



# IEEE Std 730 Software Quality Assurance: Supporting CMMI-DEV v1.3, Product and Process Quality Assurance

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# Walz Bio highlights

- Standards: IEEE and US TAG to ISO TC 176 Quality Management
- Quality: ASQ, work experience
- Software: three books, consulting, work experience
- Systems: Telecom & DoD work experience

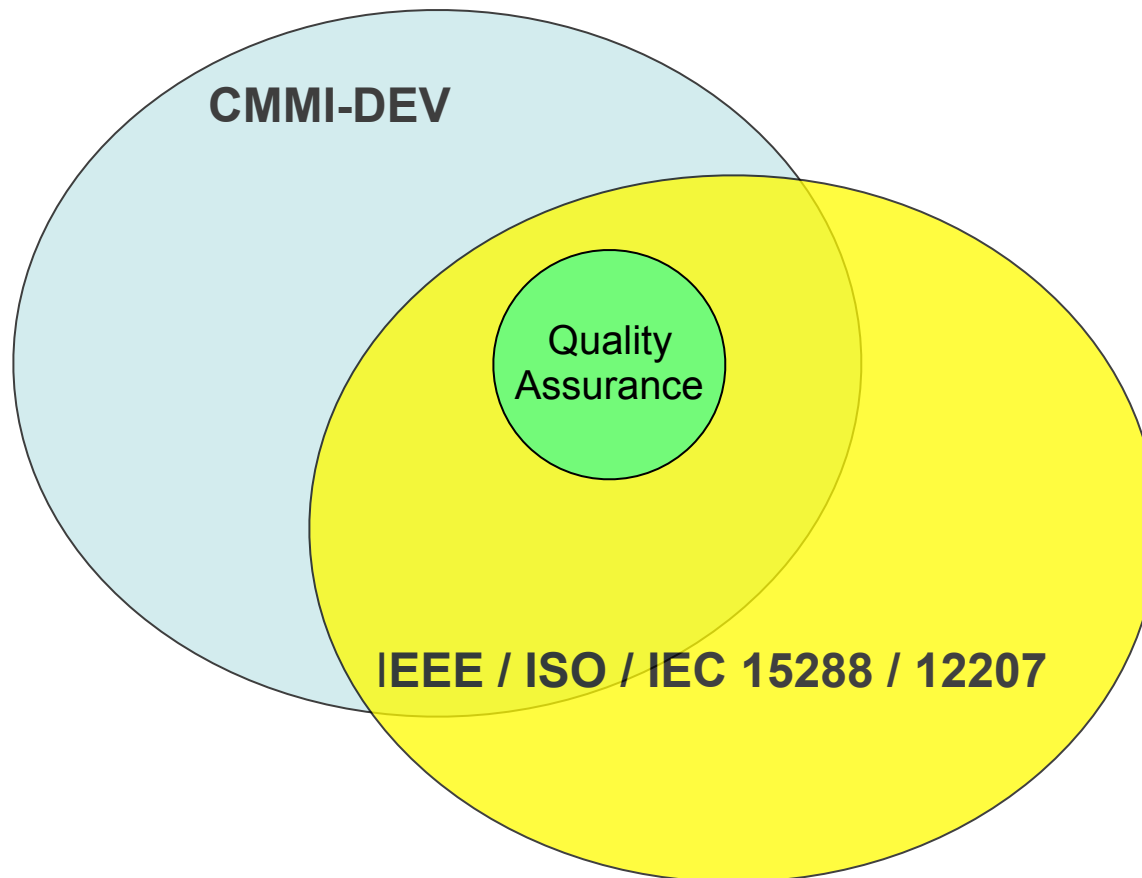


# Abstract

The latest CMMI-DEV version 1.3 shows over 50 instances of Quality Assurance (QA). It is clear that CMMI-DEV and IEEE 730 SQA need to align. The P730 IEEE standards working group has expanded the scope of the SQA process standard to align with IS 12207 software life cycle processes.

Presentation will cover IEEE 730 CMMI appendix on implementation if your organization uses the CMMI-DEV framework. We welcome audience feedback and support to enhance this IEEE 730 guidance

# Life Cycle Process frameworks



# IEEE Life Cycle Processes & Artifacts

- **Systems Life Cycle Processes (IS 15288)**
  - 25 processes including
    - life cycle management process
    - software implementation
- **Software Life Cycle Processes (IS 12207)**
  - 18 processes: Implementation, Technical, Reuse, & Support
    - Support processes include Software QA (SQA)
- **Life Cycle Information Products (IS 15289)**
  - assist users to manage information items as products of the system or software life cycle processes

