privacy Advisory.
For webmaster contact information click on *Contact Us*

The SEPO home page and Process Asset Library (PAL) is a sub-web of the Space and Naval Warfare Systems Center San Diego public Web site, which can be accessed by clicking the *HOME* link in the navigation pane to the left. To return here, click on *About SSC San Diego* and then click on *Software/System Engineering Process Office*.

Based on many lessons learned, it is our goal that the SSC San Diego software community, as well as our industry partners and other government associates, have the tools and techniques to raise our systems and software capability maturity in a concerted effort. In the spirit of improving the systems and software engineering competency of all players on the SSC San Diego team, we offer this home page. Also, in this spirit, we ask that any of you who have lessons learned in systems and software process improvement that could benefit the rest of the team, to please pass them along as a document or as a link and we will include them on this home page.

SSC San Diego Process Asset Library Local intranet

Start Inb... Micr... CM... SSC... SSC... Mee... Micr... SEP... Micr... Calc... Micr... 13:31

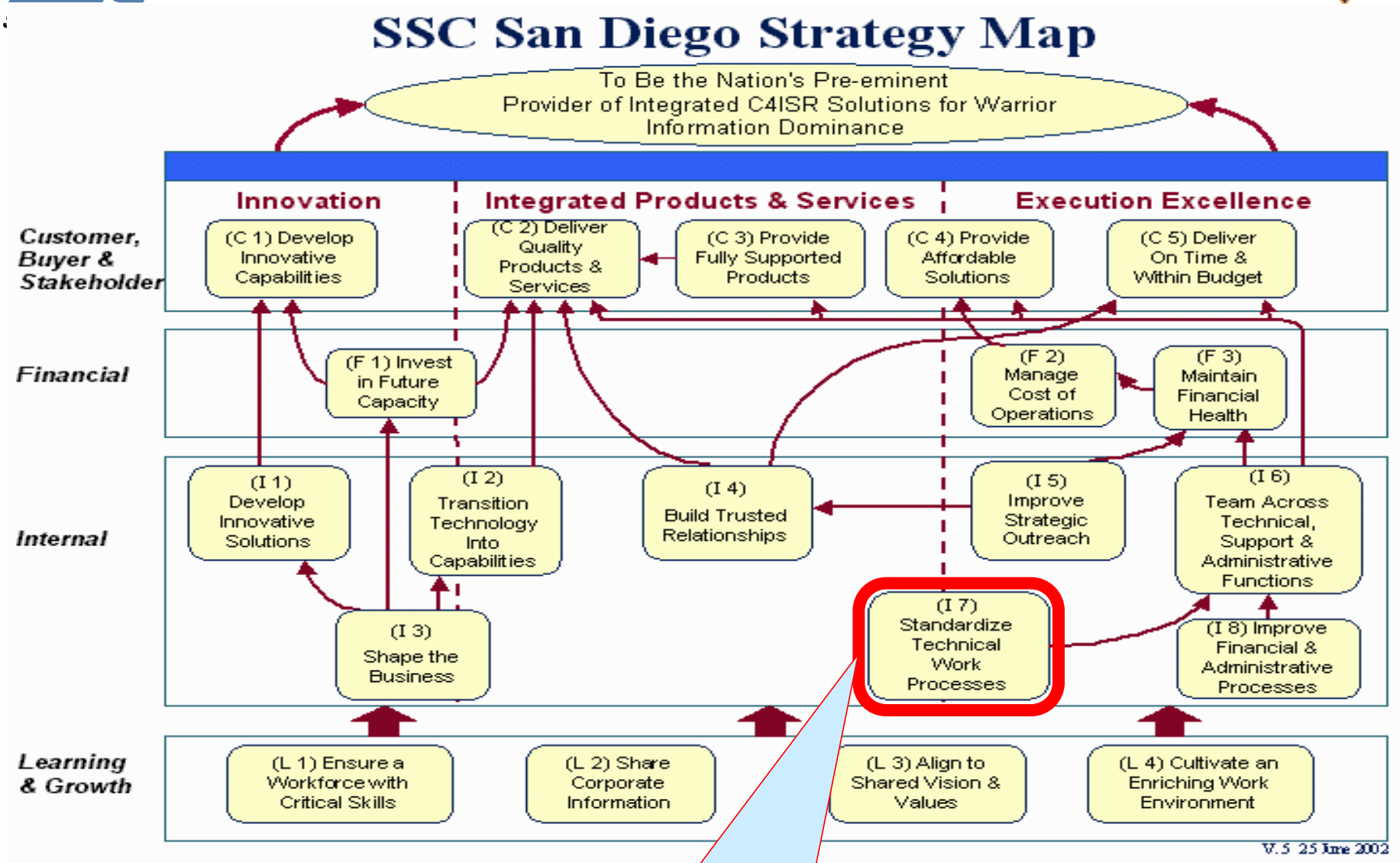
Transition Challenges

- Updating current process assets to cover software and systems instead of software only
- Updating/reengineering training curriculum
- Redesigning SPI infrastructure to support many more projects
- Will every project be CMMI Level 3?
- Establishing accountability for adoption; measuring compliance and success
- Clarifying Project Manager roles and responsibilities

Transition Approach

- SSC San Diego has developed:
  - Software Engineering Process Policy
  - Software engineering processes, templates, example documents
  - Training courses
- Software projects have improved their project management and software engineering process maturity
- What about non-software projects? Are they operating in accordance with project management and engineering best practices?
- Entire organization would benefit from adoption of the CMMI, but where do you start?
- Transition to CMMI will affect virtually every project in the organization
- Senior management has decided to start by focusing on standardizing technical work processes across the organization as part of our implementation of the Balanced Scorecard
  - Development of a “Project Management Guide” is the focal point of this effort

The Balanced Scorecard



Project Management guidelines support this BSC objective

Migrating from SW-CMM to the CMMI

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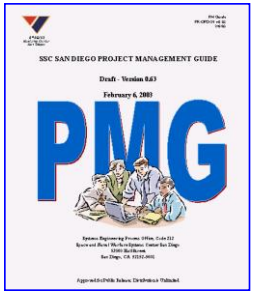
	SW-CMM Key Process Areas	CMMI Process Areas	
LEVEL 5 *OPTIMIZING*	Defect prevention Technology change mgmt Process change mgmt	Causal analysis and resolution Org. innovation & deployment	Focus still on continuous improvement
LEVEL 4 *MANAGED*	Quantitative process mgmt Software quality mgmt	Org. process performance Quantitative project mgmt	Focus still on quantitative management
LEVEL 3 *DEFINED*	Org. process focus Org. process definition Training program Integrated software mgmt Software product engr Intergroup coordination Peer reviews	Org. process focus Org. process definition Organizational training Integrated project mgmt Risk Management Technical solution Product Integration Verification Validation Requirements Development Decision Analysis / Resolution	Focus still on process standardization
LEVEL 2 *REPEAT-ABLE*	Requirements management Software project planning SW project track & oversight Software subcontract mgmt Software quality assurance Software configuration mgmt	Requirements management Project planning Project Monitoring & Control Measurement and Analysis Supplier agreement mgmt Product & Process QA Configuration mgmt	Focus still on basic project management

Documents being Developed by SEPO

Project Management Policy

Implemented by

Project Management Guide



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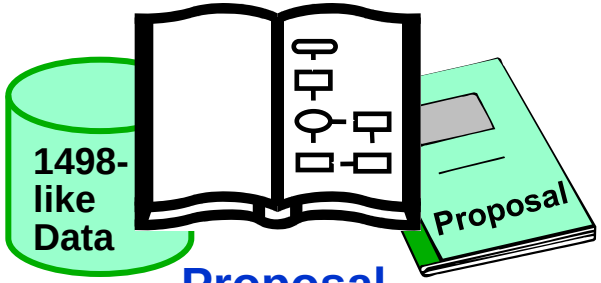
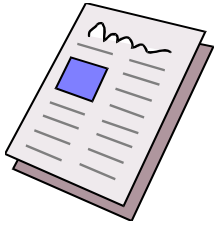


Proposal Development Guide

Project Mgmt Plan - template and examples



Project Manager job description

SSC San Diego Project Management Guide

- **Status: Draft completed**

Principles for Development of the PM Guide

- Define SSC San Diego standard project management process for Project Managers to use in the successful execution of a project.
- Focus on management responsibilities, not practitioner details. (Audience: primarily Project Manager, and some levels above the Project Manager)
- Serve as standard work process
- Take advantage of best practices in the CMMI, but DO NOT mention it
- Provide simplified method to measure project status; and provide guidance to SSC San Diego upper-level managers in successful oversight of projects.
- Be a basis for management, training, Project Manager certification, QA
- Be compatible with IEEE12207, EIA632, SPMN's 16 best practices, Project Management Institute (PMI), and SSC San Diego's Balanced Scorecard
- Be SHORT! Comprehensive. Readable. Usable.

Keep project goals in mind:
quality products, on-time delivery, within budget

Key Purposes of the Project Management Guide

- Aid in achieving the organization's Balanced Scorecard strategic objective "Standardize Technical Work Processes"
- Move away from "doing SPI" or "doing CMMI" to "following best practices"
  - Clarify and manage project requirements
  - Plan and schedule project activities
  - Apply engineering best practices (software and systems)
  - Track and control progress

Which Projects does this Apply to?