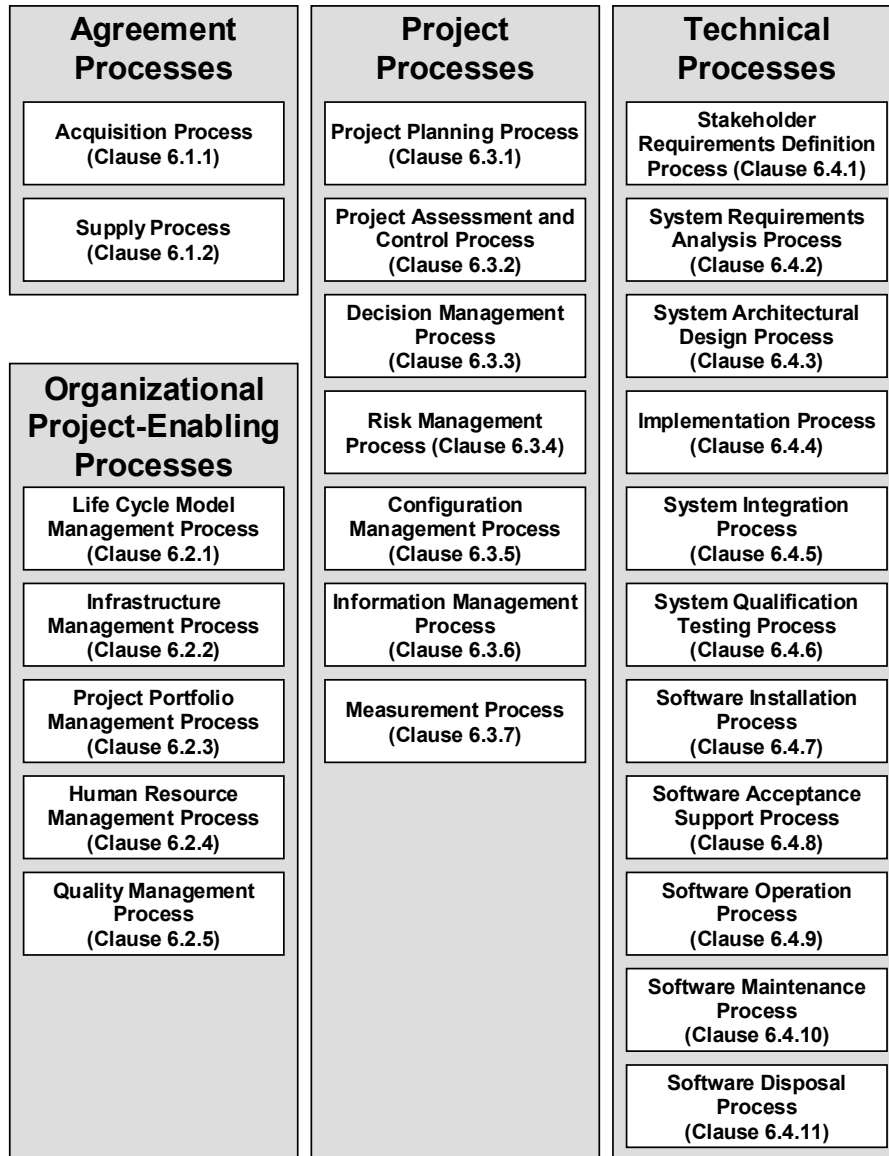
# CMMI Life Cycle Process Areas

- CMMI Architecture and Framework
  - CMMI® for Acquisition, ACQ
    - 22 process areas
      - include process & product quality assurance, PPQA
  - CMMI® for Services, SVC
    - 24 process areas
      - include process & product quality assurance, PPQA
  - CMMI® for Development, DEV
    - 22 process areas
      - including process & product quality assurance, PPQA