All SSC San Diego projects (new and ongoing) that produce products or services. For example:

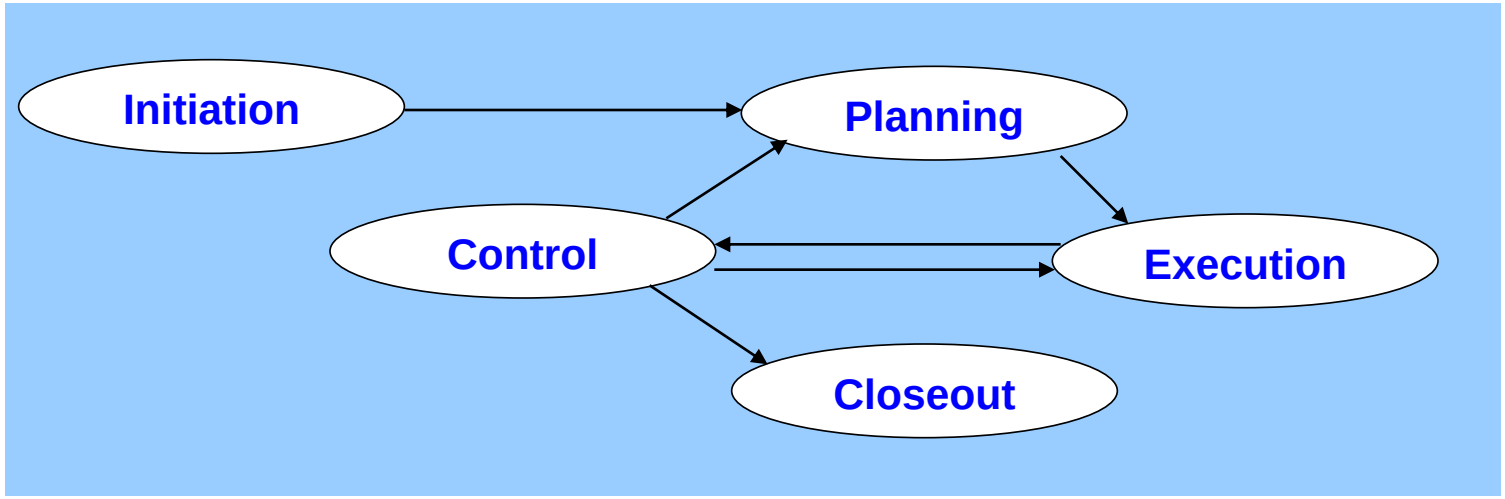
Project	Product
System development	A system
Hardware fabrication	Hardware
Concept exploration	A concept
Analysis or study	A document
System integration	An integrated system
Software development	Software program
Life cycle maintenance	Upgraded systems or software
Support, guidance, assistance	Service
Testing, test beds	Service

Tailorable to small and large projects

- Tier I: "Small" projects; perform all activities in "Basic" PM Guide
- Tier II: "Large" (defined by Depts/Divs); perform activities in Advanced PM Guide with added rigor, depth, artifacts

Project management best practices apply to ALL projects

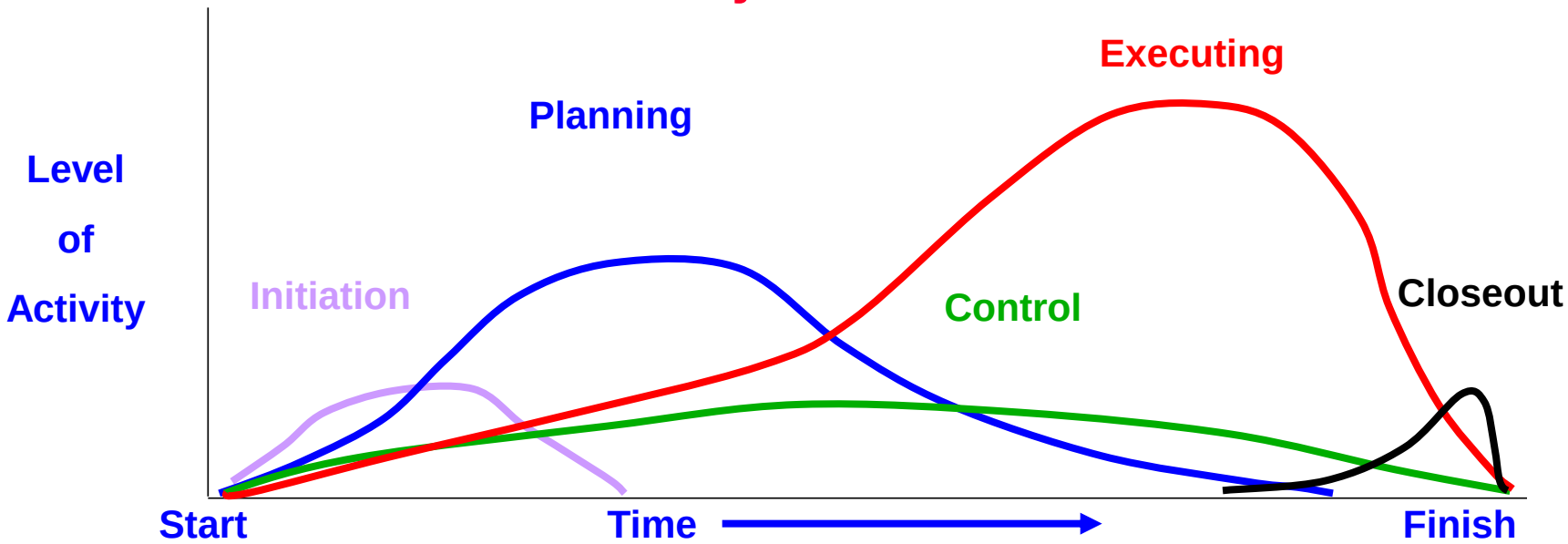
The 5 Project Management Functions *



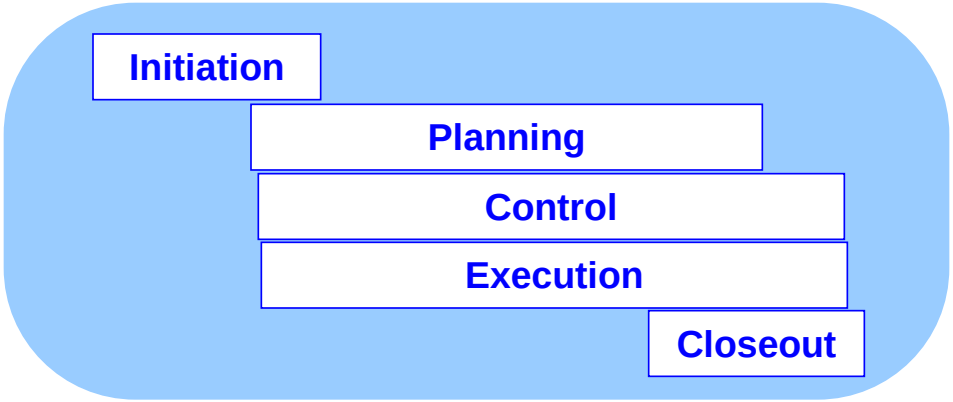
- **Initiation.** Authorizing the project or phase.
- **Planning.** Defining a plan, refining objectives, and selecting the best of the alternative courses of action to attain the objectives of the project.
- **Execution.** Coordinating people and other resources to carry out the plan.