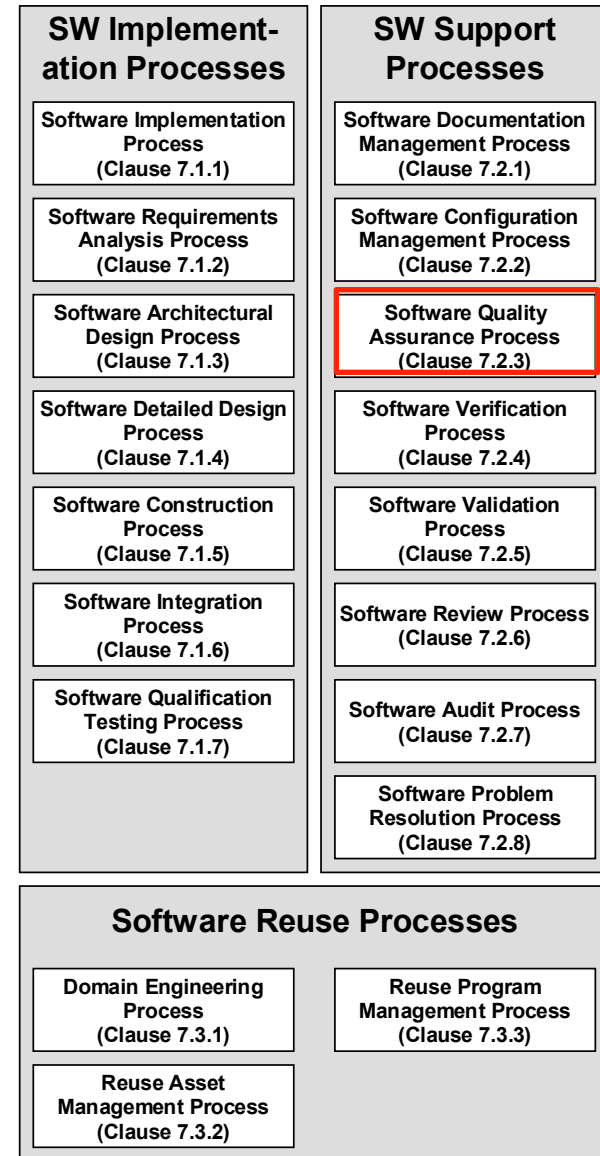


# IEEE Life Cycle Process groups

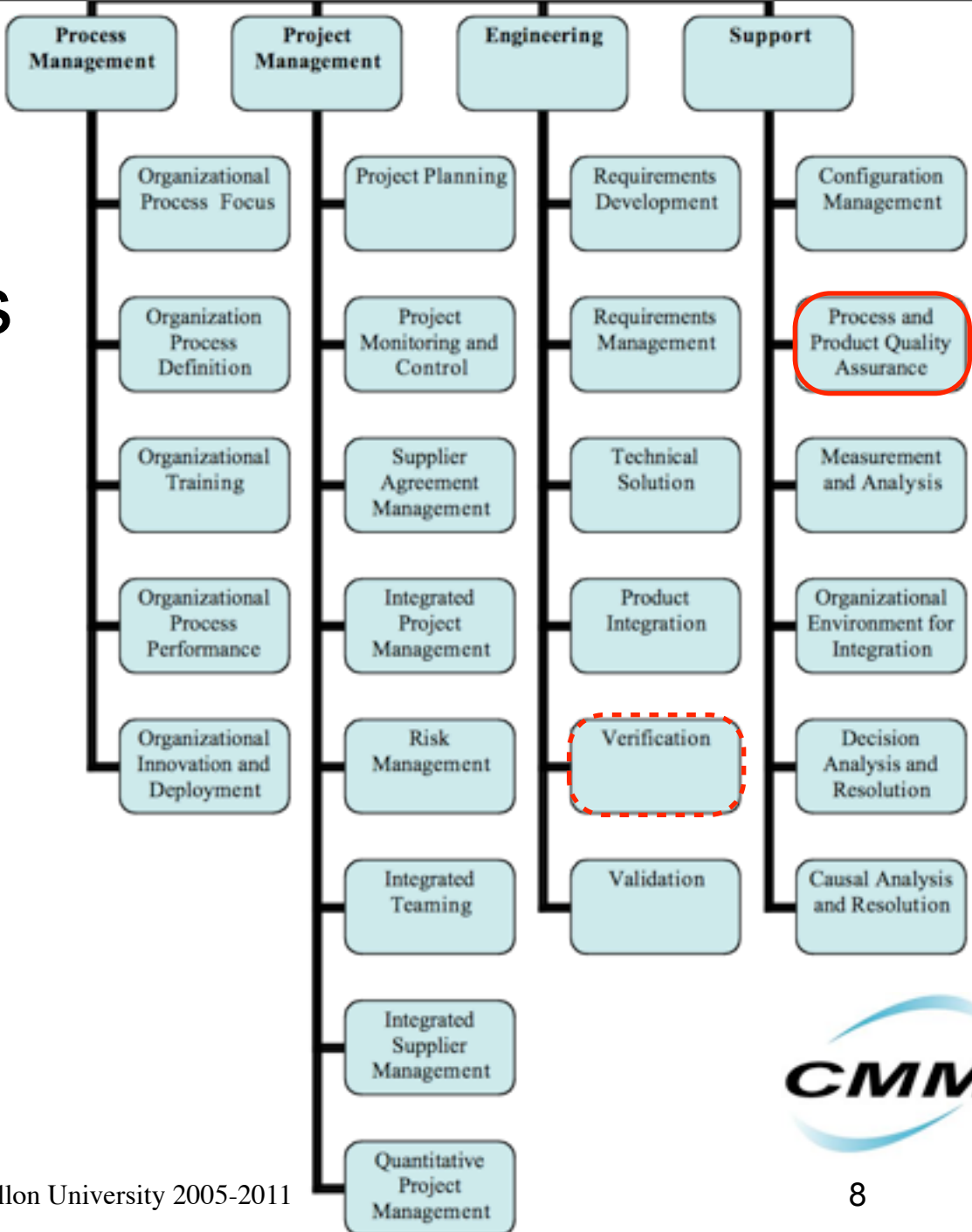
## System Context Processes



## Software Specific Processes

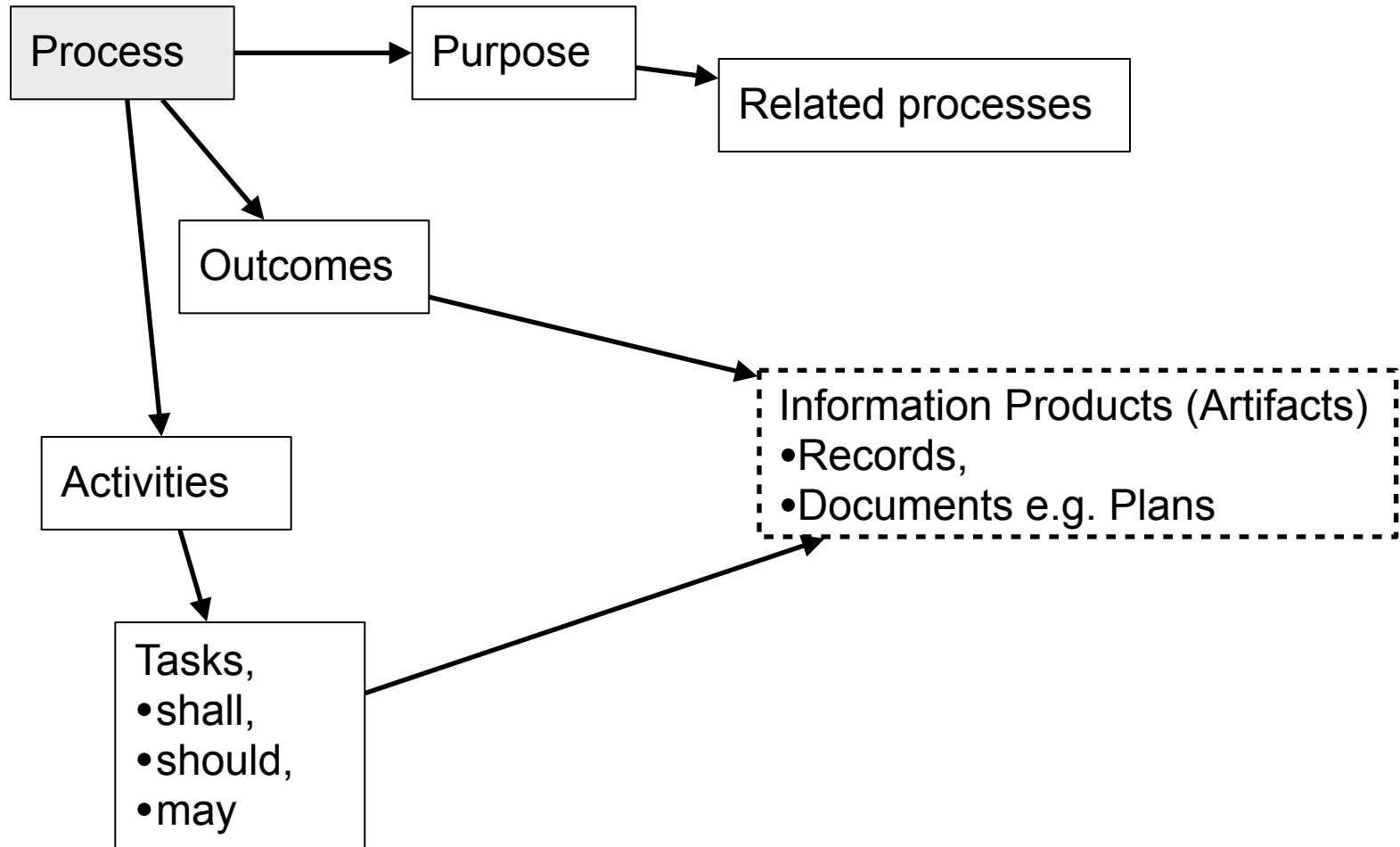


# CMMI-DEV Categories of Process Areas

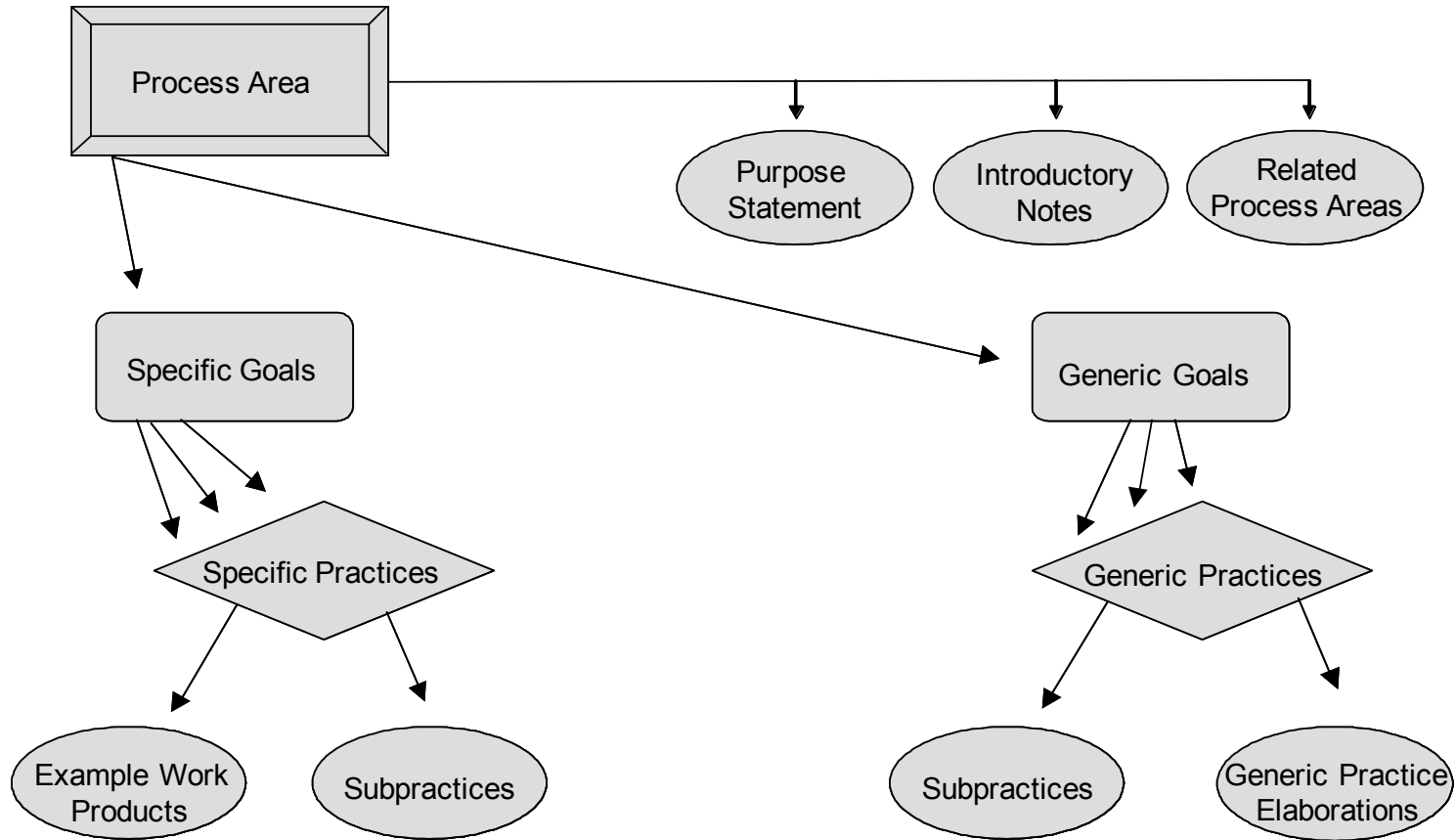