- **Control.** Ensuring the project objectives are met by monitoring and measuring progress regularly to identify variances from plan so that corrective action can be taken when necessary.
- **Closeout.** Formalizing acceptance of the project or phase and bringing it to an orderly end.

* from the "Project Management Body of Knowledge" (PMBOK)

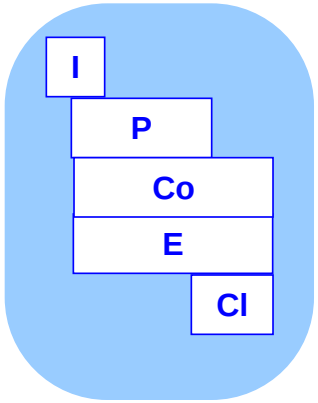
Overlap of PM Functions in a Project or Phase



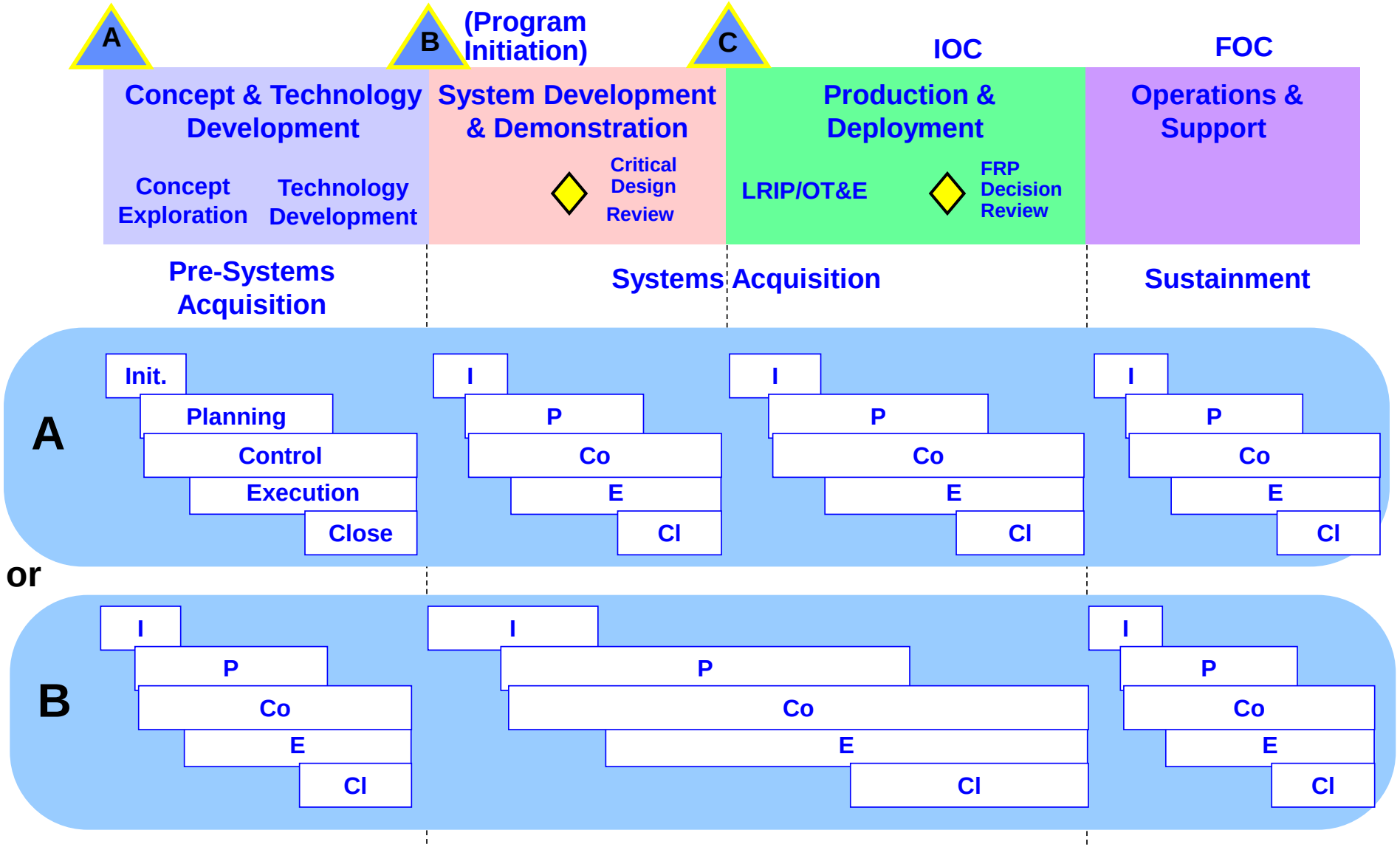
- In a bar chart:



- Or in shorthand notation:



PM Flow Applied to DoD 5000 Phases

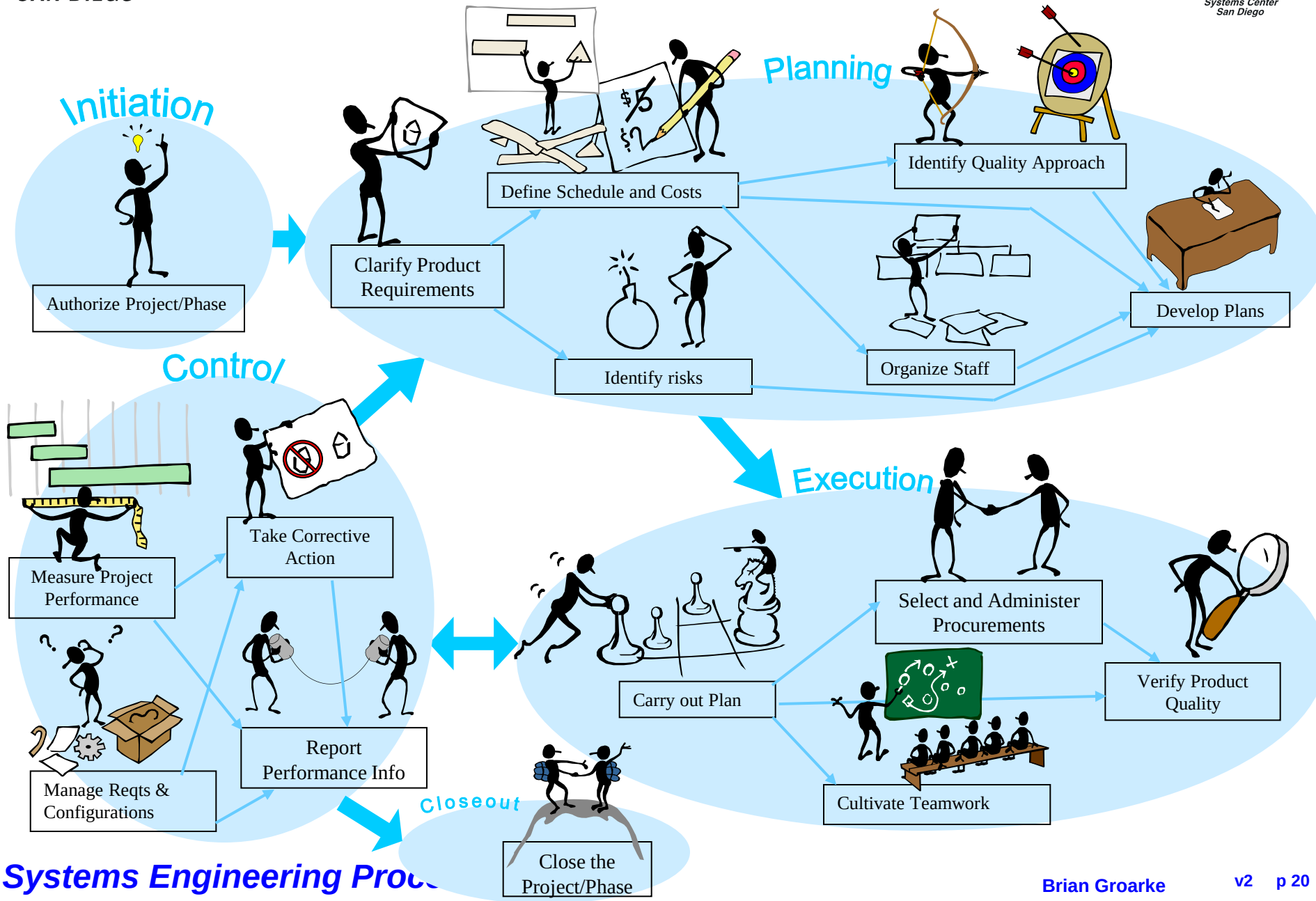


5 PM Functions and 16 Activities

Function	Activity
Initiation	1. Authorize the project or phase
Planning	1. Clarify product requirements
	2. Define schedule and costs
	3. Identify risks
	4. Identify quality approach
	5. Organize staff
	6. Develop plans
Execution	1. Carry out the plan
	2. Select and administer procurements
	3. Cultivate teamwork
	4. Verify product quality
Control	1. Monitor project performance
	2. Manage requirements and configurations
	3. Take corrective action
	4. Report performance information
Closeout	1. Close the project or phase

PM best practices apply to ALL projects

Project Management Functions and Activities



Document Format

c. Determine risk reduction and contingency actions. Determine what actions or decisions could reduce the probability and/or the severity of the identified risk, including formal monitoring, peer reviews, or configuration audits. Determine the contingency plans for actions needed if the risk is realized or is expected to occur soon.

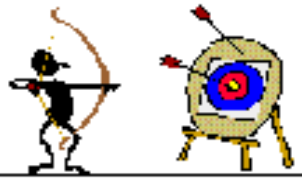
Develop and document reduction/mitigation plans and contingency plans for high- priority risks.

d. Determine what measurable or observable events can be tracked to know if the risk are being encountered, avoided, or minimized.

Define measurements for tracking high- priority risks. Refer to the Risk Management Process document on the PAL.

3.4 Identify Quality Approach.

Planning for product control encompasses quality assurance (QA), configuration management (CM), peer reviews, and measurements. Project QA includes the steps required to ensure that the project will satisfy the needs for which it was undertaken. It includes all activities that determine the quality policy, objectives, and responsibilities. CM establishes and maintains the integrity of the work products. Measurements provide visibility into the actual progress of the project so that management can take effective actions when performance deviates significantly from plans.



Identify Quality Approach

a. Define the (QA) approach for evaluating the quality of the product, associated documentation, and the engineering processes. Develop a strategy to verify that the product will meet the requirements. Develop a strategy to validate that the processes are being followed correctly.

Identify the QA structure and personnel resources for performing QA activities on the products and for evaluating the engineering or development processes. Identify tools utilized for QA. Refer to Software QA Process, Expert Mode, and SQA Plan template on the PAL.
Establish a verification strategy for selected work products. Develop plans and an environment to support verification that "you build the product right."
Establish a validation strategy, environment, and procedures to demonstrate that the product fulfills its intended use when placed in its intended environment, that you "build the right product."

b. Define the (CM) approach for controlling the configuration of the product, documentation,

Basic requirements in regular text

Advanced requirements inside dashed boxes

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Small project requirements

PM Guide Checklist

Verification check boxes

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PROJECT MANAGEMENT GUIDE – ARTIFACT CHECKLIST

The following checklist is used by the Project Manager (in the first box) and by the assigned level of Quality Assurance (in the second box) to track usage of the Project Management Guide.

Function/ Activity	Sub-activity	Tier I Minimum Action/Artifacts	Additional Tier II Minimum Action/Artifacts	Advanced Artifacts/References	Verification	
2. INITIATION					**PM**	**QA**
2.1 Authorize the Project or Phase	a. Determine sponsor/customer needs.	Project Description in ERP; basic proposal	Detailed proposal	Project Plan begun	☐	☐
	b. Determine SSC San Diego needs.	ERP account, understanding by PM	Strategic Plan, Intranet, PAL, policies reviewed		☐	☐
	c. Identify Management and Team Responsibilities.	Roles clarified; training identified	Key people trained	Entire team trained, ready, facility needs identified	☐	☐
3. PLANNING					**PM**	**QA**
3.1 Clarify Product Requirements	a. Elicit Candidate Requirements.	Candidate requirements understood	Requirements documented in SOW, OCD, etc	OCD baselined	☐	☐
	b. Analyze Requirements.	Detailed requirements understood	Informal requirements documented	Requirements database/tool used	☐	☐
	c. Formalize the Requirements.	Requirements documented, approved, baselined	Sys Reqts Doc, under CM		☐	☐
	d. Identify the standards and procedures	Standards and procedures identified	Documented in Project Plan	Tailored to project usage	☐	☐
3.2 Define Schedule and Costs	a. Estimate the appropriate quantifiable parameters.	Parameters understood	Parameters estimated, documented, baselined		☐	☐
	b. For development projects, select a life-cycle strategy.	Strategy selected	Strategy documented in Plan	Strategy tailored to project usage	☐	☐
	c. Identify the major tasks or phases.	Tasks, phases identified in basic WBS in ERP	Tasks, phases documented in detailed WBS	Tasks, phases documented in MS Project	☐	☐
	d. Identify the processes, techniques, methodologies and tools	Processes, tools identified	Processes, tools documented in Plan	Project-specific processes documented separately	☐	☐
	e. Develop the project's overall schedule.	Schedule, milestones, reviews identified	Schedules, milestones, reviews on PERT chart	Schedules, milestones, reviews in MS Project	☐	☐

Large project requirements

How is Project Management Success Determined?

- Enterprise Resource Planning (ERP) entries required at key milestones
- Checklists reviewed by Dept/Div authority such as
  - Next-level management
  - Dept/Div Product Assurance or QA
  - Project reviews
  - Other?

Sample status report:

Function / Project	Initiation	Planning	Execution	Control	Closeout	Last Checked
ABC Development	100%	80%	10%	10%	-	May-02
DEF Maintenance	100%	60%	-	-	-	Jan-02
XYZ Study	80%	20%	-	-	-	Dec-01

Upper management support and verification will facilitate project management success

Transition Challenges

- Updating current process assets to cover software and systems instead of software only
  - We are currently evaluating the scope of required changes
- Updating/reengineering training curriculum
  - We are developing a basic project management training class
- Redesigning SPI infrastructure to support many more projects
  - Redefining role of SEPO in the organization
- Will every project be CMMI Level 3?
  - Two-tiered definition for projects; only Tier II projects would implement CMMI through Level 3
- Establishing accountability for adoption; measuring compliance and success
  - First line managers and middle mangers will be held accountable
- Clarifying Project Manager roles and responsibilities
  - Project Manager position description being revised

Summary

- Transition to CMMI has caused a rethinking of our entire process improvement approach and philosophy
- Focusing on implementing “best practices” vs. implementing CMMI
- Many issues to be worked out; we have started to address some
- We believe the end result will be improved products and services across the organization

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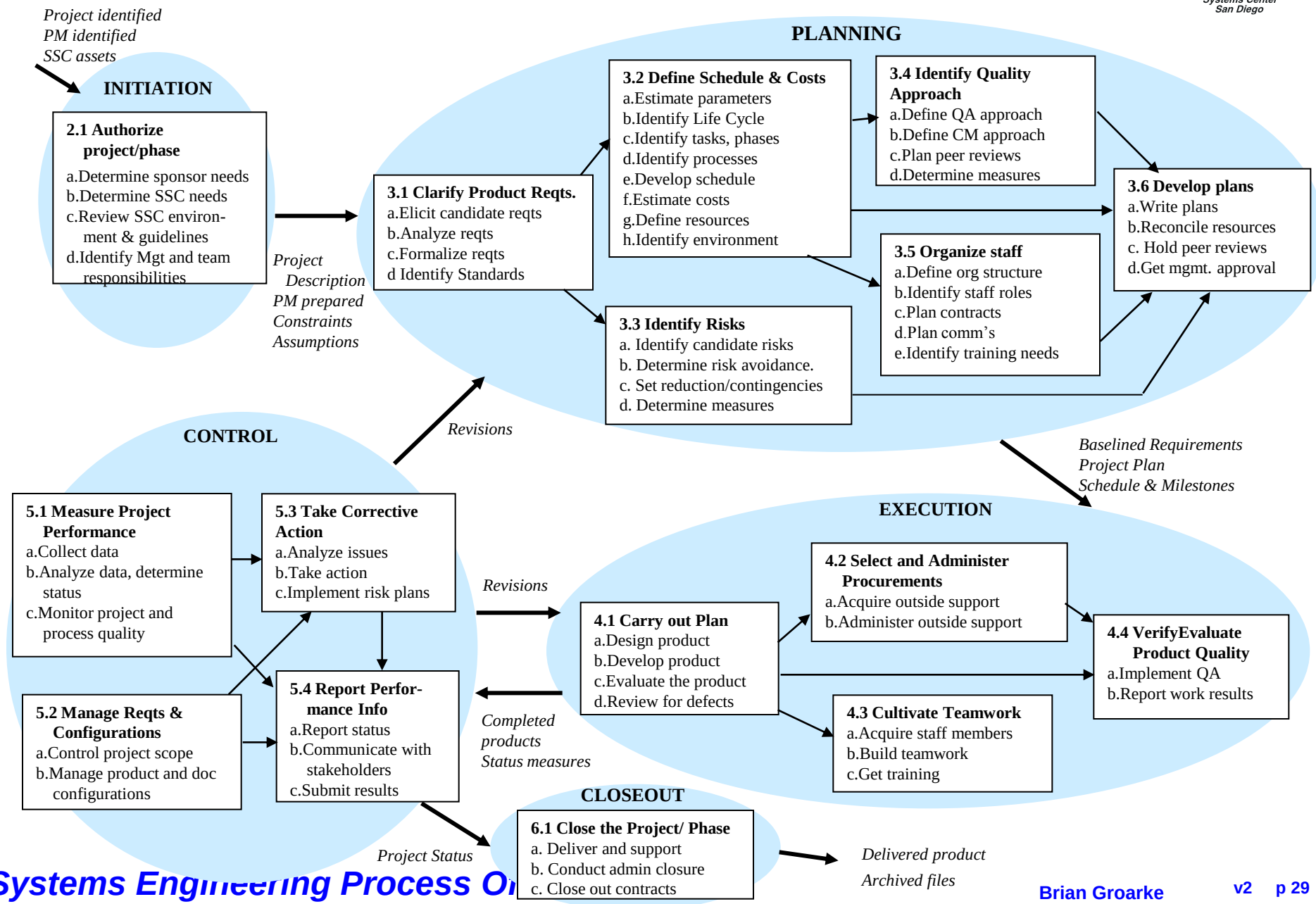
Acronyms