# IEEE Life Cycle Processes



# CMMI Model Components



# Processes and Products QA

## ISO/IEC/IEEE

**Process → Activities → Tasks → Artifacts, Records, Documents (Plans)**

IEEE 730 SQA Process-2011

IEEE 730 SQA Plan-2002, 2011

## CMMI-DEV v1.3

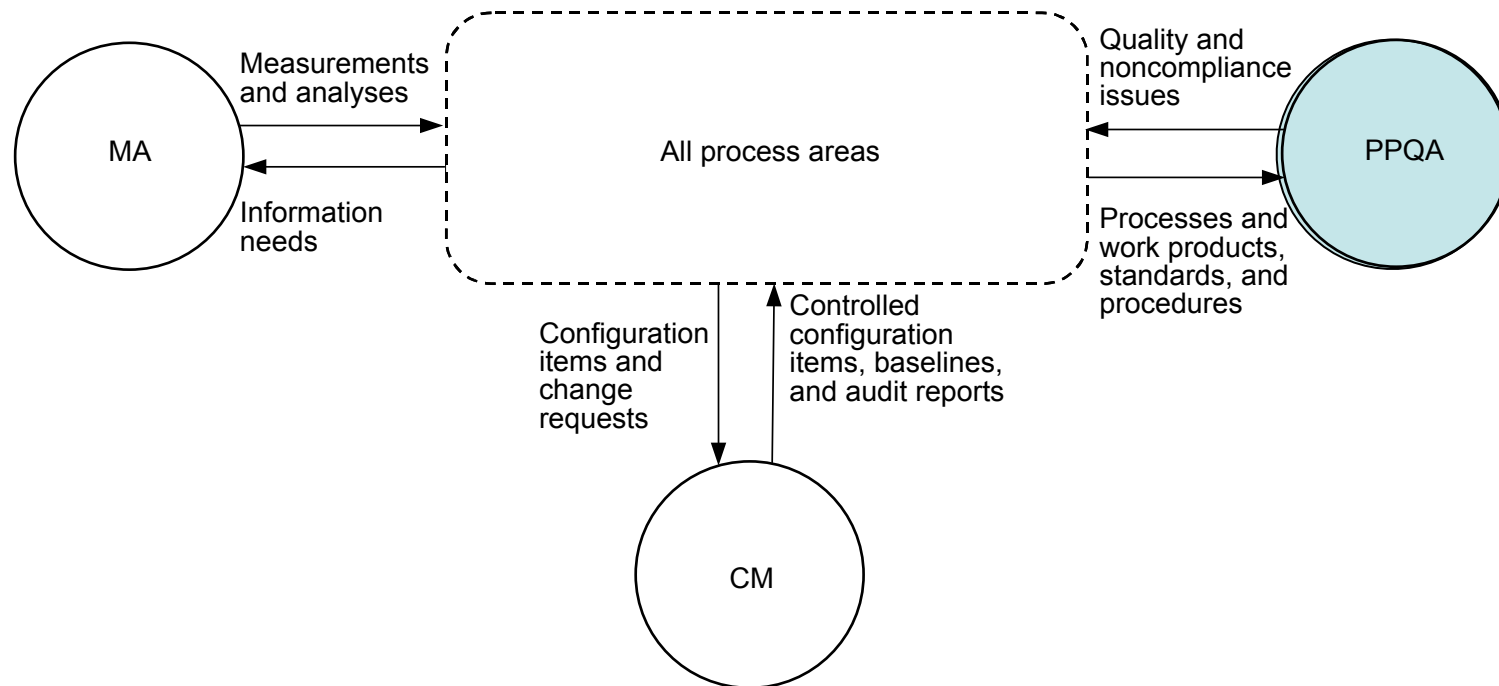
**Process Area → Goals → Practices → Artifacts, Records, Documents (Plans)**

PPQA Process & Product QA  
VER Verification

GP Generic Practices

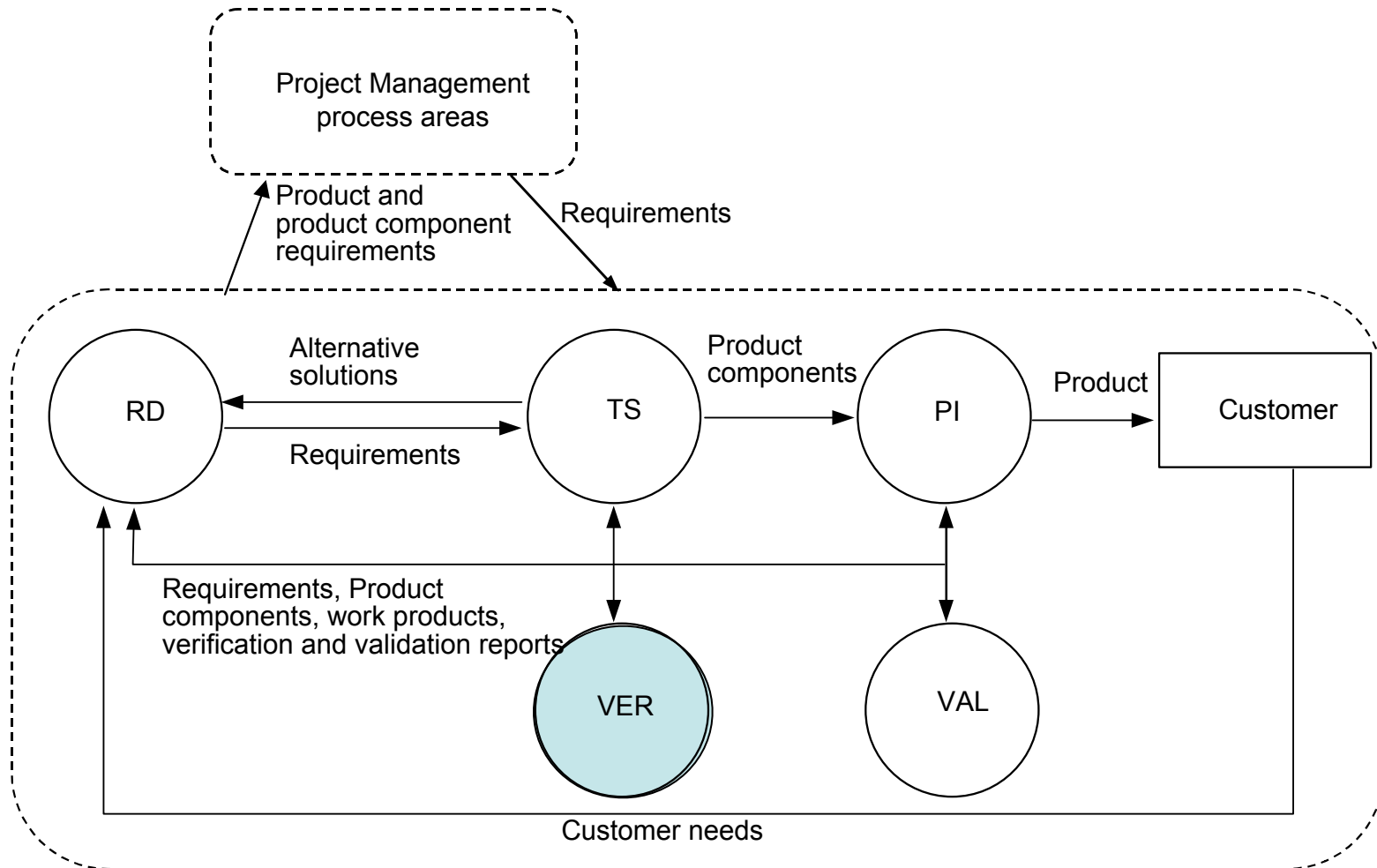
SG Process Specific Goal  
SP Process Specific Practices

# Basic Support Process Areas



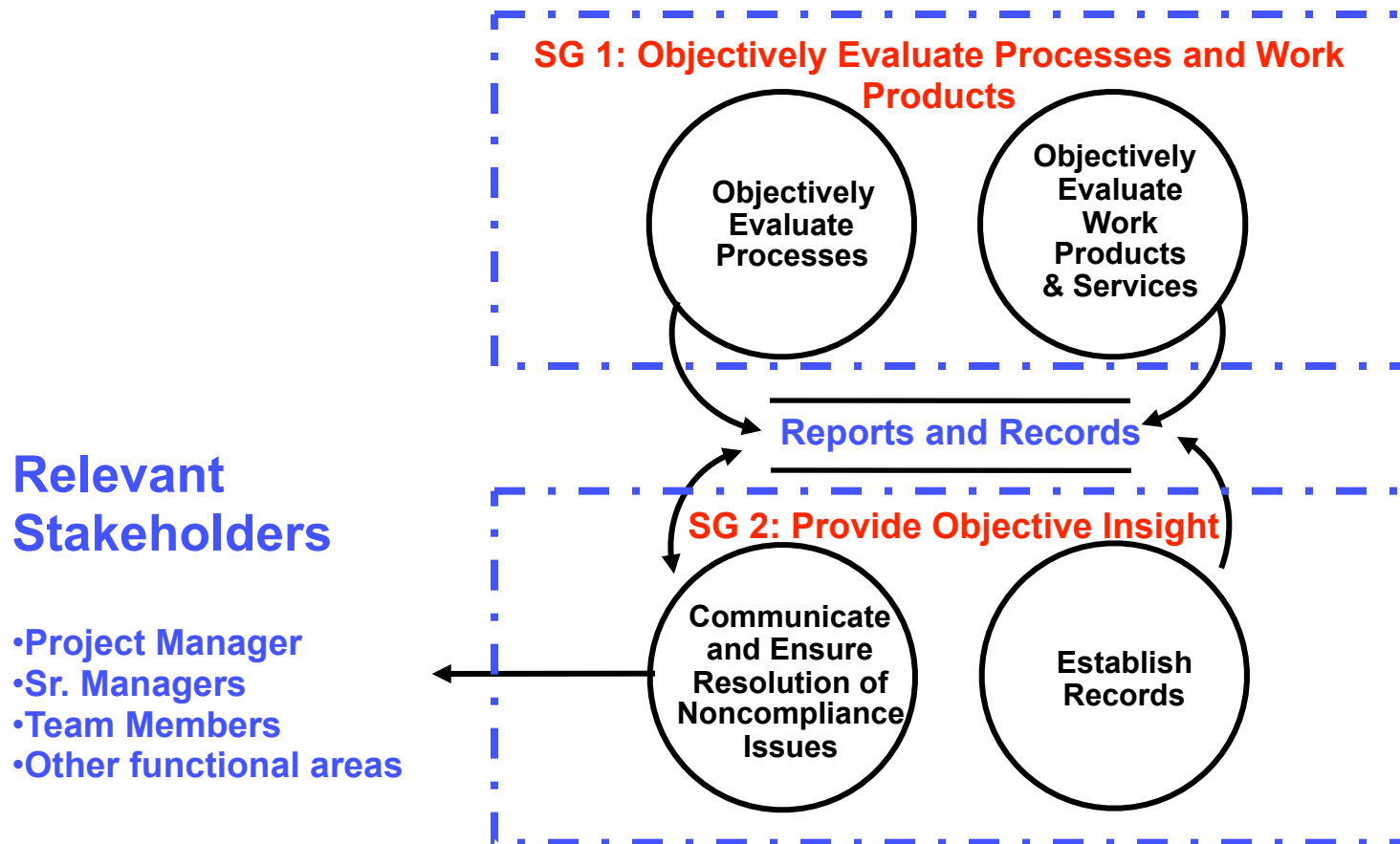
CM = Configuration Management  
MA = Measurement and Analysis  
PPQA = Process and Product Quality Assurance