- C4ISR: Command, Control, Communication, and Computers, Intelligence, Surveillance, and Reconnaissance
- EIA: Electronics Industry Association
- IEEE: Institute of Electrical and Electronics Engineers
- SW-CMM: Capability Maturity Model for Software
- CMMI: Capability Maturity Model Integrated
- ERP: Enterprise Resource Planning
- PMI: Project Management Institute
- QA: Quality Assurance
- RDT&E: Research, Development, Test, and Engineering
- SEPO: Systems Engineering Process Office
- SPI: Software Process Improvement
- SPMN: Software Program Manager's Network
- SSC San Diego: Space and Naval Warfare Systems Center, San Diego

Backup Viewgraphs

Project Management's 57 Subactivities



Coverage of CMMI Process Areas at Level 2 and 3

Level	Process Area	Init	Plan	Exec	Cont	Clo
2	Requirements Management		X		X	
2	Project Planning		X			
2	Project Monitoring and Control				X	
2	Supplier Agreement Management			X		
2	Measurement and Analysis		X		X	
2	Process, Product Quality Assurance			X	X	
2	Configuration Management				X	
3	Requirements Development		X			
3	Technical Solution			X		
3	Product Integration		X	X		X
3	Verification		X	X	X	
3	Validation		X		X	
3	Organizational Process Focus	(organizational responsibility)				
3	Organizational Process Definition	(organizational responsibility)				
3	Organizational Training	(organizational responsibility)				
3	Integrated Project Management		X	X	X	X
3	Risk Management		X		X	
3	Decision Analysis and Resolution	X	X	X	X	X

Coverage of 15 CMMI Level 2 Specific Goals

PA	Specific Goal	Init	Plan	Exec	Cont	Clo
REQM	1. Manage Requirements		X		X	
PP	1. Establish Estimates		X			
PP	2. Develop a Project Plan		X			
PP	3. Obtain Commitment to the Plan		X			
PMC	1. Monitor Project Against Plan				X	
PMC	2. Manage Corrective Action to Closure				X	
SAM	1. Establish Supplier Agreements			X		
SAM	2. Satisfy Supplier Agreements			X		
M&A	1. Align Measurement and Analysis Activities		X			
M&A	2. Provide Measurement Results				X	
PPQA	1. Objectively Evaluate Processes and Work Products			X	X	
PPQA	2. Provide Objective Insight			X	X	
CM	1. Establish Baselines				X	
CM	2. Track and Control Changes				X	
CM	3. Establish Integrity				X	

Coverage of 25 CMMI Level 3 Specific Goals

PA	Specific Goal	Init	Plan	Exec	Cont	Clo
RD	1. Develop Customer Requirements		X			
RD	2. Develop Product Requirements		X			
RD	3. Analyze and Validate Requirements		X			
TS	1. Select Product Component Solutions			X		
TS	2. Develop the Design			X		
TS	3. Implement the Product Design			X		
PI	1. Prepare for Product Integration		X			
PI	2. Ensure Interface Compatibility			X		
PI	3. Assemble Components, Deliver Product			X		X
Ver	1. Prepare for Verification		X			
Ver	2. Perform Peer Reviews		X	X	X	
Ver	3. Verify Selected Work Products			X	X	
Val	1. Prepare for Validation		X			
Val	2. Validate Product or Product Components				X	
OPF	1. Determine Process Improvement Activities	(organizational responsibility)				
OPF	2. Plan, Implement Process Improve. Activities	(organizational responsibility)				
OPD	1. Create Organizational Process Assets	(organizational responsibility)				
OT	1. Identify Training Needs, Make Available	(organizational responsibility)				
OT	2. Provide Necessary Training	(organizational responsibility)				
IPM	1. Use the Project's Defined Process		X	X		X
IPM	2. Coordinate, Collaborate with Stakeholders				X	
RSKM	1. Prepare for Risk Management		X			
RSKM	2. Identify and Analyze Risks		X			
RSKM	3. Mitigate Risks		X		X	
DAR	1. Evaluate Alternatives	X	X	X	X	X