# Engineering Process Areas

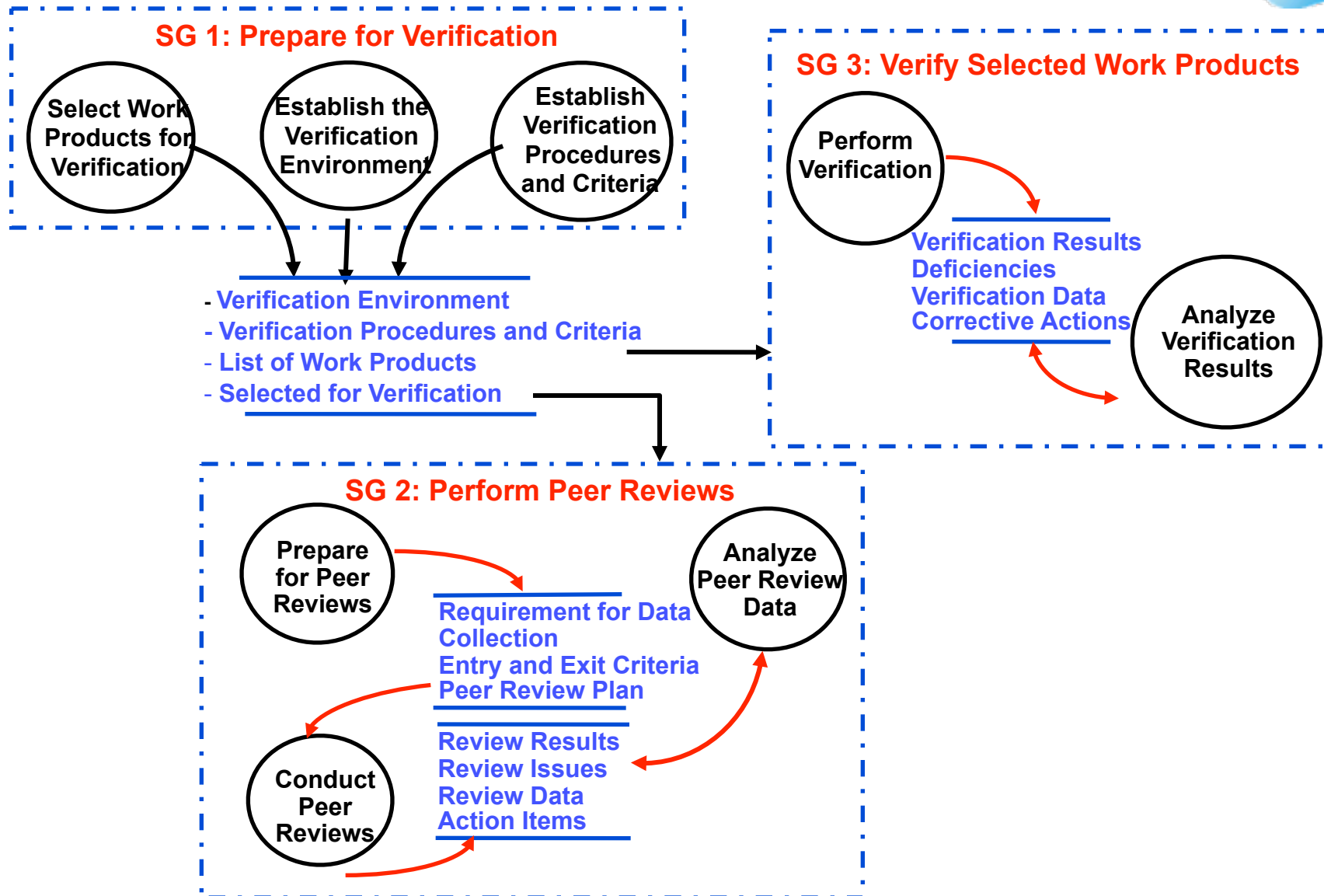


PI = Product Integration  
RD = Requirements Development  
TS = Technical Solution  
VAL = Validation  
VER = Verification

# Process and Product Quality Assurance - SGs



# Verification - SGs



# CMMI-DEV PPQA & VER

## Specific Goals (SGx) & Specific Practices (SPx.y)

### CMMI-DEV v1.3 PPQA & VER Specific Goals (SG)

**PPQA SG 1** Adherence of the performed process and associated work products and services to applicable process descriptions, standards, and procedures is objectively evaluated.

**PPQA SG 2** Noncompliance issues are objectively tracked and communicated, and resolution is ensured.

**VER SG 1** Preparation for verification is conducted.

**VER SG 2** Peer reviews are performed on selected work products.

**VER SG 3** Selected work products are verified against their specified requirements.

### PPQA & VER Specific Practices (SP)

**PPQA SP1.1** Objectively evaluate selected performed processes against applicable process descriptions, standards, and procedures.

**PPQA SP1.2** Objectively evaluate selected work products against applicable process descriptions, standards, and procedures.

**PPQA SP 2.1** Communicate quality issues and ensure the resolution of noncompliance issues with the staff and managers.

**PPQA SP 2.2** Establish and maintain records of the quality assurance activities.

**VER SP 1.1** Select work products to be verified and verification methods to be Used

**VER SP 2.2** Conduct peer reviews of selected work products and identify issues resulting from these reviews.

**VER SP 2.3** Analyze data about the preparation, conduct, and results of the peer reviews

**VER SP 3.2** Analyze results of all verification activities



# P730 SQA Outcomes - CMMI Goals

IEEE 730 has four outcomes which related to CMMI Goals

P730 / IS 12207 SQA Outcomes	CMMI-DEV Goals
a) a strategy for conducting quality assurance is developed;	<b>GP 2.2</b> Establish and maintain the plan for performing the process.
b) evidence of software quality assurance is produced and maintained;	<b>GP 2.9</b> Objectively evaluate adherence of the process and selected work products against the process description, standards, and procedures, and address noncompliance.
	<b>PPQA SG 1</b> Adherence of the performed process and associated work products and services to applicable process descriptions, standards, and procedures is objectively evaluated.
c) problems and/or non-conformance with requirements are identified and recorded; and	<b>PPQA SG 2</b> Noncompliance issues are objectively tracked and communicated, and resolution is ensured.
d) adherence of products, processes and activities to the applicable standards, procedures and requirements are verified.	<b>VER SG 1</b> Preparation for verification is conducted.
	<b>VER SG 2</b> Peer reviews are performed on selected work products.
	<b>VER SG 3</b> Selected work products are verified against their specified requirements.

# P730 / IS 12207 SQA Tasks

## IS 12207 SQA Process Tasks

**1.1** A quality assurance process suited to the project shall be established. The objectives of the quality assurance process shall be to assure that the software products and the processes employed for providing those software products comply with their established requirements and adhere to their established plans.

**1.2** The quality assurance process should be coordinated with the related Software Verification (subclause 7.2.4), Software Validation (subclause 7.2.5), Software Review (subclause 7.2.6), and Software Audit (subclause 7.2.7) Processes.

**1.3** A plan for conducting the quality assurance process activities and tasks shall be developed, documented, implemented, and maintained for the life of the contract. The plan shall include the following:

- a) Quality standards, methodologies, procedures, and tools for performing the quality assurance activities (or their references in organization's official documentation).
- b) Procedures for contract review and coordination thereof.
- c) Procedures for identification, collection, filing, maintenance, and disposition of quality records.
- d) Resources, schedule, and responsibilities for conducting the quality assurance activities.
- e) Selected activities and tasks from supporting processes, such as Software Verification (subclause 7.2.4), Software Validation (subclause 7.2.5), Software Review (subclause 7.2.6), Software Audit (subclause 7.2.7), and Software Problem Resolution (subclause 7.2.8).

**1.4** Scheduled and on-going quality assurance activities and tasks shall be executed. When problems or non-conformances with contract requirements are detected, they shall be documented and serve as input to the Problem Resolution Process (subclause 7.2.8). Records of these activities and tasks, their execution, problems, and problem resolutions shall be prepared and maintained.

**1.5** Records of quality assurance activities and tasks shall be made available to the acquirer as specified in the contract.

**1.6** It shall be assured that persons responsible for assuring compliance with the contract requirements have the organizational freedom, resources, and authority to permit objective evaluations and to initiate, effect, resolve, and verify problem resolutions.

# P730 / IS 12207 Tasks

IS 12207 SQA Process Tasks
<b>2.1</b> It shall be assured that all the plans required by the contract are documented, comply with the contract, are mutually consistent, and are being executed as required.
<b>2.2</b> It shall be assured that software products and related documentation comply with the contract and adhere to the plans.
<b>2.3</b> In preparation for the delivery of the software products, it shall be assured that they have fully satisfied their contractual requirements and are acceptable to the acquirer.
<b>3.1</b> It shall be assured that those software life cycle processes (supply, development, operation, maintenance, and support processes including quality assurance) employed for the project comply with the contract and adhere to the plans.
<b>3.2</b> It shall be assured that the internal software engineering practices, development environment, test environment, and libraries comply with the contract.
<b>3.3</b> It shall be assured that applicable prime-contract requirements are passed down to the subcontractor, and that the subcontractor's software products satisfy prime-contract requirements.
<b>3.4</b> It shall be assured that the acquirer and other parties are provided the required support and cooperation in accordance with the contract, negotiations, and plans.
<b>3.5</b> It should be assured that software product and process measurements are in accordance with established standards and procedures.
<b>3.6</b> It shall be assured that the staff assigned have the skill and knowledge needed to meet the requirements of the project and receive any necessary training.
<b>4.1</b> Additional quality management activities may be assured in accordance with the clauses of ISO 9001.

# Map Process Areas to P730 Tasks

CMMI has several Process Areas whose Specific Practices (SP) and two overall General Practices (GP) related to IEEE 730 15 of the 16 Tasks.

<b>CMMI Specific Practices (SP) and General Practices (GP)</b>	<b>730 Tasks</b>
<b>PPQA SP1.1</b> Objectively evaluate selected performed processes against applicable process descriptions, standards, and procedures.	1.1 3.1 3.2 3.5
<b>PPQA SP1.2</b> Objectively evaluate selected work products against applicable process descriptions, standards, and procedures.	1.1 2.1 2.3 3.5
<b>PPQA SP 2.1</b> Communicate quality issues and ensure the resolution of noncompliance issues with the staff and managers.	1.4 1.6
<b>PPQA SP 2.2</b> Establish and maintain records of the quality assurance activities.	1.5
<b>VER SP 1.1</b> Select work products to be verified and verification methods to be Used	2.1 3.3
<b>VER SP 2.2</b> Conduct peer reviews of selected work products and identify issues resulting from these reviews.	2.2
<b>VER SP 2.3</b> Analyze data about the preparation, conduct, and results of the peer reviews	2.2 3.3
<b>VER SP 3.2</b> Analyze results of all verification activities	2.2 2.3 3.3

# Map PPQA & VER to P730 Tasks,

continued

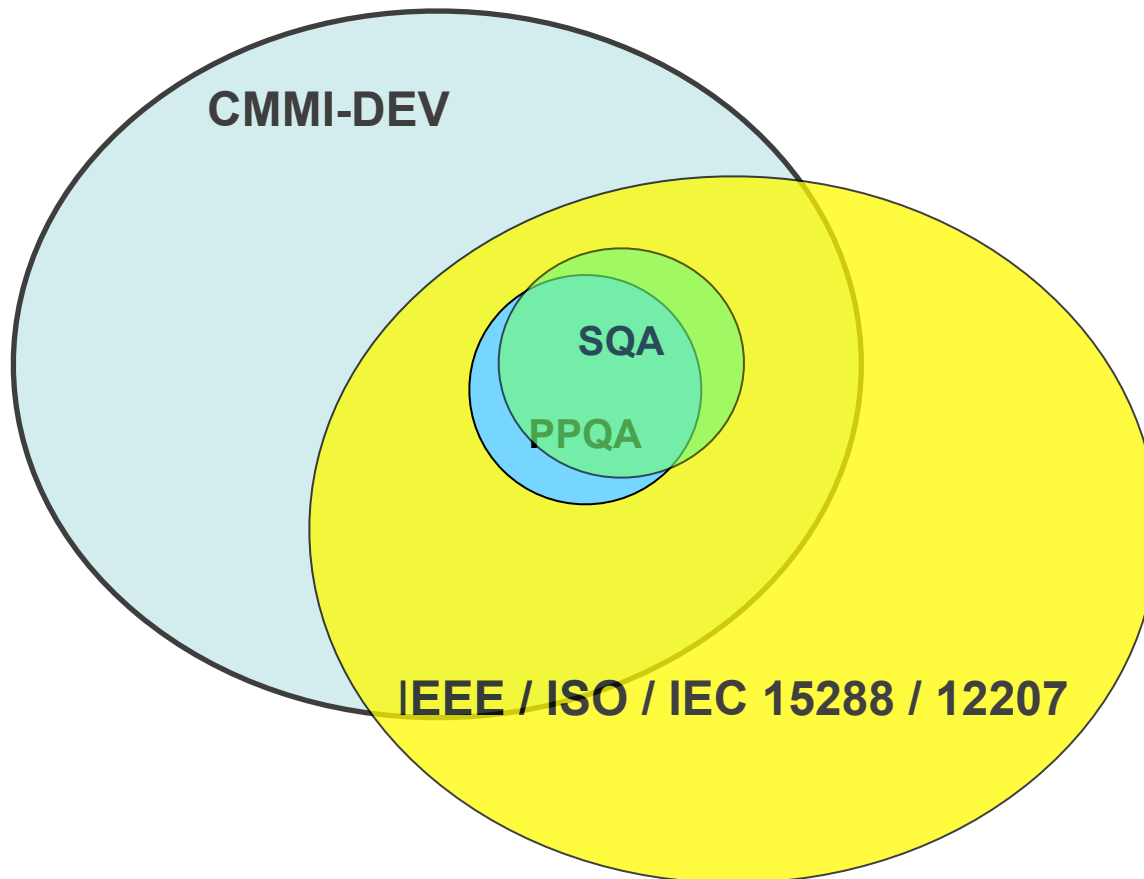
<b>CMMI Specific Practices (SP) and General Practices (GP)</b>	<b>730 Tasks</b>
<p><b>OPD SP 1.1</b> Establish and maintain the organization's set of standard processes. (especially subpractice 6 -- Ensure that there is appropriate integration among processes that are included in the organization's set of standard processes)</p> <p><b>OPF SP 3.2</b> Deploy the organization's set of standard processes to projects at their startup and deploy changes to them as appropriate throughout the life of each project. (especially subpractice 6 -- Ensure that the defined processes resulting from process tailoring are incorporated into plans for process-compliance audits)</p>	<b>1.2</b>
<b>OT SP 2.1</b> Deliver training following the organizational training tactical plan.	<b>3.6</b>
<b>GP 2.1</b> Establish and maintain the plan for performing the process.	<b>1.3</b>
<b>GP 2.3</b> Provide adequate resources for performing the process, developing the work products, and providing the services of the process.	<b>3.4</b>
<b>Missing from CMMI</b>	<b>4.1</b>

# Mapping Typical Work Products (WP)

Each CMMI Process Area Specific Practices have examples of Work Products. Below table show the best match to IEEE 730 Outcome typical deliverables as named by IS 15289 Information Products.

<b>SP WP</b>	<b>SP Work Products examples</b>	<b>IS 15289 SQA Info Products</b>
1.1.WP.1	Evaluation reports	10.22 Evaluation report
1.1.WP.2	Noncompliance reports	10.41 Problem report
1.1.WP.3	Corrective actions	Quality Activity Record
1.2.WP.1	Evaluation reports	10.22 Evaluation report
1.2.WP.2	Noncompliance reports	10.41 Problem report
1.2.WP.3	Corrective actions	Quality Activity Record
2.1.WP.1	Corrective action reports	Quality Activity Record
2.1.WP.2	Evaluation reports	10.22 Evaluation report
2.1.WP.3	Quality trends	
2.2.WP.1	Evaluation logs	10.22 Evaluation report
2.2.WP.2	Quality assurance reports	Quality Activity Record
2.2.WP.3	Status reports of corrective actions	Quality Activity Record
2.2.WP.4	Reports of quality trends	

# Conclusion: Good Fit



# Acronyms

- CMMI Capability Maturity Model Integration
- CMMI-DEV CMMI for Development
- GP generic practice
- IEEE Institute of Electrical and Electronics Engineers
- IEEE 15288 system engineering life cycle processes
- IEEE 12207 software engineering life cycle processes
- IS International Standard, IEEE/ISO/IEC
- ISO/IEC International Organization for Standardization and International Electrotechnical Commission
- PPQA Process and Product Quality Assurance (process area)
- SQA software quality assurance
- SCAMPI Standard CMMI Appraisal Method for Process Improvement
- SG specific goal
- SP specific practice
- VER Verification (process area)



# Where you can help?

- Attend a working group meeting in person or via LiveMeeting and phone, or
  - Follow the working group progress, or
  - Review the draft standard, or
  - Ballot for the final standard, or
  - Participant in the User Group
- 
- Send email to [sue.carroll@sas.com](mailto:sue.carroll@sas.com) and ask to be part of the listserv

# Questions?

